Use of Magnet Technology to Develop a Green Technology Approach to Artificial Reefs and Oyster Restoration

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Introduction

For over a decade our group has been developing different ways to make biofilms in the ocean. We tested a number of surfaces, ranging from cellulose to mineral to metals, coated or embedded with a host of nutrients ranging from organics (vitamins, amino acids, sugars, etc) to inorganics (iron, cobalt, copper, nitrate, etc.). On a number of occasions FT-ICR and NMR technology at the magnet lab was used to help identify various natural products. These measurements helped us mold our research program and guide our material and nutrient coating selection.

Along the way, we noticed a host of other marine creatures growing on, boring in, feeding from or seeking shelter around the structures. We elected to expand the project and start preliminary work at several seeks stretching from the FSU marine lab to the Florida Keys. Going through the NSF ICORP program this summer we elected to focus on osyters. Our choice was not based on their role as a food source but rather their potential use in large scale engineering projects to help with shoreline erosion and restoration and water quality issues (one oyster filters up to 50 gallons of water per day).

Experimental

We used the FT-ICR with ESI ionization to study broystatin, a marine natural product that has shown activity against cancer, HIV and recently Alzhimiers. Similar samples were analyzed using NMR (500-800 MHz) for proton and carbon-13 measurements.

Results and Discussion

Bryostatin is produced by symbiotic marine bacteria that resides on the bryozoan *Bugula neritina*. We optimize our surfaces to produce or grow this same specuies (s) of bacteria. Samples were taken from various marine enviroments, returned to the lab where they were purified (solvent extraction, silicia columns) and analyzed by ICR and NMR.

Conclusions

The bryostatin work is ongoing and encouraging. In the summer of 2014 we shipped 100 mg of iron-bryostatin to a company doing work with Alzheimer's. We are currently attempting to purify pure bryostatin-1 for an English company. The material has been adapted for artificial reef work and tested on a preliminary level. We have recently filed a total of three patent applications (see below) on the materials and design for the new approach to artificial reefs. We recently received a three year permit from the state of Florida to test our materials for oyster restoration in Apalachicola Bay.

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