

Food Lipids

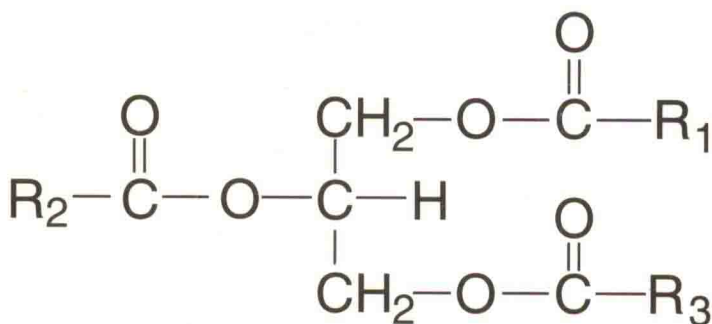
Food Lipids

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Chemistry, Nutrition, and Biotechnology

Second Edition, Revised and Expanded



edited by

Casimir C. Akoh

David B. Min

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Preface to the Second Edition

Readers' responses to the first edition, published in 1998, were overwhelming, and we are grateful. The response reassured us that there was indeed great need for a textbook suitable for teaching food lipids, nutritional aspects of lipids, and lipid chemistry courses to food science and nutrition majors. The aim of the first edition remains unchanged: to provide a modern, easy-to-read textbook for students and instructors. The book is also suitable for upper-level undergraduate, graduate, and postgraduate instruction. Scientists who have left the university and are engaged in research and development in the industry, government, or academics will find this book a useful reference. Again, we made every effort to select contributors who are internationally recognized experts. We thank them for their exceptional attention to details and timely submissions.

The text has been updated with new information. The indexing has been improved. We changed the order of chapters and added two new chapters, "Conjugated Linoleic Acid" and "Food Applications of Lipids." While it is not possible to cover every aspect of lipids, we feel we have added and covered most topics that are of interest to our readers. The book still is divided into five main parts: Chemistry and Properties; Processing; Oxidation; Nutrition; and Biotechnology and Biochemistry.

Obviously, we made some mistakes in the first edition. Thanks go to our students for pointing out most of the obvious and glaring errors. Based on readers' and reviewers' comments, we have improved the new edition—we hope without creating new errors, which are sometimes unavoidable for a book this size and complexity. We apologize for any errors and urge you to contact us if you find mistakes or have suggestions to improve the readability and comprehension of this text.

Special thanks to our readers and students, and to the editorial staff of Marcel Dekker, Inc., for their helpful suggestions toward improving the quality of this edition.

Casimir C. Akoh
David B. Min

Preface to the First Edition

There is a general consensus on the need for a comprehensive, modern textbook of food lipids that will provide a guide to students and instructors, as well as cover the topics expected of students taking a food lipids or lipid chemistry course as food science and nutrition majors. The text is suitable for undergraduate and graduate instruction. In addition, food industry professionals seeking background or advanced knowledge in lipids will find this book helpful. It is envisaged that this book will also serve as a reference source for individuals engaged in food research, product development, food processing, nutrition and dietetics, quality assurance, oil processing, fat substitutes, genetic engineering of oil crops, and lipid biotechnology. It is expected that students and others using this book will have backgrounds in chemistry and biochemistry.

Every effort was made to involve internationally recognized experts as contributors to this text. Considerable efforts were made by the authors to start from basics and build up and to provide copious equations, tables, illustrations, and figures to enhance teaching, comprehension, and to drive the lecture materials home. Mechanisms of reactions are given to help in the understanding of the underlying principles of lipid chemistry and hopefully will lead to solutions of adverse reactions of lipids in the future. We believe that the end product of this work provides state-of-the-art and authoritative information that covers almost all aspects of food lipids and will serve as a unique text for instruction throughout the world. The text is reader-friendly and easy to understand. Adequate references are provided to encourage persons who need to inquire further or need detailed information on any aspect covered in this book.

The text is divided into five main parts, namely: Chemistry and Properties; Processing; Oxidation; Nutrition; and Biotechnology and Biochemistry.

Part I is devoted to introductory chapters on the nomenclature and classification of lipids, chemistry of phospholipids, waxes and sterols, emulsion and emulsifiers, frying, and on the analysis of lipids including *trans* fatty acids. It is important to understand the structure and chemistry of lipids and some basic concepts before moving on to more complex and applied topics.

Part II deals with the technology of edible oils and fats processing including refining, recovery, crystallization, polymorphism, chemical interesterification, and hydrogenation.

Part III describes the key oxidation reactions in both edible oils and plant and animal or muscle tissues. Lipid oxidation is a major cause of quality deterioration of processed and unprocessed foods. Methods to measure lipid oxidation in fats and oils are given. The mechanism of antioxidant actions in arresting or improving the oxidative stability of foods is discussed. This section has tremendous implications for food technologists and nutritionists as the consumer continues to demand and expect nothing but high-quality foods and food products.

Part IV deals with the role of fats and oils in overall nutrition. The importance of antioxidants in nutrition and food preservation is presented. Excess fat intake is associated with many disease conditions. This section describes various omega fatty acids and their sources, the role of dietary fats in atherosclerosis, eicosanoids production, immune system, coronary heart disease and obesity. The various types of lipid-based synthetic fat substitutes are discussed.

Part V introduces the new biotechnology as applied to lipids and production of value-added lipid products. The microbial lipases used in enzyme biotechnology are discussed. The potential for replacing chemical catalysis with enzyme catalysis are described further in the chapters dealing with enzymatic interesterification and structured lipids. Lipid biotechnology and biosynthesis chapters set the stage for a better understanding of the chapter on genetic engineering of plants that produce vegetable oil and for further research in lipid biotechnology, a dynamic area of increasing industrial interest.

We feel that we covered most of the topics expected for a food lipids course in this text. It is hoped that this edition will stimulate discussions and generate helpful comments to improve upon future editions. Unavoidably, in a book of this size and complexity, there are some areas of overlap. Efforts are made to cross reference the chapters as such.

Finally, we would like to thank all the authors for the magnificent work they did in making sure that their contributions are timely, easy to read, and most of all, for their time and devotion to details and accuracy of information presented. The help of the Marcel Dekker editorial staff is greatly appreciated, with special thanks to Rod Learmonth and Maria Allegra.

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