Marine Biotechnology

Volume 1
Pharmaceutical and Bioactive Natural Products

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PLENUM PRESS • NEW YORK AND LONDON

Library of Congress Cataloging-in-Publication Data

Marine biotechnology / edited by David H. Attaway and Oskar R. Zaborsky.
p. cm.
Includes bibliographical references.
Contents: v. 1. Pharmaceutical and bioactive natural products
ISBN 0-306-44174-8 (v. 1)
1. Marine biotechnology. 2. Marine pharmacology. 3. Natural products. I. Attaway, David H. II. Zaborsky, Oskar R.
TP248.27.M37M365 1993
660'.6--dc20 92-43270
CIP

ISBN 0-306-44174-8

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Preface

Biotechnology may be defined as the application of scientific and engineering principles to the processing of materials by biological agents to provide goods and services (Bull *et al.*, 1982, p. 21) or as any technique that uses living organisms (or parts of organisms) to make or modify products, to improve plants or animals, or to develop microorganisms for specific use (OTC, 1988). In line with these broad definitions we can consider marine biotechnology as the use of marine organisms or their constituents for useful purposes in a controlled fashion. This series will explore a range of scientific advances in support of marine biotechnology. It will provide information on advances in three categories: (1) basic knowledge, (2) applied research and development, and (3) commercial and institutional issues. We hope the presentation of the topics will generate interest and interaction among readers in the academic world, government, and industry. This first volume examines chemical and biological properties of some natural products that are useful or potentially useful in research and in the chemical and pharmaceutical industries. One chapter describes a system for producing such substances on a large scale.

Biotechnology incorporates molecular biology in order to go beyond traditional biochemical technology such as the production of antibiotic drugs from bacterial cultures in bioreactors. Development of the technology for production of antibiotics in this way resulted from fundamental advances in chemistry, pharmacology, microbiology, and biochemical engineering. It is likely that molecular biology will be used to improve the efficiency of this technology. One of the objectives of this series is to emphasize the importance of interdisciplinary science and to encourage improvement of the environment for it in academic institutions. Another objective is to demonstrate the rich array of materials and processes in the marine world that have no terrestrial counterparts and to suggest that the workings

of this diverse world should be explored aggressively. The majority of plant and invertebrate phyla on earth are either exclusively or predominantly marine. Many of these marine organisms are so poorly understood that they have yet to be fully described and named. Developing a thorough understanding of the ocean's biological materials and processes will provide new information for technological development. The authors who have contributed to this volume make this point eloquently.

We acknowledge the enthusiasm and cooperation with which the advisory board and authors have endorsed this series and its first volume.

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Chapter 13

1

Biomedical Potential of Marine Natural Products

Chris M. Ireland, Brent R. Copp, Mark P. Foster, Leonard A. McDonald, Derek C. Radisky, and J. Christopher Swersey

1. INTRODUCTION

Marine natural products, the secondary or nonprimary metabolites produced by organisms that live in the sea, have received increasing attention from chemists and pharmacologists during the last two decades. Interest on the part of chemists has been twofold: natural products chemists have probed marine organisms as sources of new and unusual organic molecules, while synthetic chemists have followed by targeting these novel structures for development of new analogs and new synthetic methodologies and strategies (Albizati *et al.*, 1990). The rationale for investigating the chemistry of marine organisms has changed over the past several decades. Early investigations were largely of a "phytochemical" nature, reporting detailed metabolite profiles similar to those reported for terrestrial plants in previous decades. However, analogous to investigations of terrestrial plants, more recent studies of marine organisms have focused on their potential applications, particularly to the treatment of human disease and control of agricultural

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