

L.D. BERGELSON EDITOR

# LIPID BIOCHEMICAL PREPARATIONS

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edited by

L.D. Bergelson

USSR Academy of Sciences, Shemyakin Institute of Bioorganic  
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## Preface

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## Preface

The present book is an outcome of the joint experience of the staff of the Lipid Laboratory in the Shemyakin Institute of Bioorganic Chemistry accumulated in 15 years of working in the lipid field. Since the main occupation of the laboratory is the physico-chemical study of the structure and functioning of lipids in cell membranes, our work depends strongly on the availability of pure lipid substances. Such substances are constantly prepared in our laboratory and we thought it useful to summarize our experience in the form of a book that might serve as a practical guide for students as well as for experienced workers. The book consists of two parts, Part I is an introduction into preparative lipid chemistry and biochemistry. It also contains practical instructions for the preparation, purification and handling of lipid substances and describes the different approaches used in the partial synthesis of complex lipids as well as the techniques of purity control of lipid samples. Part II contains detailed procedures for preparing pure lipid substances, most of which have been tested in our laboratory. The procedures are assembled in seven chapters covering the main lipid classes; in the eighth one we deal with the preparation of intermediates. Each chapter is opened by a short introductory survey (by L.D. Bergelson) and presents also recommendations for the purity characterization and storage conditions of lipids belonging to the given class.

Besides the authors indicated in the title the following colleagues have contributed to the book by submitting and testing some of the procedures and by reading and commenting upon the manuscript: V.V. Bezuglov, M.L. Cirenina, V.I. Kulikov, T.J. Lazurkina, L.F. Nikulina, T.G. Pilipenko, V.P. Shevchenko, V.I. Shvets, N.G. Timofeeva, A.N. Ushakov, V.A. Vaver, V.I. Volkova and E.N. Zvonkova. It is a pleasure to acknowledge their invaluable help and advice.

## Introduction

The contemporary science of lipids and related substances (lipidology) has developed mainly on the border between biochemistry, organic chemistry and physical chemistry. The long path by which lipidology has achieved its contemporary status was not straight. During the first period which lasted about a century (from Chevreulle to Hilditch) the preparative approach dominated. In order to identify lipids and to determine their amounts it was necessary to isolate and purify the substances in quantity, to obtain derivatives and to measure their physical constants. In those days an analysis of a complex lipid mixture required years of tedious work: workers were fully occupied with extractions, evaporations, recrystallizations and distillations. Purification was difficult to achieve and mostly incomplete leading the organic purists to call this type of work "Schmierchemie". Slow progress began only in the early fifties with the appearance of different types of chromatography, countercurrent distribution and other novel separation methods. However, only in the sixties a qualitative jump took place due to the advent of sensitive techniques such as thin-layer and gas-liquid chromatography, mass spectrometry, high performance liquid chromatography and their combinations. This resulted in a dramatic decrease in sample size and a concomitant increase of productivity. From kilograms used in the past, the amount of starting materials decreased to milligrams and the size of analytical samples reached the microgram and even the nanogram level. The time required for a fatty acid analysis shortened from several months to a few hours. New unprecedented possibilities opened before the lipidologist, who now could include in his studies microscopic objects of cellular biology. The preparation methods developed in the past seemed to have become almost useless.

Recently, however, preparative lipid chemistry has received new stimuli. This

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