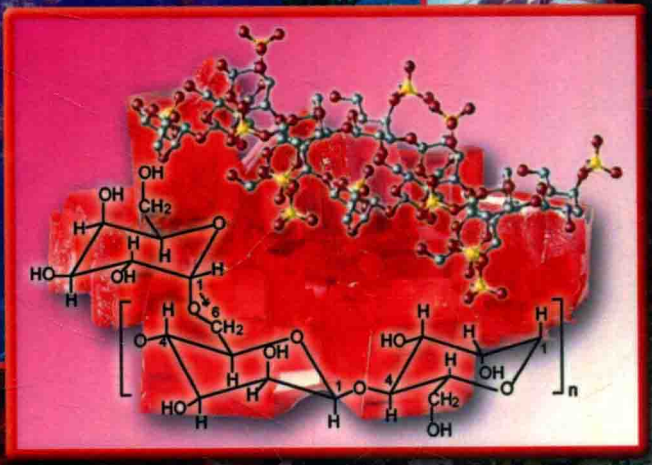
Marine Polysaccharides

Food Applications



Vazhiyil Venugopal

CRC Press
Taylor & Francis Group

Marine Polysaccharides

Food Applications

Vazhiyil Venugopal

CRC Press
Taylor & Francis Group
Boca Raton London New York

CRC Press is an imprint of the
Taylor & Francis Group, an **informa** business

CRC Press
Taylor & Francis Group
6000 Broken Sound Parkway NW, Suite 300
Boca Raton, FL 33487-2742

Printed in the United States of America on acid-free paper
10 9 8 7 6 5 4 3 2 1

International Standard Book Number: 978-1-4398-1526-7 (Hardback)

Marine Polysaccharides

Food Applications

Dedicated to

Late Prof. K. P. Antony, Department of Chemistry,

St. Thomas' College, Thrissur, India

Preface

Increasing public awareness of the importance of healthy living is presenting new challenges for the commercial food processing sector. Consumer perceptions of processed foods are changing, and processed foods are being recognized as convenient vehicles for the delivery of bioactive compounds and nutraceuticals. This changing scenario has had a profound effect on the global food processing industry, which must consider nutritional quality, cost of production, added value, consumer safety, and convenience. A major contributor to successfully addressing these challenges is the availability of novel and safe additives with fascinating functional properties that can be used to impart appealing properties to foods, such as modified texture, stability, foam and emulsion capacities, water retention, fat replacement, microbial protection, control of rancidity, and enhancement of fiber content, among others. Polysaccharides are water-soluble biopolymers (also referred to as *hydrocolloids* or *gums*), derived from diverse renewable sources such as seeds, fruits, vegetables, plant exudates, microorganisms, and animals, that can meet most of these requirements for food additives. Polysaccharides were introduced to food processing as early as the 1940s, initially through the use of modified specialty starches and high fructose sweeteners. Explosive growth in the use of other carbohydrate ingredients, such as maltodextrins and microcrystalline cellulose, occurred from the 1960s to the 1980s. These compounds are of natural origin and are considered safe and edible. Further, their chemical structures allow modification of their functional properties and expand their potential applications in food, medicine, biotechnology, and other fields.

Marine resources, apart from providing a wealth of protein foods, also provide several polysaccharides with numerous possible uses in diverse fields. Because marine environments are extremely diverse in terms of, for example, available nutrients, temperature, and pressure, organisms inhabiting the oceans have adapted themselves to these varying habitats by evolving several unique compounds. It is likely that marine polysaccharides possess some unique properties that may be useful in food technology and other fields. Although some marine polysaccharides, such as carrageenans, and agar, have found wide use as hydrocolloids due to their ability to form gels and function as thickeners and stabilizers in a variety of foods, the potential of many of these hydrocolloids has yet to be explored. This book attempts to compile recent data on the food applications of marine polysaccharides from such diverse sources as fishery products, seaweeds, microalgae, microorganisms, and corals.

The chapters of the book are grouped into three sections. The chapters in the first section are devoted to discussions on the isolation of polysaccharides from marine sources and their general properties, particularly those important from a food technology point of view. The second section of the book focuses on the actual food applications of these compounds, and the chapter in the third section provides a brief discussion of biomedical applications. Chapter 1 discusses major sources of marine polysaccharides, including crustacean shellfish, macroalgae (seaweed), microalgae, and marine microorganisms, as well as coral. Chapter 2 provides an overview of the general functional properties of polysaccharides, such as their structure; their hydration, gelation, emulsification, and rheological properties; and interactions among themselves and with other food components such as proteins that are relevant to food processing. Chapters 3, 4, and 5 further discuss the isolation and food-related properties of various marine polysaccharides.

The second section covers the use of these polysaccharides for food product and biopackaging development. Recent developments in composite films and nanotechnology have greatly contributed to this field, as discussed in Chapter 9. The safety and regulatory aspects of food ingredients are very important factors to consider during product development, and Chapter 10 addresses these aspects with respect to polysaccharides. The book concludes with an overview of recent developments in the biomedical applications of marine polysaccharides.

I thank Stephen Zollo, Chief Editor, and Patricia Roberson, Project Coordinator, Taylor & Francis, Boca Raton, FL, for their editorial support.

Vazhiyil Venugopal
venugopalmenon@hotmail.com
vvenugopalmenon@gmail.com

Author

Vazhiyil Venugopal received his MSc in chemistry from the University of Kerala and his PhD in biochemistry from the University of Bombay, India. He began his career at the Central Institute of Fisheries Technology, Cochin, India, and later moved to the Bhabha Atomic Research Center, Mumbai, where he was the head of the Seafood Technology Section of the Food Technology Division. He has been a postdoctoral Research Fellow at the National Institutes of Health, Bethesda, Maryland, and a visiting scientist at the Memorial University of Newfoundland, St. John's, Newfoundland, Canada. His main interests are the value addition of fishery products, radiation processing of seafood, and marine proteins. His more than 120 publications in these areas include research papers, review articles, and book chapters. He has previously published two books, *Seafood Processing: Adding Value Through Quick Freezing, Retortable Packaging, and Cook-Chilling* (CRC Press, 2006) and *Marine Products for Healthcare: Functional Compounds and Bioactive Nutraceuticals from the Ocean* (CRC Press, 2008). He is a Fellow of the National Academy of Agricultural Sciences, New Delhi, India.

Contents

Section II. Food Applications

Section III. Biomedical Applications

Section I

Isolation and Properties of Marine Polysaccharides