



# MODERN NUTRITION

## IN HEALTH AND DISEASE

TENTH EDITION

EDITORS

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LIPPINCOTT WILLIAMS & WILKINS



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T E N T H   E D I T I O N



LIPPINCOTT WILLIAMS & WILKINS

A **Wolters Kluwer** Company

Philadelphia • Baltimore • New York • London  
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Acquisitions Editor: David B. Troy  
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Designer: Holly Reid McLaughlin  
Cover and Interior Designer: Karen Klinedinst  
Compositor: TechBooks

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351 West Camden Street  
Baltimore, MD 21201

530 Walnut Street  
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*Printed in China*

### **Library of Congress Cataloging-in-Publication Data**

Modern nutrition in health and disease / senior editor, Maurice E. Shils ; associate editors, Moshe Shike . . . [et al.].—10th ed.  
p. ; cm.

Includes bibliographical references and index.

ISBN-13: 978-0-7817-4133-0

ISBN-10: 0-7817-4133-5 (alk. paper)

1. Nutrition. 2. Diet therapy. I. Shils, Maurice E. (Maurice Edward), 1914- II. Shike, Moshe.

[DNLM: 1. Diet Therapy. 2. Nutrition. WB 400 M689 2006] QP141.M64 2006 613.2—dc22

2005014447

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# PREFACE



The first edition of *Modern Nutrition in Health and Disease* appeared 50 years ago. A brief history of the editions and publishers in all editions to date is presented on page IX.

This edition continues the goal of providing an updated, comprehensive, and authoritative text and reference source authored by experts in their fields. The close interconnection of nutrition with various chronic diseases has become even more obvious since the publication of the previous edition. Accordingly, we have included more chapters and more information related to these interconnections with emphasis on the need for different approaches in the understanding, evaluation, prevention, and management of these interrelated diseases.

This new edition combines the expertise of many repeat contributors with their updated chapters. We welcome new contributors in 63 chapters. A complete list of the names of all authors and their affiliations is presented just before the Table of Contents. We extend our appreciation to all for their informative contributions.

The organization is, except for changes in Part I, similar to recent past editions. That part now has three key nutrition history vignettes. The Appendices have been updated, particularly with the inclusion of the Dietary Reference Intakes of all nutrients by gender and age.

We invite comments and suggestions from our readers.

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The new edition of *Modern Nutrition in Health and Disease* had the misfortune of losing through untimely deaths the expertise of James Allen Olson, Ph.D. and Roland Louis Weinsier, M.D., Dr.P.H. Dr. Olson had been a member of the Editorial Board of the eighth and ninth editions but died unexpectedly on September 22, 2000 in the early discussions of the tenth edition.

Dr. Weinsier, who had joined the Editorial Board for this edition, became seriously ill during the early period of author recruitment.

Nutritional science lost two eminent investigators and leaders in their areas of nutrition research and education. We honor our two colleagues with the following brief summaries in memoriam.

The Editors

## **JAMES ALLEN OLSON, Ph.D. (1925–2000)**

James Allen Olson, Distinguished Professor of Liberal Arts and Sciences at Iowa State University, passed away suddenly on September 22, 2000, age 75. Dr. Olson served as an editor for the eighth and ninth editions of *Modern Nutrition in Health and Disease*.

Dr. Olson graduated from Gustavus Adolphus College in Minnesota and received his Ph.D. from Harvard University. During his predoctoral and postdoctoral training, he worked in the laboratories of Christian Anfinsen (Harvard), Sir Ernst Chain (Rome), and Konrad Bloch (Harvard). His career was nearly as varied and colorful as the carotenoids and retinoids he loved to study. He held an academic appointment in the Department of Biochemistry at the University of Florida College of Medicine. He took an extended leave to develop the biochemistry program at Mahidol University, Bangkok, Thailand, where he worked for 8 years with support from the Rockefeller Foundation. He established a graduate biochemistry program to train Thai scientists, but several American scientists also worked in his laboratory there. Mahidol University awarded Dr. Olson an honorary doctorate of science in 1999. In 1975, Dr. Olson returned to the United States and became the Chairman of the Department of Biochemistry and Biophysics, Iowa State University, until 1985. He was named Distinguished Professor of Liberal Arts and Sciences in 1985 and continued an active research program at Iowa State until his death. He continued his interests in international nutrition and in the health of all Asian peoples through his service on the US-Japan Malnutrition Panel, one of six panels of the US-Japan Cooperative Medical Science Program. Dr. Olson's expertise in nutritional assessment and knowledge of nutritional deficiencies prevalent in Asian countries

served this panel very well. A brief history of the formation and functions of this panel, which Dr. Olson chaired in the early 1990s (Olson JA, Proc Soc Exp Biol Med 1992; 200:147) provides insight into this continuing cooperative international health and nutrition activity.

Dr. Olson's abiding fascination for the biochemistry of carotenoids and vitamin A, and for using them to improve human health, was evidenced by more than 400 research publications and reviews, spanning from public health to basic biochemistry. Some highlights included the discovery and study of water-soluble retinoids and the application of stable isotopic compounds to assess the carotenoid and retinoid status of animals and humans. He is also well known for the development of the modified relative dose-response test, a tool to assess marginal vitamin A status, which has been used worldwide to assess vitamin A status.

He organized VARIG (Vitamin A Research Interaction Group) and later CARIG, a similar group for researchers on carotenoids, which began as informal meetings in his room at the Federation of American Societies for Experimental Biology (FASEB) meetings, grew to occupy the president's suite and, in the case of CARIG, to become a well-organized group that has sponsored regular workshops at experimental biology meetings. Dr. Olson cochaired the first Carotenoids Gordon Conference, in 1992, as well as the third FASEB Summer Conference on Vitamin A and Retinoids in the 1980s. He was president of the American Society of Nutritional Sciences from 1986 to 1989.

In his memory as a distinguished scientist and to celebrate his many contributions, Iowa State University convened a Symposium in 2001, "Functions and Actions of Retinoids and Carotenoids: Building on the Vision of James Allen Olson," the proceedings of which were published in the *Journal of Nutrition* (2004;134[Suppl 1]:220S–93S).

## **ROLAND LOUIS WEINSIER, M.D., Dr.P.H. (1942–2002)**

Dr. Weinsier received his medical degree from the University of Florida in 1968 and completed his internship and residency in internal medicine at the University of Virginia. He followed with both masters and doctoral degrees in public health (nutrition) from Harvard University. In 1975, after serving as a major in the United States Air Force, he joined the Department of Medicine at the University of Alabama at Birmingham as Director of its Division of Clinical Nutrition. Roland devoted himself to clinical nutrition and instituted a nutrition support service, an outpatient clinic that eventually became four separate clinics, and a major first-year medical school course in

nutrition. The last was increasingly recognized by medical students as the preferred course of the basic science curriculum.

He had a sustained interest in nutrition education in medical and dental schools, regionally and nationally, and helped to establish the American Society for Clinical Nutrition Award for Excellence in Medical/Dental Nutrition Education in 1991; he received the award in 1995.

His early clinical research was directed to studies of the nutritional status of hospitalized patients. In 1977, he became the Director of the Division of Clinical Nutrition in the newly formed Department of Nutrition Sciences. This department was administratively in the School of Health Related Professions with financial support from the Schools of Medicine and Dentistry. In 1979, that department was awarded the first Clinical Nutrition Research Unit grant supported by the National Cancer Institute. In 1983, Dr. Weinsier became Full Professor, and in 1988, he succeeded Charles E. Butterworth, Jr., M.D. as Department Chairman.

Based on his observations of the relationships among food intake, exercise, obesity, and diabetes, he established a research group focusing on obesity, energy metabolism, and body composition. His more recent findings noted inadequate physical activity as the principal cause for the

rising prevalence of obesity and a difference between African-Americans and whites in body composition and muscle fiber efficiency that could explain their different propensities for obesity. These data led him to questioning the set-point theory for the etiology of obesity. In his 2001 American Society for Parenteral and Enteral Nutrition *Jonathan E. Rhoads Honorary Research Lecture*, Dr. Weinsier outlined the evidence for his view.

In 1999, he relinquished the chair of the Department of Nutrition Sciences, and in 2000, he was awarded a Clinical Nutrition Research Unit grant funded by the National Institute of Diabetes, Digestive and Kidney Diseases. As Director of this unit, he expanded his obesity investigations.

Roland was elected a member of the Editorial Board for the tenth edition of *Modern Nutrition in Health and Disease* in August, 2000 and participated actively in the initial planning meeting in January 2002. In the spring of 2002, he was diagnosed with cancer, and despite treatment, he died on November 27, 2002.

On November 22, 2002, a *Festschrift* was held in honor of Dr. Weinsier at the University of Alabama, Birmingham Medical Center. Many distinguished physicians and basic scientists who had worked with him were among the speakers and attendees.

# A BRIEF HISTORY OF MODERN NUTRITION IN HEALTH AND DISEASE



The title and objective of this work evolved from a book originally designated *Dietotherapy*. This was initiated by Michael G. Wohl, M.D., formerly Clinical Professor of Medicine at Temple University School of Medicine, Chairman of the Commission on Nutrition, Medical Society of Pennsylvania and also of the Committee on Nutrition, Philadelphia County Medical Society. With Robert S. Goodhart, M.D. as coeditor, the next edition had the title, *Modern Nutrition in Health and Disease*, subtitled *Dietotherapy*; this was published in 1955. Dr. Goodhart, as a Fellow in Medicine in the 1930s, spent time in the laboratory of Dr. Severo Ochoa in England, doing research on the biochemical basis of thiamin; he later became an associate Dean at New York University School of Medicine, and, after World War II, the Scientific Director of the National Vitamin Foundation. From its onset, the book has taken a broad approach to nutritional science with a strong clinical view.

On the fiftieth anniversary of its appearance and the tenth edition with this title, a brief history of these editions

seems appropriate because these editions have established themselves as a very major resource in this field, and as a whole, provide a half-century overview of the major nutritional advances in nutrition and related sciences, both basic and clinical.

The ninth edition is also on line through OVID as one of a collection of books in medical sciences sold to medical libraries. It also has been published in Spanish and Portuguese editions. Presumably, the tenth edition will follow suit.

Undoubtedly, new basic and clinical research affecting nutrition applications will continue to appear and will undoubtedly influence the Editors and Publisher to seek additional methods of providing updated information in this important field through more rapid methods of communication, although, one hopes that editions in book form will continue to be published.

The Editors

EDITION NO. <sup>a</sup>	PUBLICATION YEAR	EDITORS	PUBLISHER
1	1950	Drs. Michael Wohl, Robert Goodhart	Lea & Febiger
2	1955	Drs. Michael Wohl, Robert Goodhart	Lea & Febiger
3	1964	Drs. Michael Wohl, Robert Goodhart	Lea & Febiger
4	1968	Drs. Michael Wohl, Robert Goodhart	Lea & Febiger
5	1973	Drs. Robert Goodhart, Maurice E. Shils	Lea & Febiger
6	1980	Drs. Robert Goodhart, Maurice E. Shils	Lea & Febiger
7	1988	Drs. Maurice E. Shils, Vernon Young	Lea & Febiger
8	1994	Drs. Maurice E. Shils, James A. Olson, Moshe Shike	Lea & Febiger <sup>b</sup>
9	1998	Drs. Maurice E. Shils, James A. Olson, Moshe Shike, A. Catharine Ross	Lippincott Williams & Wilkins
10	2005	Drs. Maurice E. Shils, Moshe Shike, A. Catharine Ross, Benjamin Caballero, Robert J. Cousins	Lippincott Williams & Wilkins

<sup>a</sup>Year of the first printing

<sup>b</sup>Lea & Febiger, Philadelphia, was purchased shortly before the publication of the 8<sup>th</sup> edition by the Waverly Company, owner of Williams and Wilkins, Publishers, Baltimore. Shortly before publication of the 9<sup>th</sup> Edition, the Waverly Company was purchased by Wolters Kluwer Publishers and merged with Lippincott, the Medical Publisher in Philadelphia.



# ACKNOWLEDGMENTS



The preparation, editing, and production of this extensive work have succeeded because of the expertise, effort, and dedication of many individuals in addition to the numerous authors who are listed in the Contributors pages.

The Editors have worked personally with some of the staff of Lippincott Williams and Wilkins in Baltimore, while other members have been involved “behind the scenes” at the editorial, publication, distribution, and marketing stages.

During the period of planning and contract development, the Editors had the good fortune initially to work with Susan B. Katz, Vice-President and Publisher for Medical Education and Health Professions and with David Troy, the Senior Acquisitions Editor and his assistant, Elizabeth Connolly, and through them with various individuals in various specialty groups and in arranging the Editors’ conference.

From the initiation of the editorial work to its completion, we have worked closely and cooperatively with Matthew J. Hauber, Manager, Product Development, in the many details of developing and preparing manuscripts for publication. We were also very fortunate in the publisher’s selection of Holly Lukens as its chief copyeditor. We also express our appreciation to Chris Miller of Techbooks, Inc., who, with her staff, managed page proof production before the final printing.

We are also very indebted to those who worked closely and efficiently with us in preparing and distributing manuscripts and diskettes and in managing communications, and page proofs: Betty Shils, Nicole Goode, Virginia Mauldin, Beverly Satchell, and Madeline Stull. We express our appreciation to our respective spouses for their understanding and support.

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