



MODERN NUTRITION IN HEALTH AND DISEASE

TENTH EDITION

EDITORS

MAURICE E. SHILS
MOSHE SHIKE
A. CATHARINE ROSS
BENJAMIN CABALLERO
ROBERT J. COUSINS



LIPPINCOTT WILLIAMS & WILKINS

CONTENTS

PART I. HISTORICAL LANDMARKS IN NUTRITION

- 1 alpha Evolution of Knowledge of Essential Nutrients
KENNETH J. CARPENTER AND ALFRED E. HARPER / 3
- 1 beta Human Energy Metabolism
JOHN M. KINNEY / 10
- 1 gamma Management of Infantile Diarrhea and Dehydration
SAMUEL J. FOMON / 17

PART II. SPECIFIC DIETARY COMPONENTS

A. Major Dietary Constituents and Energy Needs

- 2. Proteins and Amino Acids / 23
DWIGHT E. MATTHEWS
- 3. Carbohydrates / 62
NANCY L. KEIM, ROY J. LEVIN, AND PETER J. HAVEL
- 4. Dietary Fiber / 83
JOANNE R. LUPTON AND PAULA R. TRUMBO
- 5. Lipids, Sterols, and Their Metabolites / 92
PETER J.H. JONES AND STANLEY KUBOW
- 6. Cholesterol and Other Dietary Sterols / 123
DAVID KRITCHEVSKY
- 7. Energy Needs: Assessment and Requirements / 136
NANCY F. BUTTE AND BENJAMIN CABALLERO

B. Minerals

- 8. Electrolytes, Water, and Acid-Base Balance / 149
MAN S. OH AND JAIME URIBARRI
- 9. Calcium / 194
CONNIE M. WEAVER AND ROBERT P. HEANEY
- 10. Phosphorus / 211
JAMES P. KNOCHEL
- 11. Magnesium / 223
ROBERT K. RUDE AND MAURICE E. SHILS
- 12. Iron / 248
RICHARD J. WOOD AND ALAYNE G. RONNENBERG
- 13. Zinc / 271
JANET C. KING AND ROBERT J. COUSINS
- 14. Copper / 286
JUDITH R. TURNLUND
- 15. Iodine / 300
JOHN T. DUNN
- 16. Selenium / 312
RAYMOND F. BURK AND ORVILLE A. LEVANDER
- 17A. Manganese / 326
ALAN L. BUCHMAN
- 17B. Chromium / 332
BARBARA J. STOECKER
- 18. Other Trace Elements / 338
CURTIS D. ECKHERT

C. Vitamins

- 19. Vitamin A and Carotenoids / 351
A. CATHARINE ROSS
- 20. Vitamin D / 376
MICHAEL F. HOLICK

- 21. Vitamin E / 396
MARET G. TRABER
- 22. Vitamin K / 412
JOHN W. SUTTIE
- 23. Thiamin / 426
ROGER F. BUTTERWORTH
- 24. Riboflavin / 434
DONALD B. MCCORMICK
- 25. Niacin / 442
CHRISTELLE BOURGEOIS, DANIEL CERVANTES-LAUREAN, AND JOEL MOSS
- 26. Vitamin B₆ / 452
AMY D. MACKAY, STEVEN R. DAVIS, AND JESSE F. GREGORY III
- 27. Pantothenic Acid / 462
PAULA R. TRUMBO
- 28. Folic Acid / 470
RALPH CARMEL
- 29. Cobalamin (Vitamin B₁₂) / 482
RALPH CARMEL
- 30. Biotin / 498
DONALD M. MOCK
- 31. Vitamin C / 507
MARK LEVINE, ARIE KATZ, AND SEBASTIAN J. PADAYATTY
- 32. Choline and Phosphatidylcholine / 525
STEVEN H. ZEISEL AND MIHAI D. NICULESCU

D. Other Compounds with Health Relevance

- 33. Carnitine / 537
CHARLES J. REBOUCHE
- 34. Homocysteine, Cysteine, and Taurine / 545
MARTHA H. STIPANUK
- 35. Glutamine / 563
ALAN L. BUCHMAN
- 36. Arginine and Nitric Oxide / 571
BENJAMIN M. CHIONGLO SY, ERIN E. DWEIK, AND RAED A. DWEIK
- 37. Phytochemicals / 582
RONALD L. PRIOR

E. Signs of Clinical Deficiencies

- 38. Clinical Manifestations of Nutrient Deficiencies and Toxicities: A Resume / 595
DOUGLAS C. HEIMBURGER, DONALD S. McLAREN, AND MAURICE E. SHILS

PART III. NUTRITION IN INTEGRATED BIOLOGIC SYSTEMS

A. Intercellular Regulation: Tutorials

- 39. Nutritional Regulation of Gene Expression and Nutritional Genomics / 615
ROBERT J. COUSINS
- 40. Polymorphisms: Effect on Nutrient Utilization and Metabolism / 627
PATRICK J. STOVER AND CUTBERTO GARZA
- 41. Hormones and Growth Factors / 636
IRWIN G. BRODSKY
- 42. Cytokines and Eicosanoids / 655
JOSEPH G. CANNON

43. Nutrition and the Immune System / 670
GABRIEL FERNANDES, CHRISTOPHER A. JOLLY, AND RICHARD A. LAWRENCE
44. Oxidant Defense in Oxidative and Nitrosative Stress / 685
JAMES A. THOMAS

B. Metabolic Regulation: Tutorials

45. Nutrition and the Chemical Senses / 695
RICHARD D. MATTES
46. Controls of Food Intake / 707
GERARD P. SMITH
47. Physical Activity, Fitness, and Health / 720
GARY R. HUNTER
48. Metabolic Consequences of Starvation / 730
L. JOHN HOFFER

PART IV. NUTRITION NEEDS AND ASSESSMENT DURING THE LIFE CYCLE

49. Body Composition and Anthropometry / 751
STEVEN B. HEYMSFIELD AND RICHARD W. BAUMGARTNER
- 50A. Nutrition During Pregnancy / 771
R. ELAINE TURNER
- 50B. Lactation / 784
MARY FRANCES PICCIANO AND SHARON S. MCDONALD
51. Infancy and Childhood / 797
WILLIAM C. HEIRD AND ARTHUR COOPER
52. Adolescence / 818
MARGARITA S. TREUTH AND IAN J. GRIFFIN
53. Adulthood / 830
DOUGLAS C. HEIMBURGER
54. The Elderly / 843
CONNIE WATKINS BALES AND CHRISTINE SEEL RITCHIE

PART V. PREVENTION AND MANAGEMENT OF DISEASE

A. Pediatric and Adolescent Disorders

55. Malnutrition among Children in the United States: The Impact of Poverty / 861
ROBERT KARP
56. Pediatric Feeding Problems / 875
RICHARD KATZ, RAMASAMY MANIKAM, AND LINDA SCHUBERTH
57. Protein-Energy Malnutrition / 881
BENJAMIN TORÚN
58. Inherited Metabolic Disease: Amino Acids, Organic Acids, and Galactose / 909
LOUIS J. ELSAS, II, AND PHYLLIS B. ACOSTA
59. Inherited Metabolic Diseases: Defects of β -Oxidation / 960
JERRY VOCKLEY AND DEBORAH L. RENAUD
60. Childhood Obesity / 979
WILLIAM H. DIETZ
61. Nutritional Management of Infants and Children with Specific Diseases or Other Conditions / 991
ARTHUR COOPER AND WILLIAM C. HEIRD

B. Disorders of Metabolism

62. Metabolic Syndrome: Definition, Relationship to Insulin Resistance, and Clinical Utility / 1004
GERALD M. REAVEN
63. Obesity: Etiology / 1013
JAMES O. HILL, VICTORIA A. CATENACCI, AND HOLLY R. WYATT

64. Obesity: Management / 1029
THOMAS A. WADDEN, KIRSTIN J. BYRNE, AND STEPHANIE KRAUTHAMER-EWING
65. Diabetes Mellitus: Medical Nutrition Therapy / 1043
JAMES W. ANDERSON

C. Prevention and Management of Cardiovascular Disease

66. Nutrient and Genetic Regulation of Lipoprotein Metabolism / 1067
MARGO A. DENKE
67. Nutrition in the Management of Disorders of Serum Lipids and Lipoproteins / 1076
SCOTT M. GRUNDY
68. Nutrition, Diet, and Hypertension / 1095
THEODORE A. KOTCHEN AND JANE MORLEY KOTCHEN
69. Congestive Heart Failure / 1108
JOHN R. HOYLE AND FREDERIC R. KAHL

D. Disorders of the Alimentary Tract

70. Alimentary Tract in Nutrition / 1115
SAMUEL KLEIN, STEVEN M. COHN, AND DAVID H. ALPERS
71. Assessment of Malabsorption / 1143
DARLENE G. KELLY
72. Nutrition and Dental Medicine / 1152
DOMINICK P. DePAOLA, RIVA TOUGER-DECKER, DIANE RIGASSIO-RADLER, AND MARY P. FAINE
73. The Esophagus and Stomach / 1179
WILLIAM F. STENSON
74. Intestinal Disaccharidase Depletions / 1189
STEVEN R. HERTZLER, YEONSOO KIM, RUBINA KHAN, MICHELLE ASP, AND DENNIS SAVAIANO
75. Short Bowel Syndrome / 1201
KHURSHEED N. JEEJEBHOY
76. Inflammatory Bowel Disease / 1209
ANNE M. GRIFFITHS
77. Celiac Disease / 1219
J. JOSEPH CONNON
78. Nutrition in Pancreatic Disorders / 1227
MASSIMO RAIMONDO AND JAMES S. SCOLAPIO
79. Nutrition in Liver Disorders and the Role of Alcohol / 1235
CHARLES S. LIEBER

E. Prevention and Management of Cancer

80. Molecular Basis of Carcinogenesis / 1260
DANA RATHKOPF AND GARY K. SCHWARTZ
81. Epidemiology of Diet and Cancer Risk / 1267
WALTER C. WILLETT AND EDWARD GIOVANNUCCI
82. Chemoprevention of Cancer / 1280
MICHAEL B. SPORN
83. Nutrition Support of the Patient with Cancer / 1290
MARK SCHATTNER AND MOSHE SHIKE

F. Prevention and Management of Skeletal and Joint Disorders

84. Bone Biology in Health and Disease / 1314
ROBERT P. HEANEY
85. Nutrition and Diet in Rheumatic Diseases / 1326
SARAH L. MORGAN AND JOSEPH E. BAGGOTT
86. Osteoporosis / 1339
BESS DAWSON-HUGHES

G. Psychiatric, Behavioral, and Neurological Disorders

87. Behavioral Disorders Affecting Food Intake: Eating Disorders and Other Psychiatric Conditions / 1353
JANELLE W. COUGHLIN AND ANGELA S. GUARDA
88. Nutritional Disorders of the Nervous System / 1362
GUSTAVO C. ROMÁN

H. Nutrition in Surgery, Infection, and Trauma

89. The Hypercatabolic State / 1381
STEPHEN F. LOWRY AND J. MARTIN PEREZ
90. Nutrition and Infection / 1401
RICHARD D. SEMBA
91. Nutrition in the Care of the Patient with Surgery, Trauma, and Sepsis / 1414
KENNETH A. KUDSK AND GORDON S. SACKS

I. Other Systemic Disorders

92. Nutritional Aspects of Hematologic Diseases / 1436
CHRISTOPHER R. CHITAMBAR AND AŠOK C. ANTONY
93. Nutrition, Respiratory Function, and Disease / 1462
BRUCE SUCKLING, MARGARET M. JOHNSON, AND ROBERT CHIN, JR.
94. Nutrition, Diet, and the Kidney / 1475
JOEL D. KOPPLE
95. Food Allergies and Intolerances / 1512
STEVE L. TAYLOR AND SUSAN L. HEFLE
96. Nutrition in the Older Person / 1531
JOHN E. MORLEY

J. Drug-Nutrient Interactions

97. Drug-Nutrient Interactions / 1539
LINGTAK-NEANDER CHAN

K. Systems of Nutritional Support

98. Enteral Feeding / 1554
MOSHE SHIKE
99. Parenteral Nutrition / 1567
REX O. BROWN AND GAYLE MINARD
100. Chronic Disease Management: The Team Approach / 1598
MAURICE E. SHILS, ABBY S. BLOCH, AND PATRICIA BROWN
101. Nutritional and Medical Ethics: The Interplay of Medical Decisions, Patients' Rights, and the Judicial System / 1608
MAURICE E. SHILS

PART VI. DIET AND NUTRITION IN HEALTH OF POPULATIONS

102. Foundations of a Healthy Diet / 1625
WALTER C. WILLETT AND MEIR J. STAMPPER
103. Nutritional Implications of Vegetarian Diets / 1638
PATRICIA K. JOHNSTON AND JOAN SABATÉ
104. Dietary Reference Intakes: Rationale and Applications / 1655
ALLISON A. YATES

105. Dietary Guidelines: National Perspectives / 1673
JOHANNA T. DWYER
106. Nutrition Monitoring in the United States / 1687
MARIE FANELLI KUCZMARSKI AND ROBERT J. KUCZMARSKI
107. Food-Based Dietary Guidelines for Healthier Populations: International Considerations / 1701
RICARDO UAUY, EVA HERTRAMPF, AND ALAN D. DANGOUR
108. The Nutrition Transition: Global Trends in Diet and Disease / 1717
BENJAMIN CABALLERO
109. Sports Nutrition / 1723
MELVIN H. WILLIAMS
110. Social and Cultural Influences on Food Consumption and Nutritional Status / 1741
SARA A. QUANDT
111. Fads, Frauds, and Quackery / 1752
STEPHEN BARRETT
112. Alternative Nutrition Therapies / 1762
STEPHEN BARRETT

PART VII. ADEQUACY, SAFETY, AND OVERSIGHT OF THE FOOD SUPPLY

113. Food Processing: Nutrition, Safety, and Quality / 1777
JOHN W. FINLEY, DENISE M. DEMING, AND ROBERT E. SMITH
114. Designing Functional Foods / 1789
WAYNE R. BIDLACK AND WEI WANG
115. Food Additives, Contaminants, and Natural Toxicants and Their Risk Assessment / 1809
STEVE L. TAYLOR
116. Nutrition Labeling of Foods and Dietary Supplements / 1827
KENNETH D. FISHER, ELIZABETH A. YETLEY, AND CHRISTINE L. TAYLOR

PART VIII. APPENDICES

ABBY S. BLOCH AND MAURICE E. SHILS

Table of Contents / 1840

- Section I. Conversion Factors, Weights and Measures, and Metabolic Water Formation / 1846
- Section II. National and International Recommended Dietary Reference Values / 1852
- Section III. Energy and Protein Needs and Anthropometric Data / 1901
- Section IV. Nutrients, Lipids, and Organic Compounds in Beverages and Selected Foods / 1964
- Section V. Therapeutic Diets / 1994
- Section VI. Web Sites of Interest to the Health Professional / 2024
- Index / 2027