Activity summary for C-MORE EDventures project: “Potentially large roles for small bacterial vesicles in the ocean.”
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This EDventures project provided support for a set of ‘proof-of-concept’ experiments investigating the presence of bacterial membrane vesicles in the oceans. Laboratory studies of the globally important marine photoautotroph *Prochlorococcus* had revealed that these bacteria naturally release small (50 - 150 nm diameter) spherical, membrane-bound vesicles during growth. The primary goal of this project was to extend our culture-based findings into the field to test the hypothesis that secreted membrane vesicles could be found in the oceans. To this end, the EDventures funding supported the purchase of equipment required to isolate these tiny particles in the oceans.

To test the equipment and develop field-sampling methodology, we first collected approximately 100 L of coastal surface seawater from Woods Hole, MA. We were able to isolate bacterial vesicles from this sample, demonstrating that vesicles are abundant in seawater (Fig. 1). Later, this study was extended to water samples collected from oligotrophic waters at the Bermuda Atlantic Times Series station in the Sargasso Sea. We were able to isolate vesicles at all depths sampled (5 - 500m). Together, these results establish bacterial vesicles as a component of marine microbial ecosystems, and open the door for future research into their functional roles.

This EDventures project has resulted in the development of methods for collecting bacterial vesicles from the oceans, and yielded important scientific advances in our understanding of these features in the environment. Future work on this topic will almost certainly involve collaborations with other C-MORE investigators and lead to participation in C-MORE research cruises. In addition, the project provided an important educational opportunity for me to participate in my first oceanographic research cruise.

**Figure 1.** Electron microscope image of extracellular vesicles isolated from surface water off of Woods Hole, MA, Sept 2012. Vesicles were found at concentrations of ~ 6 x 10⁶ mL⁻¹.