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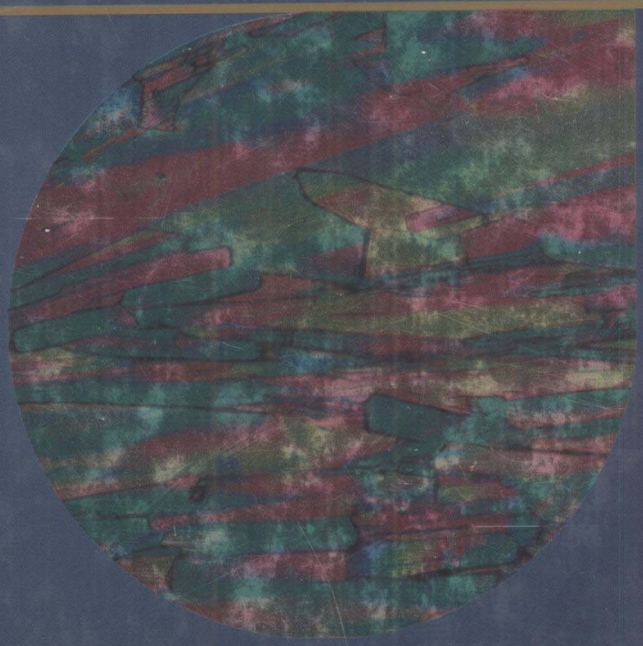
Biochemical, Physiological, & Molecular Aspects of Human Nutrition



Martha H. Stipanuk

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Biochemical, Physiological, & Molecular Aspects *of* Human Nutrition

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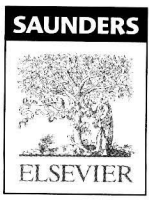
SECOND EDITION



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11830 Westline Industrial Drive
St. Louis, Missouri 63146

BIOCHEMICAL, PHYSIOLOGICAL, & MOLECULAR ASPECTS OF HUMAN NUTRITION

ISBN-13: 978-1-4160-0209-3
ISBN-10: 1-4160-0209-X

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The Publisher

ISBN-13: 978-1-4160-0209-3
ISBN-10: 1-4160-0209-X

Senior Editor: Yvonne Alexopolous
Developmental Editor: Kristin Hebberd
Editorial Assistant: Sarah Vales
Publishing Services Manager: John Rogers
Senior Project Manager: Beth Hayes
Design Direction: Mark A. Oberkrom

Printed in the United States of America

Last digit is the print number: 9 8 7 6 5 4 3 2 1

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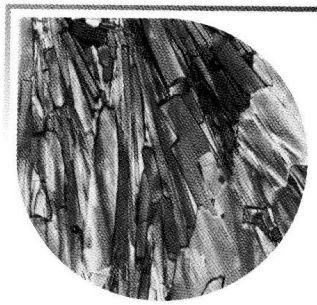

Preface

Biochemical, Physiological, & Molecular Aspects of Human Nutrition in its second edition has been revised and updated in an effort to continue to provide a book that covers the biological bases of human nutrition at the molecular, cellular, tissue, and whole-body levels. The text focuses on information from studies of human metabolism to the extent possible, but also relies on information obtained for other mammalian species. This is a book that can be used equally well as either a textbook or a reference book by students and professionals in various areas of nutrition and other life and biomedical sciences.

The second edition of *Biochemical, Physiological, & Molecular Aspects of Human Nutrition* reflects the contributions of more than 50 researchers and teachers who represent a diverse range of expertise. Authors have included the most up-to-date information and also identified areas of active research and controversy. At the same time, efforts have been made to ensure the consistency of content and approach so that the individual chapters and units work together as a whole for those who use the text as an introduction to the science of nutrition.

The study of human nutrition integrates many disciplines, and knowledge and understanding of each of these basic disciplines are essential to the understanding of nutrition. This book is intended largely for upper-level undergraduate students, graduate students, and professionals who have completed studies in organic chemistry, biochemistry, molecular biology, and physiology. Hence, topics are covered at an advanced level. Nevertheless, an effort has been made to present material in a manner that allows a reader who is unfamiliar with a particular topic to obtain a clear, concise, and thorough understanding of the essential concepts. Particular attention has been given to the design of figures and choice of tabular material to ensure that illustrations and tables clarify, extend, and enrich the text.

The text consists of six units that encompass a traditional coverage of nutrients by classification (carbohydrates, proteins, lipids, vitamins, and minerals) but that also allow for discussion of the integrated metabolism and utilization of these nutrients. In addition, in recognition of new paradigms in thinking about nutrition, a seventh unit begins the second edition, providing a discussion of the historical foundations of nutrition, the changes in how nutrients are being defined and in how dietary recommendations are being made, and of a wide variety of potentially beneficial food components. The macronutrients or energy-yielding nutrients (carbohydrates, proteins, and lipids) are discussed in Units II through V. Unit II provides an overview of the structure and properties of the macronutrients. The digestion and absorption of the macronutrients are discussed in Unit III, and the metabolism of the macronutrients is the topic of Unit IV. Finally, the relation of these macronutrients to energy is discussed in Unit V.

The vitamins are discussed in Unit VI. B vitamins have been grouped and discussed in three chapters in a manner that facilitates an understanding of their functions in macronutrient metabolism. The unique functions of vitamins C, K, E, A, and D are described in individual chapters. The minerals and water are the subjects of Unit VII; those with well-characterized nutritional or health-related roles are discussed in detail. Significant disease-related aspects of nutrition are incorporated into the individual chapters and are also highlighted in many of the feature boxes scattered throughout the book.

The text is designed so that it can easily be used for a comprehensive advanced nutrition and metabolism course in which all nutrients are covered. Alternatively, sections of the text could easily be used for courses that focus specifically on the macronutrients, energy, vitamins, or minerals. The depth and breadth of coverage given to the macronutrients make this text somewhat unique among advanced nutrition texts and make it an especially good choice for courses on macronutrient metabolism.

Each chapter begins with an outline and, when appropriate, a listing of common abbreviations. The text includes many figures drawn specifically for this book. Illustrations have been carefully selected to enhance the text and designed to provide insight and to facilitate understanding. References to the research literature and recommended readings, as well as related websites, are provided for each chapter. Also included within the text are a number of feature boxes—*Nutrition Insights, Clinical Correlations, Food Sources, RDAs/AIs Across the Life Cycle,* and *Life Cycle Considerations*—to highlight particular aspects of basic science and everyday nutrition, help readers make connections between abnormalities and their effects on normal metabolism, summarize cumbersome data pertinent to that discussion, or highlight particular nutritional processes or concepts applicable to various stages of the life span. In addition, "Thinking Critically" sections included in the *Nutrition Insight* and *Clinical Correlation* boxes encourage readers to apply the content to clinical situations.

For Instructors

An Evolve website has been created to accompany this book (http://evolve.elsevier.com/Stipanuk/nutrition/). Included within this resource are a Test Bank with approximately 850 multiple-choice examination questions and an Image Collection with nearly 400 illustrations from the textbook. Access to these materials is available free to adopting instructors through their Elsevier sales representative.

Martha H. Stipanuk

Acknowledgments

My deep appreciation goes to each of the contributors to *Biochemical, Physiological, & Molecular Aspects of Human Nutrition*. The target, as for the first edition, was "to obtain the best possible author" for each chapter, and the text is much enriched by the contributions of so many talented researchers and teachers. The commitment of the chapter contributors to education and sharing of knowledge is clear from the willingness of these busy individuals to accept the challenge and commit the time and effort required to see their chapters through the entire process. Their willingness to respond to queries, to discuss and resolve apparent differences of opinion among authors, and to allow the editorial flexibility needed to turn individual chapters into a coherent and integrated text was superb.

It has been a delight to work with the superb staff at Elsevier who handled the publication process. Senior Editor Yvonne Alexopoulos and Developmental Editor Kristin Hebberd kept the process running smoothly and efficiently and made my job much easier in so many ways. The support and efforts of Senior Project Manager Beth Hayes, who capably handled the book's production process, are greatly appreciated as well.

During the time I worked on this book, my colleagues in the Division of Nutritional Sciences at Cornell University supported my efforts in many ways, especially by serving as sources of expertise and in contributing several of the chapters. A special thanks to Charles McCormick, who assumed some of my teaching load during this past year so that I could take a semester of sabbatical leave to devote to getting the copy ready for publication. I also wish to especially acknowledge the superb efforts of Lawrence Hirschberger, Chad Simmons, John Dominy, Jr., Jeong-In Lee, and Relicardo Coloso in keeping my research program moving forward full-force during the course of my work on this book.

Finally, a special note of appreciation goes to my family and friends, who enrich each day of my life and who challenge me to a life of faith and purpose.

Working on the second edition of *Biochemical, Physiological, & Molecular Aspects of Human Nutrition* has been fun and educational. Those with whom I have worked on this project contributed to my enjoyment of this work. My thanks to each of you for your many contributions and support.

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