

# New Books

J.F. Gerecht, Book Review Editor



*Advances in Lipid Research*, Edited by Rodolpho Paoletti and David Kritchevsky (Academic Press, NY, 1976, Volume 14, 268 p., \$27.50)

This series has been an excellent and valuable source of review articles in the area of lipid metabolism for the past several years. It has served both instructional as well as research needs. The 1976 volume follows this pattern. Five important areas of lipid research are reviewed in depth, the titles of which are: Regulation of HMA-CoA Reductase; Fatty Acid Activation: Specificity, Localization, and Function; Polyene Antibiotic-Sterol Interactions; The Lipids of Plant Tissue Cultures; Synthesis of Some Acylglycerols and Phosphoglycerides. Each article is divided into sections which are listed in the table of contents. These sections help to organize each chapter into a logical sequence and are useful for rapid reference to a phase of a subject to which one may wish to refer. At the beginning of each chapter the subsections are again listed and further subdivided. This proved to be even more useful than the major sections listed in the table of contents and does not represent mere repetition of the table of contents.

Cholesterol synthesis is believed to be mostly regulated at the step that involves reduction of hydroxymethylglutaryl-coenzyme A to mevalonic acid. Rodwell, Nordstrom, and Mitschelen wrote a very complete review of the various factors involved in the regulation of HMG-CoA reductase, the enzyme that catalyzes this very important step in the biogenesis of cholesterol. In a short discussion, they review some key evidence for consideration of HMG-CoA reductase as the rate limiting step in cholesterol synthesis. It is subject to feedback inhibition by dietary cholesterol. Enzymatic activity correlates very well with actual rates of cholesterol synthesis from acetyl-CoA. Synthesis from mevalonate to cholesterol does not appear to respond to changes in dietary cholesterol. The technical problems involved in the various assay procedures of HMG-CoA reductase are also reviewed. These authors point out that there exists a diurnal rhythm of hepatic HMG-CoA reductase activity which is highest during the dark period and is parallel to a rhythm of cholesterol synthesis. Hormonal and dietary regulation of the rhythm of HMG-CoA reductase activity is discussed in a general way. The requirement of thyroid hormone for expression of the diurnal rhythm is discussed in relation to other hormones such as insulin, glucagon, hydrocortisone, and epinephrine. A small section is devoted to familial hypercholesterolemia, a disease in which regulation of HMG-CoA reductase is defective. The authors also indicate what is not known about HMG-CoA reductase regulation. For example, it is not known whether feedback inhibition is accomplished by cholesterol itself or a cholesterol derivative. This is an excellent review of the regulation of hepatic HMG-CoA reductase and cholesterol synthesis in mammals. It will be of value both for those involved in lipid research and to those who wish to merely enhance their understanding of the complicated metabolism of an important nutrient.

Fatty acids, whether released from stored lipids, ingested, or derived as a product of metabolism are metabolized by most cells. To be metabolized, fatty acids must first be in a reactive form, which is primarily as an ester of coenzyme A. The second chapter in this volume is addressed to the activation of fatty acids by acyl-CoA synthetases, also called fatty acid thiokinases. Although the

review does occasionally refer to plant, bacterial, and fungal systems, the major emphasis is on mammalian systems. Several assay procedures for acyl-CoA synthetases are reviewed. Groot, Scholte, and Hulsman seem to prefer the direct assay of radioactive acyl-CoA from radioactive fatty acid. They feel that this method can be applied to a wide variety of acyl-CoA synthetases and affords higher sensitivity than the other methods that were outlined. The most meaningful contributions of this review are the extensive discussions of substrate specificity and function of the short, medium, and long chain acyl-CoA synthetases in relation to subcellular organization. The short chain and medium chain acyl-CoA synthetases are mostly localized in the mitochondria of kidney, heart, and skeletal muscle. In liver and adipose tissue most of the short-chain acyl-CoA synthetase activity is localized in the cytosol fraction, although the comparative rates were low. Long chain acyl-CoA synthetase is localized predominantly in the microsomal fraction of small intestinal mucosa while hepatic activity of the long chain acyl-CoA synthetase is divided between mitochondrial and microsomal fractions. In muscle, practically all long chain acyl-CoA synthetase activity is associated with the mitochondria; i.e., site of fatty acid oxidation. Tissue differences in activities of the substrate-specific acyl-CoA synthetases are discussed in relation to specific tissue function. The coupling of biochemical features of the enzymes with function makes this an excellent and informative review.

Many of the polyene antibiotics are known to interact with sterols and in some cases to result in hypolipidemic activity. Most of these are antifungal agents, such as nystatin, filipin, anadicidin, and others. They may also be hypocholesterolemic and have been suggested for the treatment of prostatic hypertrophy. Besides similar chemical structure, the mechanism of action of these antifungal compounds may also be similar. The polyene antibiotics react with membrane sterols which leads to the death of the organism in question. This review by Norman, Spielvogel, and Wong of the University of California at Riverside discusses the chemistry and biochemical mechanism of action of these compounds. Investigations with natural as well as artificial membranes (liposomes) have indicated that toxicity is probably mediated through changes in cell membrane permeability. The basic chemical structure and properties of these compounds is briefly reviewed. Common features are a conjugated double bond system and a large ring of carbon atoms closed by formation of an internal ester or lactone. A very high number of hydroxyl groups are also present. Specific characteristics of some of the more important polyenes are also enumerated. The possible binding of polyenes to membrane sterol would explain their lack of effect on bacteria, since bacteria contain no sterols in their membranes. The molecular basis of interaction with membrane sterols is also discussed in some depth. Since the polyenes may delete large portions of a membrane with which it interacts, these compounds are possibly useful for the study of membrane functional and structural relationships. A 3- $\beta$ -hydroxyl group on the steroid nucleus has been found to be critically essential for the polyene-sterol interaction. The article brings together rather dispersed information which enables the authors to synthesize a stereospecific model for polyene-sterol interactions.

The lipids of plant tissue cultures have only recently

received attention. Most of the work in this area has been carried out within the last ten years which makes this review by Radwan and Mangold very timely. It will serve as a reference for those plant scientists who use tissue culture techniques. Differences in lipid patterns between plant tissues and plant tissue cultures are reviewed. Tissue cultures are characterized by relatively large proportions of sterols and complex lipids containing sterols. Phospholipid content of tissue culture is usually lower than the concentration of phospholipids found in plants. Galactosyl diglycerides and phosphatidyl glycerides are present in green plants but absent in tissue culture. In addition to an enumeration of lipid classes and variables of culture, such as age, temperature, and nutrient composition, that affect lipid composition, the authors also suggest some possible applications of plant tissue cultures. They suggest plant tissue techniques be used in genetic selection of oil-bearing plants which may have commercial value. Lipid composition is affected by environmental conditions which can be controlled much better than standard crop production methods.

The final review chapter in this volume of "Advances in Lipid Research" is addressed to the methods of preparation of specific acylglycerols and phosphoglycerides which are generally not commercially available. It has become important to use specific compounds in order to test mechanisms and hypotheses. As stated by Jensen and Pitas, "the purpose of this chapter is to provide explicit directions for the synthesis of some acylglycerols and phosphoglycerides." The authors state that they have written this review out of frustration. They have used many of these compounds in their own research efforts and feel that instructions in some publications were often inadequate to be of any use. The authors present specific instructions for the handling and storage of solvents and substrates. It is unusual for a review of organic syntheses and preparations to appear in a volume of "Advances in Lipid Research." However, the nature of this subject is unique and fills a much needed void in the literature of lipid research. This chapter should prove useful to several lipid researchers.

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*Fluorescent Whitening Agents.* Edited by F. Coulston and F. Korte (Georg Thieme Publishers, Stuttgart, distributed in U.S. by Academic Press, NY, 1975, 319 p., \$36.50).

This collection of articles on fluorescent whitening agents can best be separated into three segments: (a) The background of fluorescent whitening agents is described through articles such as "Psychological Aspects of White" by M. Lüscher, "History of Whitening" by R. Anliker, "Mechanism of Whitening" by A. Brockes, and "The Chemistry of Fluorescent Whitening Agents" by H. Gold; (b) the end-use technology is described by, in part, "Whitening of Textiles" by H. Hefti, "Fluorescent Whitening Agents in Detergents" by C. Eckhardt/R. von Rütte, "Mass Whitening of Synthetic Fibers and Plastics" by A. Wieber, "Measurement of Fluorescent White Effects and Whiteness" by G. Anders, "Qualitative Thin Layer Chromatography of Fluorescent Whitening Agents" by H. Theidel, and "Bleed Fastness of Fluorescent Whitening Agents in Mass Whiten Paper" by G. Anders/M. Flubacher; (c) the environmental aspects of fluorescent whitening agents is presented in detail by such papers as "Analysis of River Water and Drinking Water from Seven European Countries" by G. Anders, "Metabolic Behavior of Water-Soluble Fluorescent Whitening Agents in the Rat and Bean Plant" by W. Muecke/G. Dupuis/H.O. Esser, "Acute

Oral, Dermal and Inhalation Studies" by P. Thomann/L. Krüger, "Chronic Toxicity and Carcinogenicity Studies with FWAs" by M.L. Keplinger/F.L. Lyman/J.C. Calandra, and "Studies of Embryo Toxicity in Rats and Rabbits" by D. Lorke/L. Machemer. A quite extensive bibliography compiled by M. Morf completes the coverage of the subject. The thorough papers are further complimented by a total of 148 figures and 127 tables.

By the nature of a monograph of this type, there is some overlapping of coverage in the introduction of the articles by the various authors (48 total); however, this slight duplication tends not to detract from the book. While the book offers a good background in the nature and application of fluorescent whitening agents, it gives excellent coverage to the ecological and toxicological aspects of optical brighteners; in fact, two thirds of the book are dedicated to this subject.

This book is a fine addition to the library of anyone who deals with fluorescent whitening agents and a must for anyone who confronts the environmental impact of products which contain fluorescent whitening agents.

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*Handbook of Analysis of Organic Solvents*, V. Sedivec and J. Flek (translated from Czech by H. Sommernitz) (Ellis Horwood Ltd., distributed by Halsted Press division of John Wiley & Sons Inc., 1976, 455 p. \$42.50)

This book gives a detailed description of mostly classical methods for analysis of solvent mixtures.

Part I discusses the determination of boiling points and other physical constants followed by methods for the analysis of two- and three-component systems. A brief (16-page) chapter discusses the applications of gas chromatography.

Part II reviews the various solvent classes, means of detection (everything except spectra), preparation of derivatives, etc.

Several appendices contain information on boiling points, azeotropes, other physical properties, and the qualitative composition of selected commercial solvents.

Unlike other books on solvents there is no discussion of methods of purification. The reviewer feels this volume should have limited appeal except, perhaps, to those chemists who, like the authors, are epidemiologists.

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*Objective Methods for Food Evaluation* (Proceedings of a Symposium), (National Academy of Sciences, Washington, DC, 289 p., 1976, \$8.75).

This soft cover book contains proceedings of a symposium held on Nov. 7-8, 1976 in Newton, MA, under the auspices of the U.S. Army Natick Research and Development Command and the National Research Council. The stated purpose of the symposium was "to explore and summarize the current status of objective methods for 1) clarifying and improving specifications for procurement of foods for the military, 2) predicting storage life or determining past history of military food items, and 3) evaluating by appropriate research the applicability of existing objective methods for new food products." The symposium consisted of two technical sessions and four roundtable discussions. The book contains the full text of the presented papers and, with some exceptions, the details of the

presentations by the roundtable panelists and the ensuing discussions.

The first technical session encompassed a review of instrumental methods for beef texture evaluation, a summary of research conducted at Kansas State University on reflectance measurement of color deterioration in frozen beef, a discussion of the military procurement concerns in buying frozen entrees, a discussion on available objective means for determining some of these attributes and a review of objective quality assessment methods for eggs, egg products and poultry meats. Much of this information is available in other sources and the respective authors contributed very little that is new. Most emphasized the need for objective measurements to reflect the sensory attributes. However, there was no paper addressing itself specifically to sensory qualities and principles of correlating sensory with instrumental measurements.

The second technical session included reviews on composition of fish oils, methods to determine seafood quality, objective measurement of fat stability alone and in prepared foods, and texture of fats and emulsified foods. The quality of these papers varied from good, with some new approaches to objective measurement, to rather poor. Again, most of the information given is available from other sources. But the collected papers are valuable as a reference to the current state of our knowledge. It is apparent that the development of objective methods to predict storage stability is incomplete. Much needs yet to be done before methods are available which can be applied to a wide variety of food products.

The four roundtable discussions dealt with texture, appearance, flavor and prediction of fat stability. With the exception of the texture session, where the report consists of the chairman's summary, the book contains the texts of the remarks made by each panel member. The respective chairmen attempted to fill the void left by most speakers in offering remarks addressed to a critical appraisal of the current state of knowledge against the stated meeting objectives and specific recommendations regarding implementation or needs for future research.

In general, this book contains little beyond a historical, documentary value. The symposium must have been a disappointment to the organizers in that most of the speakers did not address themselves directly to the stated objectives of the meeting, but, instead, chose the easy and noncontroversial ground of merely reviewing the state-of-the-art or reporting on their own research projects. In this respect, the remarks on the roundtable discussion chairmen are of greatest value. Against the question of whether objective methodology now exists for quantifying sensory attributes and stability of meat, their answers ranged from "no" for flavor and color to a qualified "yes" for fat stability and texture measurements. It is to be hoped that this symposium will soon be followed by another more streamlined meeting designed to really tackle the aspects of the problem so important to the military.

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*Organic Functional Group Analysis by Gas Chromatography*, T.S. Ma and A.S. Ladas (Academic Press, 1976, 173 p. \$16.75).

Throughout this text the term monograph is used, the definition being "a scholarly book on a specific and usually limited subject." This is an accurate description of this book as it pertains to a limited area of gas chromatography and its use in an analytical laboratory.

The title of this book is somewhat misleading since most

of the topics may be classified as reaction chromatography, i.e. nonvolatile compounds are converted before or during chromatography to volatile components. The introduction (24 pages) covers a basic explanation of the principles of gas chromatography. This section seems superficial since it is not detailed enough for the beginner and not necessary for anyone working in the field. The second chapter is titled, "Coupling of Functional Group Reactions with Gas Chromatography," and is followed by chapters on oxygen, nitrogen, sulfur, unsaturated and miscellaneous functions. Each chapter contains detailed descriptions of methods with complete diagrams as well as references to many other methods. It should be noted that no limitations or opinions are given by the authors on these procedures.

This monograph is a worthwhile addition to the library of any university or industrial laboratory. It would be most valuable in laboratories where only gas chromatographs are available since in many cases the identification and quantitation can be done more readily by other instruments.

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# the latest in Lipids

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Ether Lipids in Human Brain Tumors  
Lipids and Taurocholate Absorption  
Hydrocarbons in Rabbit Tissues  
Rumen Isoprenoid Hydrocarbons  
Lipid Metabolism in Nephrotic Rats  
Studies on Rapeseed Oils in the Rat  
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GC Separation of Cholesteryl Esters  
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Eicosatrienoic Acid in Sheep  
Lipase Activity in Teeth Pulp  
TLC of Plant Neutral Lipids  
Fucosterol from Giant Kelp  
Cholesteryl Ester Synthesis