



# LIPASES

*their structure, biochemistry  
and applications*

EDITED BY

PAUL WOOLLEY &

STEFFEN B. PETERSEN

# Lipases Their Structure Biochemistry And Application

**Mark Doolittle**



## **Lipases Their Structure Biochemistry And Application:**

**Lipases** Paul Woolley, Steffen B. Petersen, 2012-01-26 This 1994 book provides a fascinating account of the fast moving field of lipase research. The contributions written by active research workers summarise developments in the field and give access to recent literature. It covers both the lipases proper triglyceride lipases and the phospholipases. It gives a comprehensive picture of the state of knowledge of these enzymes with a strong bias towards the fields that are attracting the greatest attention: their detailed molecular structure, their mechanism of action, their position in the evolution of enzymes and their application both in the laboratory and industry. The book will continue to be of interest to those working in universities, in research institutes and in companies specialising in biotechnology. The book will also be a useful reference book for postgraduate students entering this field of research. **Industrial Enzymes** Julio Polaina, Andrew P.

MacCabe, 2007-05-16 Man's use of enzymes dates back to the earliest times of civilization. Important human activities such as the production of certain types of foods and beverages and the tanning of hides and skins to produce leather for garments serendipitously took advantage of enzyme activities. Important advances in our understanding of the nature of enzymes and their action were made in the late 19th and early 20th centuries, seeding the explosive expansion from the 1950s and 60s onward to the present billion dollar enzyme industry. Recent developments in the fields of genetic engineering and protein chemistry are bringing ever more powerful means of analysis to bear on the study of enzyme structure and function that will undoubtedly lead to the rational modification of enzymes to match specific requirements as well as the design of new enzymes with novel properties. This volume reviews the most important types of industrial enzymes covering in a balanced manner three interrelated aspects of paramount importance for enzyme performance: three dimensional protein structure, physicochemical and catalytic properties and the range of both classical and novel applications. The material covered will be of interest to undergraduate and graduate students in biochemistry, biotechnology and applied microbiology, in addition to researchers and industrialists. **New Lipases and Proteases** Abu Bakar Salleh, Noor Zaliha Raja Abdul Rahman

(Raja.), Mahiran Basri, 2006 Enzymatic processing of lipids and oils is becoming an important area of research. Hydrolytic enzymes such as lipases and proteases are being sought after as the biocatalysts. This book focuses on the search and acquisition, isolation and purification and the characterisation of these enzymes. Lipases and Phospholipases in Drug Development Günter Müller, Stefan Petry, 2006-03-06 Lipases and Phospholipases are key control elements in mammalian metabolism. They share many common features that set them apart from other metabolic enzyme classes, most importantly their association with biological membranes. Their potential as drug targets for the treatment of metabolic diseases is widely recognized and the first lipase inhibitor drugs have been successfully introduced. Providing drug developers with a firm foundation for lipase centered drug design, the editors of this volume have assembled experts from different scientific disciplines to create a comprehensive handbook for all pharmaceutical chemists, biochemists and physiologists working with

lipases The authors examine fundamental aspects of lipase function in vitro and in vivo explaining how this knowledge may be used to develop lipase assays They also treat the physiological roles of lipases in normal and disordered metabolism as well as strategies to target lipases for the treatment of diabetes obesity and related disorders Additional topics include the application of phospholipases for liposome based drug delivery and their use as diagnostic tools **LIPASE: ITS**

**CHARACTERIZATION, PRODUCTION AND IMMOBILIZATION ON MODIFIED ORGANIC SUPPORT** Dr. Prita

Shamrao Borkar, 2022-02-21 Lipases glycerol ester hydrolases EC 3 1 1 3 are ubiquitous enzymes of considerable physiological significance and industrial potential Lipases are unique enzymes in that they require interfacial activation for full catalytic performance Sarda and Desnuelle 1958 Brockman 1984 Lipases comprise a group of enzymes whose biological function is to catalyze the hydrolysis and synthesis of triacylglycerols to yield glycerol and fatty acids *Engineering Of/with Lipases* F.X. Malcata, 1996-03-31 The innovative uses of lipases in a wide variety of organic syntheses and the modification of existing fats and oils have increased exponentially over the last five years due to the increasing availability of lipases from genetically engineered microbial sources coupled with their special capacity to act as catalysts at hydrophilic hydrophobic interfaces As a result of the structural characterisation performed during the same period applications of these lipases can now be developed in a much more rational way Engineering of with Lipases presents two major topics the design and production of lipases with desired preselected properties and the use of lipases for desired applications Audience Doctoral and post doctoral crystallographers biochemists geneticists and enzyme kineticists Food chemical and biochemical engineers The former will learn about the practical aims and constraints associated with industrial applications of lipases enabling them to design lipases for specific purposes The latter will learn how to take advantage of the structural knowledge of lipases and their metabolic genesis to better design media processes and products in terms of biochemical and technical feasibility

Lipid Technologies and Applications FredB. Padley, 2018-05-02 Provides a comprehensive review of the major technologies and applications of lipids in food and nonfood uses including current and future trends Discusses the nature of lipids their major sources and role in nutrition **Supercritical Fluids Technology in Lipase Catalyzed Processes**

Sulaiman Al-Zuhair, Hanifa Taher, 2018-10-08 Enzymes are currently used in various industries most commonly in food detergents and pharmaceuticals production Lipases are hydrolytic enzymes that demonstrate great potential as an alternative to conventional catalysts in a number of industrial applications A complete understanding of enzymes and their proteins structure and environmental behavior can greatly aid in the further development of industrial applications Supercritical Fluids Technology in Lipase Catalyzed Processes provides basic information about enzymes their sources reaction kinetics and main industrial applications The book focuses in lipases their main sources structure and features with an emphasis on their specificity and interfacial activity and presents proven techniques for isolating extracting and purifying Comprised of six compact chapters this comprehensive guide introduces Immobilization techniques and immobilized lipases

that allow repeated use which is essential from an economic point of view Different bioreactor configurations using immobilized lipases The latest information on the available technologies in lipolytic reactions The advantages of nonaqueous media in biochemical synthesis over aqueous and solvent free systems Material on the use of lipases in nonaqueous media to overcome the drawbacks usually encountered with the use of conventional chemical catalysts The use of supercritical fluids SCFs as a green alternative reaction medium Factors affecting the physical properties of lipases in this medium and hence their activity and stability A case study using supercritical carbon dioxide SC CO<sub>2</sub> for biodiesel production Novel cutting edge technology using immobilized enzymes to reduce the overall production cost Supercritical Fluids Technology in Lipase Catalyzed Processes outlines the main industrial applications of common enzymes and discusses relevant challenges and innovations emerging in the field Handbook of Industrial Biocatalysis Ching T. Hou, 2005-06-09 Until now no comprehensive handbook on industrial biocatalysis has been available Soliciting chapters on virtually every aspect of biocatalysis from international experts most actively researching the field the Handbook of Industrial Biocatalysis fills this need The handbook is divided into three sections based on types of substrates T **Hydrolases in Organic Synthesis** Uwe Theo Bornscheuer, Romas Joseph Kazlauskas, 2006-05-12 From reviews to the first edition Bornscheuer and Kazlauskas have set out and succeeded in producing a definitive manual on hydrolytic enzymes especially lipases esterases and proteases for organic chemists This is quite simply the best book of its type and can be unreservedly recommended to organic chemists who have an interest in using hydrolytic enzymes in synthesis Nicholas J Turner University of Edinburgh The book is an indispensable source of information on the use of hydrolases in organic synthesis The subject matter is very well set out and the chapters are clearly written and presented from a critical viewpoint Bornscheuer and Kazlauskas have succeeded admirably in describing the capabilities and limitations of the use of hydrolytic enzymes and in critically evaluating them No library should be without the book Fritz Theil WITEGA Angewandte Werkstoff Forschung GmbH Berlin The second edition of this extremely successful and well proven book presents recent developments in the use of hydrolases for organic synthesis reflecting in particular the enormous progress made in enzyme discovery and optimization with a new chapter on Protein Sources and Optimization of Biocatalyst Performance The renowned authors survey the stereoselective reactions of hydrolases especially lipases esterases and proteases giving researchers an overview of what has worked in the past so that they can judge how to solve their own synthetic problems In total the book contains over one thousand chemical structures rounded off by some 1 800 invaluable references Unique Sequence Signatures in Plant Lipolytic Enzymes: Emerging Research and Opportunities Ben Halima, Nihed, 2018-12-04 Lipids are biomolecules that constitute a significant amount of biomass in the earth and plant lipids are rapidly growing in interest due to their roles in improving food technology medicine nutrition and biotechnology With recent advances in protein chemistry biochemistry and enzymology promoting research on lipolytic enzymes it is important for research to address the mechanisms of such enzymes and their diverse functions Unique

Sequence Signatures in Plant Lipolytic Enzymes Emerging Research and Opportunities provides innovative insights into the biochemistry of plant lipases and phospholipases as well as their structures and catalytic mechanisms The book explores the conserved domains and motifs of plant lipolytic enzymes by identifying the main residues involved in the catalysis in the enzymes and the phylogeny of important plant lipolytic enzymes as well as calculating the evolutionary distance in those enzymes Organized into six chapters it is a vital reference source for researchers chemists biologists academicians practitioners medical professionals engineers and graduate students

**Biotransformations in Organic Chemistry** Kurt Faber, 2012-12-06 The use of natural catalysts enzymes for the transformation of nonnatural man made organic compounds is not at all new they have been used for more than one hundred years employed either as whole cells cell organelles or isolated enzymes 1 2 Certainly the object of most of the early research was totally different from that of the present day Thus the elucidation of enzyme mechanisms was the main reason for biochemical pathways and research some decades ago It was mainly during the 1980s that the enormous potential of applying natural catalysts to transform non natural organic compounds was recognized What started as a trend in the late 1970s could almost be called a fashion in synthetic organic chemistry in the 1990s Although the early euphoria during the gold rush in this field seems to have eased somewhat there is still no limit to be seen for the future development of such methods As a result of this extensive recent research there have been an estimated 13 000 papers published on the subject To collate these data as a kind of super review would clearly be an impossible task and furthermore such a hypothetical book would be unpalatable for the non expert 3 7

**Enzymatic Reactions in Organic Media** A. Koskinen, A. Klivanov, 2012-12-06 The outlook of organic synthesis has changed many times during its tractable history The initial focus on the synthesis of substances typical of living matter exemplified by the first examples of organic chemistry through the synthesis of urea from inorganic substances by Liebig was accepted as the birth of organic chemistry and thus also of organic synthesis Although the early developments in organic synthesis closely followed the pursuit of molecules typical in nature towards the end of the 19th century societal pressures placed higher demands on chemical methods appropriate for the emerging age of industrialization This led to vast amounts of information being generated through the discovery of synthetic reactions spectroscopic techniques and reaction mechanisms The basic organic functional group transformations were discovered and improved during the early part of this century Reaction mechanisms were elucidated at a growing pace and extremely powerful spectroscopic tools such as infrared nuclear magnetic resonance and mass spectrometry were introduced as everyday tools for a practising organic chemist By the 1950s many practitioners were ready to agree that almost every molecule could be synthesized Some difficult stereochemical problems were exceptions for example Woodward concluded that erythromycin was a hopelessly complex target This frustration led to a hectic phase of development of new and increasingly more ingenious protecting group strategies and functional group transformations and also saw the emergence of asymmetric synthesis

**Biotechnology Annual Review** M.R.

El-Gewely, 1995-11-14 The Biotechnology Annual Review covers the various developments in biotechnology in the form of comprehensive illustrated and well referenced reviews With the expansion of the field of biotechnology coupled with the vast increase in the number of new journals reporting recent results in this field the need for a publication that is continuously providing reviews is urgent Hence each volume of the Biotechnology Annual Review will have a number of reviews covering different aspects of biotechnology Reviewed topics will include biotechnology applications in medicine agriculture marine biology industry bioremediation and the environment Fundamental problems dealing with enhancing the technical knowledge encountering biotechnology utilization regardless of the field of application will be particularly emphasized This series will help both students and teachers researchers as well as administrators to remain knowledgeable on all relevant issues in biotechnology Proposals for contributions and or suggestions for topics for future volumes in this series should be sent to the Editor professor M R El Gewely Department of Biotechnology University of Tromsø IMB MH Bygget N 9037 Tromsø Norway Tel 47 77 644000 Fax 47 77 645350

*Intestinal Lipid Metabolism* Charles M. Mansbach II, Patrick Tso, Arnis Kuksis, 2011-06-28 This book was stimulated by the enthusiasm shown by attendees at the meetings in Saxon River VT sponsored by the Federation of American Societies for Experimental Biology FASEB on the subject of the intestinal processing of lipids When these meetings were first started in 1990 the original organizers two of whom are editors of this volume CMM and PT had two major goals The first was to bring together a diverse group of investigators who had the common goal of gaining a better understanding of how the intestine absorbs lipids The second was to stimulate the interest of younger individuals whom we wished to recruit into what we believed was an exciting and fruitful area of research Since that time the field has opened up considerably with new questions being asked and new answers obtained suggesting that our original goals for the meetings were being met In the same spirit it occurred to us that there has not been a recent book that draws together much of the information available concerning how the intestine processes lipids This book is intended to reach investigators with an interest in this area and their pre and post doctoral students The chapters are written by individuals who have a long term interest in the areas about which they write and many have been speakers at the subsequent FASEB conferences that have followed on the first

*Lipid Biotechnology* Tsung Min Kuo, Harold Gardner, 2002-01-22 This text presents the latest advances in supercritical fluid technology biocatalysis bioprocess engineering and crop breeding It offers an in depth review of the most recent principles and approaches utilized in the development and design of lipids for cosmetic industrial and pharmaceutical and food products Discussing a variety of lipid active enzymes from animal plant fungal and microbial sources Lipid Biotechnology covers modern techniques in genetic engineering for the modification of conventional oilseed crops and biosynthetic pathways for cutin polymers flavor volatiles oxylipins and terpenoid compounds It chronicles the use of lipases and phospholipases in the creation of structured lipids and fats including cocoa butter low calorie fats and Betapol and emerging methods using supercritical carbon dioxide as a benign solvent for lipid analysis fractionation and enzymatic

reaction It also covers reaction conditions reactor design solvent selection immobilization technology and enzyme sources for optimal large scale manufacturing and describes the formation of oxylipins through the lipoxygenase pathway as well as other unusual fatty acids The authors provide in depth analyses of the structure metabolic and enzymatic functions and mechanisms defensive and catalytic properties industrial uses and other applications of oxylipins and lipases *Adsorption and Aggregation of Surfactants in Solution* K.L. Mittal, Dinesh O. Shah, 2002-11-07 Offering the latest research and developments in the understanding of surfactant behavior in solutions this reference investigates the role and dynamics of surfactants and their solution properties in the formulation of paints printing inks paper coatings pharmaceuticals personal care products cosmetics liquid detergents and lubricants Exploring the science behind techniques from oil recovery to drug delivery the book covers surfactant stabilized particles solid particles at liquid interfaces nanocapsules aggregation behavior of surfactants micellar catalysis vesicles and liposomes the clouding phenomena viscoelasticity of micellar solutions and more

Advances in Biofuels Pogaku Ravindra, Rosalam Hj. Sarbatly, 2013-03-02 Biofuels will play a key role in the 21st century as the world faces two critical problems volatile fuel prices and global climatic changes Both of these are linked to the overdependence on the fossil fuels petroleum natural gas and coal Transportation is almost totally dependent on petroleum based fuels such as gasoline diesel fuel liquefied petroleum gas and on natural gas Despite a significant amount of research into biofuels the field has not been able to replace fossil fuels Recent advances will change this scenario Extracting fuel from biomass has been very expensive both monetarily and in land usage time consuming unusable byproducts etc Technology to obtain liquid fuel from non fossil sources must be improved to be faster more efficient and more cost effective This book will cover the current technology used for a variety of plant types and explore shortcomings with each *Seafood Enzymes* Norman F. Haard, Benjamin K. Simpson, 2000-02-25 Reviews specific enzymes and enzyme groups studied in recent years delves into the relationship between enzymes and seafood quality covers the application of enzymes as seafood processing aids and focuses on the recovery of useful enzymes as by products from seafood waste Details the control of enzyme activity in seafood products Lipase and Phospholipase Protocols Mark Doolittle, 2008-02-02 The lipases and phospholipases represent a diverse group of enzymes that are expressed in animals plants fungi and bacteria Their ubiquitous distribution among all species is a testament to the essential roles played by these enzymes in lipid storage mobilization and metabolism membrane homeostasis and remodeling endocrine and immune functions and signal transduction In humans lipases and phospholipases are also thought to contribute to complex diseases such as atherosclerosis obesity arthritis and cancer as well as to single gene defects such as Wolman's disease and Type I hyperlipoproteinemia Enzymatically the lipases are unique since they hydrolyze substrates that are either insoluble or only partly soluble in aqueous solvents thus enzyme catalysis takes place at a lipid water interface The interface comprises at least two and often more discrete bulk and surface phases in which the enzyme substrate and products of lipolysis disperse among these phases based on their physical properties Furthermore



the distribution of these components changes continuously as lipolysis proceeds. Thus the lipases and phospholipases are fundamentally different from any other enzyme because of the physical complexity of the environment in which catalysis occurs.

Fuel your quest for knowledge with is thought-provoking masterpiece, **Lipases Their Structure Biochemistry And Application** . This educational ebook, conveniently sized in PDF ( PDF Size: \*), is a gateway to personal growth and intellectual stimulation. Immerse yourself in the enriching content curated to cater to every eager mind. Download now and embark on a learning journey that promises to expand your horizons. .

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