

# **Bioactive Lipids**

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# Bioactive Lipids

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## Preface

There is no doubt that the elucidation of the human genome has changed the face of modern science. All the resulting developments in gene analysis and protein expression studies have emphasized the importance of a deeper understanding of the regulatory mechanisms in the living cell and whole body. Lipid research has not been left untouched by these advances. Intense research effort has successfully defined the roles of lipids in cell signalling and the pathophysiology of disease states. Lipidomics is emerging as a rapidly expanding field aiming at the full characterization of lipid molecular species and of their biological roles in terms of molecular mechanisms, gene regulation, and protein structure and function.

For many people the term 'lipid' brings to mind negative associations linked with excess dietary fat consumption, obesity and heart disease. However, lipids are essential components of the cell membrane shown to play many dynamic roles in mediating and controlling a wide array of cellular activities including membrane structure and organization, metabolic and gene regulation, protein structure and function, energy production, and signalling pathways. Lipids have been intimately linked to the immune and inflammatory responses, cell proliferation, mediation of programmed cell death (apoptosis), as well as clearly shown to be major determinants in many pathologies, including diabetes, cancer, cardiovascular disease and neurodegenerative disorders. Lipid metabolizing enzymes and rate limiting steps in lipid-regulating and lipid-producing metabolic cascades have been targeted for drug development, the best known example being the enzyme cyclooxygenase, target for the widely used non-steroidal anti-inflammatory drugs. Furthermore, functional foods and dietary supplements are already in the market (e.g. fish oils, conjugated linoleic acid) making claims for health benefits.

The main objective of this book is to present a clear overview of bioactive lipids to scientists and technologists not totally familiar with lipid research. We want to address the needs of new postgraduate researchers, industrial technologists, physicians, and scientists in the pharmaceutical and food industries. Overall, we wish to introduce this exciting field of research to all who need to appreciate the multifaceted roles of these biomolecules in health and disease. We have not tried to compile a series of scientific reviews but have strived for chapters discussing the nomenclature, structures, biochemistry, pharmacology and recent developments in the main classes of bioactive lipids. Our starting point has been the definition of bioactive lipids

as lipids derived from components of the cellular membrane that mediate cellular function.

The first chapter of the book deals with the properties and activities of fatty acids. This is followed by detailed discussions of diacylglycerols and phosphoinositides. The lysolipids are represented by sphingosine 1-phosphate and lysophosphatidic acid, followed by an overview of the properties of ether lipids. Ceramides and glycosphingolipids are covered in two chapters. The metabolites of the arachidonic acid cascade are discussed in a further two chapters on prostanoids, leukotrienes and lipoxins, followed by the last two chapters of the book which focus on endocannabinoids and isoprostanes. The authors come from several European countries and North America, each one of them bringing on board their individual research and teaching experience, and insight of their expertise.

The book would not have been possible without the help and patience of our publisher, Peter J. Barnes, whom we thank. We are also thankful to William Christie for helpful discussions and advice during the first stages of drafting this book, the late David Horrobin for his suggestions and recommendations, and, last but not least, our copy editor Beverley White who managed to convert a bundle of manuscripts into a slick volume. We hope that this book will contribute to the advancement of lipid research, will tempt more colleagues to consider the roles of lipids in their individual fields, and inspire more students to consider researching this fascinating area.

A. Nicolaou  
G. Kokotos  
May 2004

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