THE THIRD ANNUAL MDIBL ENVIRONMENTAL HEALTH SCIENCES SYMPOSIUM: BIOACTIVE COMPOUNDS FROM THE SEA AND THEIR IMPACT ON HUMAN HEALTH

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The impact of marine natural products on human health and disease was the focus of the Mount Desert Island Biological Laboratory's 1996 Environmental Health Sciences Symposium. The marine environment has long been recognized as a rich source of unique chemicals and other compounds, but has only recently been explored as a source of new drugs to treat human ailments. However, it is also increasingly evident that some of the chemicals produced in the marine environment pose a threat to human health. The benefits as well as the potential adverse effects of bioactive marine compounds were examined in this two-day symposium, held at the MDIBL on July 17 and 18, 1996.

Thirteen of the world's experts on marine biotechnology and marine toxins came to the MDIBL to share their latest findings in these exciting research areas. The first day of the symposium was devoted to studies on the identification and development of natural marine compounds for specific clinical applications, including antibiotics, antiviral and anticancer agents, and artificial biomaterials. Dr. David J. Newman of the Natural Products Branch, National Cancer Institute, provided an overview of the experimental strategies that are employed by the National Cancer Institute to screen marine organisms collected from around the world for clinically useful drugs. He discussed the recent identification of several compounds that show promise as anticancer agents in their preliminary screening. Dr. Michael Zasloff, President of the Magainin Research Institute, described his discovery of antimicrobial peptides (magainins) from frogs, and of an antiproliferative agent (squalamine) from the dogfish shark, *Squalus acanthias*. The latter finding was stimulated by a prior visit by Dr. Zasloff to the MDIBL, where he was introduced to the dogfish shark. Squalamine is a flat-ring steroid that inhibits endothelial cell growth, and is providing encouraging results in clinical trials aimed at slowing the growth of brain tumors, and possibly of other solid tumors.

Naturally-produced biomaterials was the focus of four presentations. Dr. J. Malcolm Shick of the University of Maine and the MDIBL discussed his research into antioxidants and natural UV sunscreens derived from marine organisms. Dr. Herbert Waite from the College of Marine Studies of the University of Delaware described the identification and characterization of novel adhesives and antifouling compounds from mussels and clams. Water-resistant and water-compatible adhesives have widespread applications in industrial and clinical settings, and several patents have been awarded for these marine compounds. Dr. Thomas J. Koob, an MDIBL researcher as well as chief of the Skeletal Biology Section of the Shriners Hospital in Tampa Florida, described the remarkable properties of the skate egg case, and his efforts to exploit these properties to develop artificial bone and cartilage replacements. Dr. H. William Harris of Boston Children's Hospital and MDIBL discussed a novel calcium-sensing receptor that regulates serum calcium, and may be involved in fish adaptation to different environments.

The second day of the symposium was devoted to natural marine products that have adverse effects on human health. Dr. Frances M. Van Dolah on the National Marine Fisheries Service, Medical University of South Carolina, and an MDIBL investigator, provided a superb overview of the marine toxins produced by cyanobacteria, dinoflagellates, diatoms, sponges, corals and bacteria, and how these toxins impact human health. Dr. Van Dolah focused in on the so called "red tide" toxins, and described the toxic chemicals involved and the mechanisms by which these chemicals produce cell injury. An alarming increase in the number and size of "red tide" blooms has been recorded, and it is important to understand the human health implications of this phenomenon. Dr. Michael R. Bubb of the University of Florida College of Medicine

described some unusual chemicals derived from marine sponges that disrupt actin microfilament structure. Although toxic, these chemicals may nevertheless be useful in certain clinical settings, and in particular Dr. Bubb mentioned the possible use of swinholide A in cystic fibrosis therapy. Dr. Maria Runnegar of the University of Southern California discussed toxins produced by "blue-green" algae that target the liver. These toxins, and in particular mycrocystin, have killed farm animals and wildlife, and are also toxic to humans. The selective hepatotoxicity of mycrocystin, a protein phosphatase inhibitor, is attributed to the presence in the liver of a transport system that facilitates accumulation of the toxin from the bloodstream. Dr. Charles Holmes, University of Alberta, Edmonton, discussed another class of protein phosphatase inhibitors, motuporin and nodularin, and provided an elegant biochemical description of their mode of action. Dr. Armen H. Tashjian, Jr., Harvard School of Public Health described the mechanism by which palytoxin disturbs cellular calcium, sodium and proton homeostasis. Finally, Dr. John S. Ramsdell from the Medical University of South Carolina described the mode of action of demoic acid, the agent that causes amnesic shellfish poisoning.

The Symposium concluded with the Fifteenth Annual William B. Kinter Memorial Lecture, presented by Dr. Daniel G. Baden of the Rosenstiel School of Marine and Atmospheric Sciences at the University of Miami. Dr. Baden's lecture was entitled "New frontiers with natural toxin probes: Learning things you never knew you never knew", in which he described the molecular mechanism by which brevetoxin interacts with the sodium channel, its target site in cells. The overall goal of Dr. Baden's research work is to identify the effects of seafood toxins on humans and to develop tests to detect toxins in food sources and human tissue samples.

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