

# CONTENTS



## Part I. Specific Dietary Components

### A. Major Dietary Constituents ..... 3

- Chapter 1. Proteins and Amino Acids .....3  
Dwight E. Matthews
- Chapter 2. Carbohydrates.....36  
Nancy L. Keim, Roy J. Levin, and Peter J. Havel
- Chapter 3. Dietary Fiber.....58  
Holly J. Willis and Joanne L. Slavin
- Chapter 4. Lipids, Sterols, and Their Metabolites .....65  
Peter J. H. Jones and Todd Rideout
- Chapter 5. Energy Needs: Assessment and Requirements .....88  
Nancy F. Butte and Benjamin Caballero
- Chapter 6. Water, Electrolytes, and Acid-Base Metabolism..... 102  
James L. Bailey, Jeff M. Sands, and Harold A. Franch

### B. Minerals ..... 133

- Chapter 7. Calcium .....133  
Connie M. Weaver and Robert P. Heaney
- Chapter 8. Phosphorus..... 150  
Kimberly O. O'Brien, Jane E. Kerstetter, and Karl L. Insogna
- Chapter 9. Magnesium..... 159  
Robert K. Rude
- Chapter 10. Iron..... 176  
Marianne Wessling-Resnick
- Chapter 11. Zinc..... 189  
Janet C. King and Robert J. Cousins
- Chapter 12. Copper .....206  
James F. Collins
- Chapter 13. Iodine.....217  
Peter Laurberg
- Chapter 14. Selenium.....225  
Roger A. Sunde
- Chapter 15. Manganese.....238  
Alan L. Buchman
- Chapter 16. Trace Elements.....245  
Curtis D. Eckhert

### C. Vitamins..... 260

- Chapter 17. Vitamin A .....260  
A. Catharine Ross
- Chapter 18. Vitamin D .....278  
Glenville Jones
- Chapter 19. Vitamin E.....293  
Maret G. Traber
- Chapter 20. Vitamin K.....305  
John W. Suttie

- Chapter 21. Thiamin.....317  
Chantal Bémour and Roger F. Butterworth
- Chapter 22. Riboflavin .....325  
Hamid M. Said and A. Catharine Ross
- Chapter 23. Niacin.....331  
James B. Kirkland
- Chapter 24. Vitamin B<sub>6</sub> .....341  
Vanessa R. da Silva, Amy D. Mackey, Steven R. Davis, and Jesse F. Gregory III
- Chapter 25. Pantothenic Acid.....351  
Paula R. Trumbo
- Chapter 26. Folic Acid .....358  
Patrick J. Stover
- Chapter 27. Cobalamin (Vitamin B<sub>12</sub>) .....369  
Ralph Carmel
- Chapter 28. Biotin .....390  
Donald M. Mock
- Chapter 29. Vitamin C.....399  
Mark Levine and Sebastian J. Padayatty
- Chapter 30. Choline.....416  
Steven H. Zeisel

### D. Other Compounds with Health Relevance... 427

- Chapter 31. Carotenoids .....427  
Xiang-Dong Wang
- Chapter 32. Carnitine .....440  
Charles J. Rebouche
- Chapter 33. Cysteine, Taurine, and Homocysteine .....447  
Martha H. Stipanuk
- Chapter 34. Glutamine.....464  
Thomas R. Ziegler
- Chapter 35. Arginine, Citrulline, and Nitric Oxide.....477  
Yvette C. Luiking, Leticia Castillo, and Nicolaas E.P. Deutz
- Chapter 36. Functional Foods and Nutraceuticals in Health Promotion .....487  
John Milner, Cheryl Toner, and Cindy D. Davis
- Chapter 37. Polyphenols and Flavonoids.....494  
Ronald L. Prior
- Chapter 38. Probiotics and Prebiotics as Modulators of the Gut Microbiota.....506  
Sandra Tejero, Ian R. Rowland, Robert Rastall, and Glenn R. Gibson

## Part II. Nutritional Roles in Integrated Biologic Systems

### A. Nutrient-Gene Mechanisms ..... 515

- Chapter 39. Nutritional Regulation of Gene Expression and Nutritional Genomics .....515  
Robert J. Cousins and Louis A. Lichten

Chapter 40. Genetic Variation: Effect on Nutrient Utilization and Metabolism .....	523
Patrick J. Stover and Zhenglong Gu	
Chapter 41. Epigenetics.....	534
Paul Haggarty	
<b>B. Digestive, Endocrine, Immune, and Neural Mechanisms.....</b>	<b>540</b>
Chapter 42. Nutritional Physiology of the Alimentary Tract .....	540
Shelby Sullivan, David Alpers, and Samuel Klein	
Chapter 43. Nutrition and the Chemical Senses.....	574
Valerie B. Duffy	
Chapter 44. Control of Food Intake and Appetite .....	589
Syed Sufyan Hussain, Akila De Silva, and Stephen Robert Bloom	
Chapter 45. Nutrition and the Immune System .....	601
Charles B. Stephensen and Susan J. Zunino	
Chapter 46. Defenses against Oxidative Stress .....	611
Dean P. Jones	
Chapter 47. Mechanisms of Nutrient Sensing .....	626
Douglas G. Burrin and Teresa A. Davis	

### Part III. Nutritional Needs and Assessment during the Life Cycle and Physiologic Changes

Chapter 48. Body Composition.....	635
Scott Going, Melanie Hingle, and Joshua Farr	
Chapter 49. Use and Interpretation of Anthropometry .....	649
Youfa Wang, Hyunjung Lim, and Benjamin Caballero	
Chapter 50. Metabolic Consequences of Starvation .....	660
L. John Hoffer	
Chapter 51. Metabolic Consequences of Calorie Restriction.....	678
Edward P. Weiss and Luigi Fontana	
Chapter 52. Nutrition in Pregnancy .....	684
R. Elaine Turner	
Chapter 53. Nutrition in Lactation .....	698
Deborah L. O'Connor and Mary Frances Picciano	
Chapter 54. Nutritional Requirements of Infants and Children .....	712
William C. Heird	
Chapter 55. Nutrition in Adolescence.....	734
Marie-Pierre St-Onge and Kathleen L. Keller	
Chapter 56. Nutrition in Older Adults .....	744
Connie Watkins Bales and Mary Ann Johnson	
Chapter 57. Clinical Manifestations of Nutrient Deficiencies and Toxicities .....	757
Douglas C. Heimburger	

### Part IV. Prevention and Management of Disease

<b>A. Obesity and Diabetes.....</b>	<b>771</b>
Chapter 58. Obesity: Epidemiology, Etiology, and Prevention.....	771
Sarit Polsky, Victoria A. Catenacci, Holly R. Wyatt, and James O. Hill	
Chapter 59. Obesity Management .....	786
Lawrence J. Cheskin and Kavita H. Poddar	
Chapter 60. Bariatric Surgery .....	800
Kevin Tymitz, Thomas Magnuson, and Michael Schweitzer	
Chapter 61. Nutritional Management of Diabetes Mellitus .....	808
Susan Oh, Rita Rastogi Kalyani, and Adrian Dobs	
Chapter 62. Metabolic Syndrome: Definition, Relationship with Insulin Resistance, and Clinical Utility.....	828
Dominic N. Reeds	
Chapter 63. Nutrition and Inflammatory Processes .....	837
Philip C. Calder	
<b>B. Cardiovascular Diseases .....</b>	<b>849</b>
Chapter 64. Nutrient and Genetic Regulation of Lipoprotein Metabolism.....	849
Edward A. Fisher, Raanan Shamir, and Robert A. Hegele	
Chapter 65. Nutrition in the Prevention of Coronary Heart Disease and the Management of Lipoprotein Disorders.....	860
Ernst J. Schaefer	
Chapter 66. Diet and Blood Pressure .....	875
Lawrence J. Appel	
<b>C. Pediatric and Adolescent Disorders .....</b>	<b>887</b>
Chapter 67. Pediatric Feeding Problems.....	887
Richard M. Katz, James K. Hyche, and Ellen K. Wingert	
Chapter 68. Protein-Energy Malnutrition.....	894
Manuel Ramirez-Zea and Benjamin Caballero	
Chapter 69. Inherited Metabolic Disease: Amino Acids, Organic Acids, and Galactose .....	906
Louis J. Elsas II and Phyllis B. Acosta	
Chapter 70. Inherited Lipid Disorders of $\beta$ -Oxidation .....	970
Jerry Vockley, Lynne A. Wolfe, and Deborah L. Renaud	
Chapter 71. Nutritional Management of Infants and Children with Specific Diseases and Other Conditions.....	988
Arthur Cooper, Richard L. Mones, and William C. Heird	
Chapter 72. Food Insecurity in Children: Impact on Physical, Psychoemotional, and Social Development.....	1006
Rafael Pérez-Escamilla	

<b>D. Disorders of the Alimentary Tract</b> .....	1016
Chapter 73. Nutrition and Dental Medicine.....	1016
Riva Touger-Decker, Diane Rigassio Radler, and Dominick P. DePaola	
Chapter 74. Esophagus and Stomach.....	1041
Mark H. DeLegge	
Chapter 75. Assessment of Malabsorption .....	1048
John K. DiBaise	
Chapter 76. Diet and Intestinal Disaccharidases .....	1058
Steve Hertzler, Yeonsoo Kim, Rubina Khan, Michelle Asp, and Dennis Savaiano	
Chapter 77. Short Bowel Syndrome .....	1069
Khursheed N. Jeejeebhoy	
Chapter 78. Nutrition in Inflammatory Bowel Disease: Implications for Its Role in the Management of Crohn Disease and Ulcerative Colitis.....	1080
Gerald W. Dryden and Douglas L. Seidner	
Chapter 79. Celiac Disease .....	1089
Carol E. Semrad	
Chapter 80. Irritable Bowel Syndrome and Diverticular Disease .....	1096
Lauren Schwartz and Carol E. Semrad	
Chapter 81. Nutrition in Pancreatic Diseases .....	1103
Amit Raina and Stephen J. D. O'Keefe	
Chapter 82. Nutrition in Liver Disorders and the Role of Alcohol.....	1115
Juliane I. Beier, Sarah Landes, Mohammad Mohammad, and Craig J. McClain	
Chapter 83. Enteral Feeding.....	1126
Laura E. Matarese and Michele M. Gottschlich	
Chapter 84. Parenteral Nutrition .....	1136
Rex O. Brown, Gayle Minard, and Thomas R. Ziegler	
Chapter 85. Nutrition Therapy in Hospital and Outpatient Medicine.....	1162
Kris M. Mogensen and Malcolm K. Robinson	
<b>E. Nutritional Management during Cancer</b> .....	1171
Chapter 86. Epidemiology of Diet and Cancer Risk....	1171
Walter C. Willett and Edward Giovannucci	
Chapter 87. Cancer Cachexia .....	1187
Vickie E. Baracos	
Chapter 88. Nutritional Support of the Patient with Cancer .....	1194
David A. August and Maureen Huhmann	
<b>F. Skeletal and Joint Disorders</b> .....	1214
Chapter 89. Bone Biology in Health and Disease .....	1214
Robert P. Heaney	
Chapter 90. Prevention and Management of Osteoporosis.....	1227
Katherine L. Tucker and Clifford J. Rosen	
Chapter 91. Nutrition and Diet in Rheumatic and Arthritic Diseases.....	1245
Sarah L. Morgan and Joseph E. Baggott	
<b>G. Nutrition in Surgery and Trauma</b> .....	1261
Chapter 92. Hypercatabolic States.....	1261
Stephen F. Lowry and Susette M. Coyle	
Chapter 93. Nutrition Support for the Patient with Surgery, Trauma, or Sepsis.....	1273
Kenneth A. Kudsk	
Chapter 94. Nutrition in Burn Injury .....	1289
Marc G. Jeschke, Celeste C. Finnerty, Rachael A. Harrison, and David N. Herndon	
<b>H. Behavioral, Psychiatric, and     Neurologic Disorders</b> .....	1298
Chapter 95. Nutritional Disorders of the Nervous System .....	1298
Gustavo C. Román	
Chapter 96. Behavioral Disorders Affecting Food Intake: Eating Disorders and Other Psychiatric Conditions.....	1319
Janelle W. Coughlin, Margaret Seide, and Angela S. Guarda	
<b>I. Other Systemic Disorders</b> .....	1330
Chapter 97. Nutrition, Diet, and the Kidney.....	1330
Joel D. Kopple	
Chapter 98. Hematologic Aspects of Iron Deficiency and Less Common Nutritional Anemias .....	1372
Christopher R. Chitambar and Aśok C. Antony	
Chapter 99. Nutrition in Respiratory Diseases .....	1385
Neal M. Patel and Margaret M. Johnson	
Chapter 100. Nutrition and Infectious Diseases.....	1396
Alice M. Tang, Ellen Smit, and Richard D. Semba	
<b>J. Food Additives, Hazards, and     Nutrient–Drug Interactions</b> .....	1407
Chapter 101. Food Additives, Contaminants, and Natural Toxicants: Maintaining a Safe Food Supply .....	1407
Steve L. Taylor and Joseph L. Baumert	
Chapter 102. Food Allergies and Intolerances.....	1421
Steve L. Taylor and Joseph L. Baumert	
Chapter 103. Drug–Nutrient Interactions.....	1440
Lingtak-Neander Chan	
<b>Part V. Nutrition of Populations</b>	
<b>A. Nutrition in a Changing World</b> .....	1455
Chapter 104. Foundations of a Healthy Diet .....	1455
Walter C. Willett and Meir J. Stampfer	
Chapter 105. Dietary Patterns.....	1470
Katherine L. Tucker	

**Chapter 106.** Dietary Reference Intakes.....1480  
Christine Lewis Taylor and  
Linda D. Meyers

**Chapter 107.** Food Labeling .....1490  
F. Edward Scarbrough

**Chapter 108.** Food Assistance Programs.....1502  
Craig Gundersen

**Chapter 109.** The Nutrition Transition:  
Global Trends in Diet, Lifestyle, and  
Noncommunicable Diseases..... 1511  
Benjamin Caballero

**Chapter 110.** Food-Based Dietary Guidelines  
for Healthier Populations:  
International Considerations ..... 1518  
Ricardo Uauy, Sophie Hawkesworth,  
and Alan D. Dangour

**Chapter 111.** Approaches to Preventing  
Micronutrient Deficiencies..... 1533  
Lindsay H. Allen

**B. Nutrition and Human Performance..... 1540**

**Chapter 112.** Physical Activity, Fitness, and Health ....1540  
Gary R. Hunter

**Chapter 113.** Sports Nutrition .....1549  
Melvin H. Williams

**Chapter 114.** The Evolving Science of  
Dietary Supplements .....1564  
Christine A. Swanson, Paul R. Thomas,  
and Paul M. Coates

**Index ..... 1572**