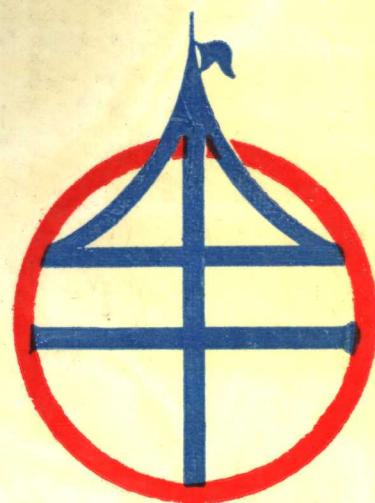


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TEXTBOOK
of
MEDICINE

WYNGAARDEN/SMITH/BENNETT

VOLume 2



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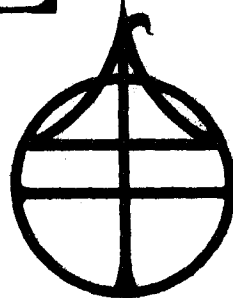
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We urge, therefore, that you check the package information data for the manufacturer's recommended dosage to be certain that changes have not been made in the recommended dose or in the contraindications for administration. In addition, there are some quite serious situations in which drug therapy must be individualized and expert judgment advises the use of a higher dosage or administration by a different route than is included in the manufacturer's recommendations. Throughout the text examples of such instances are indicated by a footnote.

THE EDITORS

ALSO ASSOCIATED WITH THE CECIL TEXTBOOK OF MEDICINE

Review of General Internal Medicine: A Self-Assessment Manual, 5th Edition, 1992

Editors: J. Allen D. Cooper, Jr., M.D.; Peter G. Pappas, M.D.

The fifth edition of this self-assessment book contains approximately 1200 questions covering all the specialty areas of internal medicine. The answers are linked to this edition of the *Cecil Textbook of Medicine*, to the *Cecil Essentials of Medicine*, and to other readily available sources.

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PREFACE

The 19th edition of the *Cecil Textbook of Medicine* appears on the one-hundredth anniversary of the publication of William Osler's influential *The Principles and Practice of Medicine*, a monumental single-authored volume notable for its comprehensive clinical coverage, authoritative pathologic descriptions, and literary qualities. Microbiology was then the newest medical science. A tone of therapeutic nihilism was the book's most salutary contribution. At least two generations of physicians would fall under its influence. The textbook ushered in a period of increasingly exact diagnosis, especially in infectious diseases, and an ever more critical evaluation of drugs, remedies, and nostrums in the practice of medicine. It also led to the establishment of the Rockefeller Institute, founded to address the pervasive ignorance of the pathophysiology of disease so abundantly displayed in Osler's textbook, avant garde though it was for its day.

Thirty-five years later, in 1927, Russell Cecil introduced "A Text-book of Medicine by American authors." Single-authored textbooks had largely given way to books jointly authored by a small number of writers, but the idea of an edited textbook compiled by multiple authors, each writing on topics of personal interest and experience, was new. Basic biologic sciences were making increasingly important contributions to clinical medicine, and these were to be accorded substantial attention. The maturing sciences were physiology, pharmacology, and biochemistry. With succeeding editions, Cecil's philosophy became more explicit. Cecil believed that "... in terms of biological processes, fragmentation of the discussion of disease is artificial" (Preface, 10th edition, 1959). Each chapter was a treatise in which clinical description, pathologic information, pathophysiologic knowledge, diagnostic criteria, and therapeutic measures were well integrated, so that students and physicians consulting the text could secure the most authoritative information available and find it in one place (Beeson and McDermott, Preface, 11th edition, 1963).

Cecil's inaugural philosophy continues into the 19th edition of the *Cecil Textbook*, 65 years later, appropriately adapted to ever-changing circumstances. By 1992, several generations of physicians have learned medicine with the help of Cecil. The series spans a period of remarkable progress in biomedical and behavioral sciences, and each new edition has incorporated new insights on disease causation, prevention, and treatment. The pace has quickened as we approach the twenty-first century. New technologies have revolutionized molecular genetics, neurobiology, immunology, cell biology, and structural biology; the application of these disciplines to all branches of the traditional biomedical sciences proceeds apace. The structure of DNA was elucidated less than 40 years ago, and recombinant DNA technology was discovered less than 20 years ago. Today, the leitmotif of biologic science, regardless of its disciplinary name, is increasingly cell and molecular biology. This theme is now permeating medicine and prefiguring the developments of the next few decades. Beyond these contributions from the biologic sciences, applications of the physical and mathematical sciences, especially in diagnostic imaging (CT, MRI, PET, and sonography) and in the information sciences, continue to alter medical practice. In such a climate of change, medical competence itself is fragile. It must be constantly renewed or else it will erode.

To reflect the best in medical practice, a major textbook of medicine must also be constantly renewed. In that spirit, this edition of the *Cecil Textbook of Medicine* has been thoroughly revised. As before, approximately one third of the book is "new" in that different authors have been selected, in this way assuring that their chapters have been completely recast. All other chapters have been revised and updated by their current authors, carefully chosen authorities in their respective subjects. The editors are deeply grateful to all retiring authors for the high standards of their contributions. We have retained the two-color presentation of figures and charts, so well received in the 18th edition, and have expanded the color plates from 8 to 16 pages.

The most extensive change in the 19th edition is the further expansion of space devoted to the acquired immunodeficiency syndrome (AIDS), a still unfolding epidemic. This condition

now commands a part of its own (Part XXI, HIV and Associated Disorders), comprising 13 newly written chapters: "Immunology Related to AIDS" (B. D. Walker); "Biology of Human Immunodeficiency Viruses" (G. M. Shaw); "Epidemiology of HIV Infection and AIDS" (J. W. Curran); "Prevention of HIV Infection" (M. S. Saag); "Neurologic Complications of HIV-1 Infection" (R. W. Price); "Pulmonary Manifestations of AIDS: Special Emphasis on Pneumocystosis" (F. R. Sattler); "Gastrointestinal Manifestations of AIDS" (J. G. Bartlett); "Cutaneous Signs of AIDS" (N. S. Penneys); "Ophthalmologic Manifestations of AIDS" (M. A. Jacobson); "Hematology/Oncology in AIDS" (J. E. Groopman and D. T. Scadden); "Renal, Cardiac, Endocrine, and Rheumatologic Manifestations of HIV Infection" (M. S. Saag); "Treatment of AIDS and Related Disorders" (R. Yarchoan and S. Broder); and "Chronic Management and Counseling for Persons with HIV Infection" (J. A. Bartlett). In addition, related chapters on AIDS dementia and on opportunistic infections associated with AIDS, found elsewhere in the book, have been thoroughly updated.

A new chapter, "Human T Cell Lymphotropic Virus Type I-Associated Myelopathy and Tropical Spastic Paraparesis" (R. W. Price), reflects the growing appreciation of other retroviruses as causes of human disease. Oncology (Part XIII) has been strengthened by the addition of two new chapters: "Oncologic Emergencies" (S. M. Hahn and A. Russo) and "Metastatic Cancer, Source Unknown" (D. C. Ihde). In addition, a new chapter, "Ovarian Carcinoma" (H. W. Jones), is included in Part XVI, Endocrine and Reproductive Diseases. Part XXIII, Neurology, has been reorganized to increase the depth of focus on problems of the elderly. New chapters include "Neurologic Problems Associated with Aging" (F. Plum) and "Disturbances of Memory and Language" and "Alzheimer's Disease and Related Dementias" (both by A. R. Damasio). Also, "Brief Loss of Consciousness," "Sustained Impairments of Consciousness," and "Brain Death" (all by F. Plum) are now full chapters.

New chapters have also been added elsewhere, including "Zoonoses" (B. McLain), "Liver Transplantation" (J. P. Roberts), and "Erythromelalgia" (E. V. Ball). Part IV, Principles of Diagnosis and Management, is now expanded by a new chapter, "NSAID's: Aspirin and Aspirin-like Drugs" (G. Weissmann), in response to the need for an authoritative discussion of the nature, use, and side effects of these widely employed agents. Also, in this edition "Antimicrobial Therapy" (L. S. Young) and "Antiviral Therapy" (a new chapter by M. Middlebrooks) have been transferred from Part IV to be associated more closely with chapters on specific bacterial and viral diseases in Part XX, Infectious Diseases. As in recent editions of *Cecil*, each chapter lists a limited number of carefully selected, recent references to research or review articles in accessible journals, or to books, that may be consulted for additional information. The particular value of each entry is briefly described in an annotation. Finally, a new chapter entitled "Internal Medicine and Today's Internist" has been contributed by our co-editor, J. Claude Bennett, whom the continuing editors warmly welcome to the task of shepherding the 19th edition of *Cecil*, with its attendant high honor and immense responsibility.

Cecil not only stands alone; it is also the senior member of a trilogy. *Cecil Essentials of Medicine* (edited by T. E. Andreoli, C. C. J. Carpenter, F. Plum, and L. H. Smith, Jr.), now in its 2nd edition, offers a more concentrated guide to what every doctor should know about internal medicine. It is designed primarily for the medical student, for whom the authoritative compendium of *Cecil* may sometimes seem formidable. Nevertheless, it serves in general as a useful point of entry guide. *Cecil Review of General Internal Medicine* (edited by J. A. D. Cooper, Jr., and P. G. Pappas) appears in a 5th edition in parallel with this 19th edition of *Cecil*. As before, its 1200 questions and answers are designed to be of general educational benefit as well as to reinforce the value of *Cecil* as a reference text.

Editing a major textbook is a complex task, as one attempts to balance content, format, style, integration, and innovation. The editors have been privileged to work with an admirable group of colleagues in this shared responsibility. Fred Plum has continued in his role as Editor for Neurology. We welcome two new Consulting Editors: Gerald L. Mandell for Infectious Diseases and Robert K. Ockner for Digestive Diseases. They join a seasoned team of fellow Consulting Editors: Thomas E. Andreoli (Renal Diseases), John F. Murray (Respiratory Diseases), David G. Nathan (Hematologic and Hematopoietic Diseases), and Thomas W. Smith (Cardiovascular Diseases). We thank our retiring Consulting Editors, Robert Lefkowitz, William Paul, and Marvin Sleisenger, for extraordinary contributions to *Cecil*, in one case (M. Sleisenger) extending over eight editions. The Consulting Editors continually review their respective sections of this complex book and bring us their ideas and expertise concerning

modifications. Our special gratitude is extended to the 360 contributors who have written the 534 chapters that collectively constitute this 19th edition. The ultimate value and authenticity of *Cecil* lie not with the editors but with the scholarship and experience that these individual physicians and scientists have brought to this joint enterprise.

"Language is the armoury of the human mind; and at once contains the trophies of its past, and the weapons of its future conquests." The weaponry of language, in Coleridge's image above, does not always come fully burnished in submitted manuscripts. As in the 18th edition, we have been most fortunate to work with seasoned editorial assistants in Washington (Margaret Quinlan), San Francisco (Judith Serrell), and Birmingham (Carolyn Thomley), without whose dedication and skill this large project could not have been completed. At W. B. Saunders Company, Lorraine Kilmer, Donna Walker, Frank Polizzano, and Faith Voit carried out with experienced professionalism the intricate task of formatting, editing, and assembling the book. The overall editor at the W. B. Saunders Company for this 19th edition of *Cecil* was again John Dyson, who has been an invaluable guide, colleague, and good friend. We are deeply indebted to him for his extensive contributions in bringing to completion this 19th edition of a venerable book.

JAMES B. WYNGAARDEN, M.D.

LLOYD H. SMITH, JR., M.D.

J. CLAUDE BENNETT, M.D.

CONTENTS

PART I	MEDICINE AS A LEARNED AND HUMANE PROFESSION	2
PART II	HUMAN GROWTH, DEVELOPMENT, AND AGING	15
PART III	PERSONAL HEALTH CARE AND PREVENTIVE MEDICINE	33
PART IV	PRINCIPLES OF DIAGNOSIS AND MANAGEMENT	65
PART V	PRINCIPLES OF HUMAN GENETICS	119
PART VI	CARDIOVASCULAR DISEASES	147
PART VII	RESPIRATORY DISEASES	369
PART VIII	CRITICAL CARE MEDICINE	459
PART IX	RENAL DISEASES	477
PART X	GASTROINTESTINAL DISEASES	620
PART XI	DISEASES OF THE LIVER, GALLBLADDER, AND BILE DUCTS	753
PART XII	HEMATOLOGIC DISEASES	817
PART XIII	ONCOLOGY	1018
PART XIV	METABOLIC DISEASES	1075
PART XV	NUTRITIONAL DISEASES	1147
PART XVI	ENDOCRINE AND REPRODUCTIVE DISEASES	1194
PART XVII	DISEASES OF BONE AND BONE MINERAL METABOLISM	1398
PART XVIII	DISEASES OF THE IMMUNE SYSTEM	1438
PART XIX	MUSCULOSKELETAL AND CONNECTIVE TISSUE DISEASES ...	1488
PART XX	INFECTIOUS DISEASES	1566
PART XXI	HIV AND ASSOCIATED DISORDERS	1908
PART XXII	DISEASES CAUSED BY PROTOZOA AND METAZOA	1971
PART XXIII	NEUROLOGY	2033
PART XXIV	EYE DISEASES	2269
PART XXV	SKIN DISEASES	2280
PART XXVI	OCCUPATIONAL AND ENVIRONMENTAL MEDICINE	2331
PART XXVII	LABORATORY REFERENCE INTERVAL VALUES OF CLINICAL IMPORTANCE	2370

(Detailed table of contents begins on page xxxi.)

PART I MEDICINE AS A LEARNED AND HUMANE PROFESSION

1	INTERNAL MEDICINE AND TODAY'S INTERNIST, <i>J. Claude Bennett</i>	2
2	MEDICINE AS AN ART, <i>Lloyd H. Smith, Jr.</i>	6
3	MEDICINE AS A SCIENCE, <i>James B. Wyngaarden</i>	9
4	CLINICAL ETHICS IN THE PRACTICE OF MEDICINE, <i>Mark Siegler and Peter A. Singer</i>	11

PART II HUMAN GROWTH, DEVELOPMENT, AND AGING

5	ADOLESCENT MEDICINE, <i>Iris F. Litt</i>	15
6	AGING AND GERIATRIC MEDICINE, <i>John W. Rowe</i>	21
7	MANAGEMENT OF COMMON PROBLEMS IN THE ELDERLY, <i>T. Franklin Williams</i>	26
8	CARE OF DYING PATIENTS AND THEIR FAMILIES, <i>Balfour M. Mount</i>	29

PART III PERSONAL HEALTH CARE AND PREVENTIVE MEDICINE

9	PRINCIPLES OF PREVENTIVE MEDICINE, <i>Stephen B. Hulley</i>	33
10	TOBACCO AND HEALTH, <i>David M. Burns</i>	34
11	CONTROL OF UNINTENDED INJURIES AND THOSE DUE TO VIOLENCE, <i>Stephen B. Hulley</i>	37
12	THE JUDICIOUS DIET, <i>John P. Kane</i>	39
13	EXERCISE AND HEALTH, <i>William L. Haskell</i>	42
14	ALCOHOLISM AND ALCOHOL ABUSE, <i>Ivan Diamond</i>	44
15	DRUG ABUSE AND DEPENDENCE, <i>Charles P. O'Brien</i>	47
16	IMMUNIZATION, <i>Walter A. Orenstein</i>	55
17	THE PREVENTIVE HEALTH EXAMINATION, <i>Gary D. Friedman</i>	61
18	THE HEALTH OF THE PHYSICIAN, <i>Linda Hawes Clever</i>	62

PART IV PRINCIPLES OF DIAGNOSIS AND MANAGEMENT

19	CLINICAL APPROACH TO THE PATIENT, <i>Suzanne W. Fletcher</i>	65
20	CLINICAL DECISION MAKING, <i>Stephen G. Pauker</i>	68
21	THE USE AND INTERPRETATION OF LABORATORY-DERIVED DATA, <i>James B. Wyngaarden</i>	73
22	OVERVIEW OF IMAGING TECHNIQUES AND PROJECTION FOR THE FUTURE, <i>Alexander R. Margulis</i>	76
23	PRINCIPLES OF DRUG THERAPY, <i>Alan S. Nies</i>	81
24	INTERACTIONS BETWEEN DRUGS, <i>Alan S. Nies</i>	92
25	ADVERSE REACTIONS TO DRUGS, <i>Alan S. Nies</i>	95
26	PAIN AND ITS MANAGEMENT, <i>Kathleen M. Foley</i>	97
27	GLUCOCORTICOSTEROID THERAPY, <i>Barton F. Haynes</i>	104
28	COMMON POISONINGS, <i>William O. Robertson</i>	108
29	NSAIDs: ASPIRIN AND ASPIRIN-LIKE DRUGS, <i>Gerald Weissmann</i>	114

PART V PRINCIPLES OF HUMAN GENETICS

30	HUMAN HEREDITY, <i>James B. Wyngaarden</i>	119
31	INBORN ERRORS OF METABOLISM, <i>James B. Wyngaarden</i>	125
32	EXPECTATIONS FROM RECOMBINANT DNA RESEARCH, <i>W. French Anderson</i>	130
33	CHROMOSOMES AND THEIR DISORDERS, <i>John L. Hamerton</i>	133
34	CONGENITAL MALFORMATIONS, <i>Lewis B. Holmes</i>	141
35	GENETIC COUNSELING, <i>Margretta R. Seashore</i>	143

PART VI CARDIOVASCULAR DISEASES

36	APPROACH TO THE PATIENT WITH CARDIOVASCULAR DISEASE, <i>Thomas W. Smith</i>	147
37	EPIDEMIOLOGY OF CARDIOVASCULAR DISEASE, <i>William T. Friedewald</i>	151
38	CARDIAC FUNCTION AND CIRCULATORY CONTROL, <i>John Ross, Jr.</i>	155
39	SPECIALIZED DIAGNOSTIC PROCEDURES	162
39.1	RADIOLOGY OF THE HEART, <i>Murray G. Baron</i>	162
39.2	ELECTROCARDIOGRAPHY, <i>Joseph C. Greenfield, Jr.</i>	170

39.3	ECHOCARDIOGRAPHY, <i>Richard L. Popp</i>	175
39.4	NUCLEAR CARDIOLOGY, <i>Barry L. Zaret</i>	180
39.5	CARDIAC CATHETERIZATION AND ANGIOGRAPHY, <i>William H. Barry</i>	184
40	HEART FAILURE, <i>Thomas W. Smith</i>	187
41	SHOCK, <i>David W. Ferguson</i>	207
42	CARDIAC ARRHYTHMIAS, <i>J. Thomas Bigger, Jr.</i>	228
43	SUDDEN CARDIAC DEATH, <i>Douglas P. Zipes</i>	250
44	ARTERIAL HYPERTENSION, <i>Suzanne Oparil</i>	253
45	PULMONARY HYPERTENSION, <i>Alfred P. Fishman</i>	269
46	CONGENITAL HEART DISEASE, <i>Samuel Kaplan</i>	280
47	ATHEROSCLEROSIS, <i>Russell Ross</i>	293
48	DISORDERS OF THE CORONARY ARTERIES	298
48.1	ANGINA PECTORIS, <i>William J. Rogers</i>	298
48.2	ACUTE MYOCARDIAL INFARCTION, <i>Burton E. Sobel</i>	304
48.3	SURGICAL TREATMENT OF CORONARY ARTERY DISEASE, <i>Lawrence S. Cohen</i>	318
49	VALVULAR HEART DISEASE, <i>Charles E. Rackley</i>	321
50	DISEASES OF THE MYOCARDIUM, <i>Joseph K. Perloff</i>	332
51	DISEASES OF THE PERICARDIUM, <i>Ralph Shabetai</i>	343
52	MISCELLANEOUS CONDITIONS OF THE HEART: TUMOR, TRAUMA, AND SYSTEMIC DISEASE, <i>Bernadine P. Healy</i>	348
53	DISEASES OF THE AORTA, <i>Lawrence S. Cohen</i>	350
54	VASCULAR DISEASES OF THE LIMBS, <i>Hermes A. Kontos</i>	355

PART VII RESPIRATORY DISEASES

55	INTRODUCTION, <i>John F. Murray</i>	369
56	RESPIRATORY STRUCTURE AND FUNCTION, <i>John F. Murray</i>	373
57	ASTHMA, <i>Jeffrey M. Drazen</i>	381
58	CHRONIC AIRWAYS DISEASES, <i>Richard A. Matthay</i>	386
59	ABNORMALITIES OF LUNG AERATION, <i>Richard A. Matthay</i>	394
60	INTERSTITIAL LUNG DISEASE, <i>Ronald G. Crystal</i>	396
61	INTRODUCTION TO PNEUMONIA, <i>Waldemar G. Johanson, Jr.</i>	409
62	LUNG ABSCESS, <i>John G. Bartlett</i>	413
63	BRONCHIECTASIS, <i>Roger Bone</i>	415
64	CYSTIC FIBROSIS, <i>Roger Bone</i>	418
65	PULMONARY EMBOLISM, <i>Robert M. Senior</i>	421
66	FAT EMBOLISM SYNDROME, <i>Robert M. Senior</i>	429
67	SARCIDOSIS, <i>Barry L. Fanburg</i>	430
68	PULMONARY NEOPLASMS, <i>Charles H. Scoggin</i>	435
69	DISEASES OF THE DIAPHRAGM, CHEST WALL, PLEURA, AND MEDIASTINUM, <i>Bartolome R. Celli</i>	443
70	RESPIRATORY FAILURE, <i>John F. Murray</i>	452

PART VIII CRITICAL CARE MEDICINE

71	CRITICAL CARE MEDICINE, <i>John M. Luce and Philip C. Hopewell</i>	459
----	--	-----

PART IX RENAL DISEASES

72	APPROACH TO THE PATIENT WITH RENAL DISEASE, <i>Thomas E. Andreoli</i>	477
73	STRUCTURE AND FUNCTION OF THE KIDNEYS, <i>Saulo Klahr</i>	482
74	INVESTIGATIONS OF RENAL FUNCTION, <i>Vincent W. Dennis</i>	492
75	DISORDERS OF FLUID VOLUME, ELECTROLYTE, AND ACID-BASE BALANCE, <i>Thomas E. Andreoli</i>	499
76	ACUTE RENAL FAILURE, <i>Jared J. Grantham</i>	528
77	CHRONIC RENAL FAILURE, <i>David G. Warnock</i>	533
78	TREATMENT OF IRREVERSIBLE RENAL FAILURE	541
78.1	DIALYSIS, <i>Robert G. Luke</i>	541
78.2	RENAL TRANSPLANTATION, <i>John J. Curtis</i>	546
79	GLOMERULAR DISORDERS, <i>William G. Couser</i>	551
80	TUBULOINTERSTITIAL DISEASES AND TOXIC NEPHROPATHIES, <i>T. Dwight McKinney</i>	568
81	OBSTRUCTIVE UROPATHY, <i>Saulo Klahr</i>	579
82	SPECIFIC RENAL TUBULAR DISORDERS, <i>Martin G. Cogan</i>	584
83	DIABETES AND THE KIDNEY, <i>Bryan D. Myers</i>	590
84	URINARY TRACT INFECTIONS AND PYELONEPHRITIS, <i>Vincent T. Andriole</i>	593
85	VASCULAR DISORDERS OF THE KIDNEY, <i>Jordan J. Cohen</i>	598
86	RENAL DISEASE IN PREGNANCY, <i>John P. Hayslett</i>	599
87	HEREDITARY CHRONIC NEPHROPATHIES, <i>Wadi N. Suki</i>	602
88	RENAL CALCULI, <i>Charles Y. C. Pak</i>	603

89	CYSTIC DISEASE OF THE KIDNEY, <i>Patricia A. Gabow</i>	608
90	ANOMALIES OF THE URINARY TRACT, <i>Richard D. Williams</i>	612
91	TUMORS OF THE KIDNEY, URETER, AND BLADDER, <i>Richard D. Williams</i>	614

PART X GASTROINTESTINAL DISEASES

92	INTRODUCTION TO GASTROINTESTINAL DISEASES, <i>Robert K. Ockner</i> ..	620
93	DIAGNOSTIC IMAGING PROCEDURES IN GASTROENTEROLOGY, <i>Susan D. Wall</i>	625
94	GASTROINTESTINAL ENDOSCOPY, <i>Jack A. Vennes</i>	630
95	DISEASES OF THE MOUTH AND SALIVARY GLANDS, <i>Troy E. Daniels</i> ..	635
96	DISEASES OF THE ESOPHAGUS, <i>Sidney Cohen</i>	639
97	GASTRITIS, <i>Andrew H. Soll</i>	648
98	PEPTIC ULCER	652
98.1	PATHOGENESIS, <i>Charles T. Richardson</i>	652
98.2	EPIDEMIOLOGY, CLINICAL MANIFESTATIONS, AND DIAGNOSIS, <i>Lawrence R. Schiller</i>	656
98.3	MEDICAL THERAPY, <i>Walter L. Peterson</i>	658
98.4	SURGICAL THERAPY, <i>Richard C. Thirlby</i>	661
98.5	COMPLICATIONS, <i>Mark Feldman</i>	663
98.6	ZOLLINGER-ELLISON SYNDROME, <i>Charles T. Richardson</i>	665
99	NEOPLASMS OF THE STOMACH, <i>Sidney J. Winawer</i>	667
100	DISORDERS OF GASTROINTESTINAL MOTILITY, <i>William J. Snape, Jr.</i> ..	671
101	DIARRHEA, <i>Guenier J. Krejs</i>	680
102	MALABSORPTION, <i>Phillip P. Toskes</i>	687
103	INFLAMMATORY BOWEL DISEASE, <i>Stephen B. Hanauer</i>	699
104	VASCULAR DISEASES OF THE INTESTINE, <i>James H. Grendell</i>	708
105	NEOPLASMS OF THE LARGE AND SMALL INTESTINE, <i>Bernard Levin</i> ..	713
106	PANCREATITIS, <i>William M. Steinberg</i>	721
107	CARCINOMA OF THE PANCREAS, <i>Eugene P. DiMaggio</i>	727
108	FOOD POISONING, <i>David F. Altman</i>	730
109	DISEASES OF THE RECTUM AND ANUS, <i>Theodore R. Schrock</i>	734
110	DISEASES OF THE PERITONEUM, MESENTERY, AND OMENTUM, <i>Michael D. Bender</i>	737
111	GASTROINTESTINAL HEMORRHAGE, <i>John P. Cello</i>	742
112	MISCELLANEOUS INFLAMMATORY DISEASES OF THE INTESTINE, <i>Marvin H. Sleisenger</i>	746

PART XI DISEASES OF THE LIVER, GALLBLADDER, AND BILE DUCTS

113	CLINICAL APPROACH TO LIVER DISEASE, <i>Robert K. Ockner</i>	753
114	HEPATIC METABOLISM IN LIVER DISEASE, <i>Richard A. Weisiger</i>	754
115	BILIRUBIN METABOLISM AND HYPERBILIRUBINEMIA, <i>Bruce F. Schar Schmidt</i>	756
116	LABORATORY TESTS IN LIVER DISEASE, <i>Richard A. Weisiger</i>	760
117	ACUTE VIRAL HEPATITIS, <i>Robert K. Ockner</i>	763
118	TOXIC AND DRUG-INDUCED LIVER DISEASE, <i>Nathan M. Bass</i>	771
119	CHRONIC HEPATITIS, <i>Robert K. Ockner</i>	775
120	PARASITIC, BACTERIAL, FUNGAL, AND GRANULOMATOUS LIVER DISEASE, <i>Teresa L. Wright</i>	778
121	INHERITED, INFILTRATIVE, AND METABOLIC DISORDERS INVOLVING THE LIVER, <i>Bruce F. Schar Schmidt</i>	782
122	CIRRHOSIS OF THE LIVER AND ITS MAJOR SEQUELAE, <i>Thomas D. Boyer</i>	786
123	ACUTE AND CHRONIC HEPATIC FAILURE, <i>Bruce F. Schar Schmidt</i>	796
124	LIVER TRANSPLANTATION, <i>John Paul Roberts</i>	799
125	HEPATIC TUMORS, <i>Bruce F. Schar Schmidt</i>	801
126	DISEASES OF THE GALLBLADDER AND BILE DUCTS, <i>Peter F. Malet</i> and <i>Roger D. Soloway</i>	804

PART XII HEMATOLOGIC DISEASES

127	INTRODUCTION TO HEMATOLOGIC DISEASES, <i>David G. Nathan</i>	817
128	AN APPROACH TO THE ANEMIAS, <i>John Lindenbaum</i>	822
129	APLASTIC ANEMIA AND RELATED BONE MARROW FAILURE SYNDROMES, <i>Neal S. Young</i>	831
130	NORMOCHROMIC, NORMOCYTIC ANEMIAS, <i>James P. Kushner</i>	837
131	HYPOCHROMIC ANEMIAS, <i>James P. Kushner</i>	839

132	MEGALOBlastic ANEMIAS, <i>Robert H. Allen</i>	846
133	HEMOLYTIC DISORDERS: INTRODUCTION, <i>Manuel E. Kaplan</i>	855
134	HEREDITARY DEFECTS IN THE MEMBRANE OR METABOLISM OF THE RED CELL, <i>Samuel E. Lux</i>	857
135	ACQUIRED HEMOLYTIC DISORDERS, <i>Manuel E. Kaplan</i>	865
136	HEMOGLOBIN AND HEMOGLOBINOPATHIES	872
136.1	STRUCTURE, FUNCTION, AND SYNTHESIS OF THE HUMAN HEMOGLOBINS, <i>Edward J. Benz, Jr.</i>	872
136.2	CLASSIFICATION AND BASIC PATHOPHYSIOLOGY OF THE HEMOGLOBINOPATHIES, <i>Edward J. Benz, Jr.</i>	877
136.3	HEMOGLOBINOPATHIES WITH ALTERED SOLUBILITY OR OXYGEN AFFINITY, <i>Edward J. Benz, Jr.</i>	879
136.4	THE THALASSEMIA, <i>Arthur W. Nienhuis</i>	883
136.5	SICKLE CELL ANEMIA AND ASSOCIATED HEMOGLOBINOPATHIES, <i>Bernard G. Forget</i>	888
137	BLOOD TRANSFUSION, <i>Jay E. Menitove</i>	893
138	FUNCTION OF NEUTROPHILS AND MONONUCLEAR PHAGOCYTES, <i>Bernard M. Babior</i>	898
139	DISORDERS OF NEUTROPHIL FUNCTION, <i>Bernard M. Babior</i>	904
140	LEUKOPENIA, <i>Grover C. Bagby, Jr.</i>	907
141	LEUKOCYTOSIS AND LEUKEMOID REACTIONS, <i>Grover C. Bagby, Jr.</i> ..	914
142	ERYTHROCYTOSIS AND POLYCYTHEMIA, <i>Paul D. Berk</i>	920
143	MYELOPROLIFERATIVE DISORDERS, <i>Paul D. Berk</i>	929
144	THE CHRONIC LEUKEMIAS, <i>Michael J. Keating</i>	933
145	THE ACUTE LEUKEMIAS, <i>Frederick R. Appelbaum</i>	944
146	INTRODUCTION TO NEOPLASMS OF THE IMMUNE SYSTEM, <i>Carol S. Portlock</i>	949
147	NON-HODGKIN'S LYMPHOMAS, <i>Carol S. Portlock</i>	951
148	HODGKIN'S DISEASE, <i>John H. Glick</i>	955
149	LANGERHANS CELL (EOSINOPHILIC) GRANULOMATOSIS, <i>Jerome E. Groopman</i>	963
150	EOSINOPHILIC SYNDROMES, <i>Peter F. Weller</i>	965
151	PLASMA CELL DISORDERS, <i>Robert A. Kyle</i>	967
152	DISEASES OF THE LYMPH NODES AND SPLEEN, <i>Douglas V. Faller</i> ..	978
153	BONE MARROW TRANSPLANTATION, <i>Rainer Storb</i>	985
154	HEMORRHAGIC DISORDERS: ABNORMALITIES OF PLATELET AND VASCULAR FUNCTION, <i>Marc Shuman</i>	987
155	DISORDERS OF BLOOD COAGULATION, <i>Deane F. Mosher</i>	999

PART XIII ONCOLOGY

156	INTRODUCTION, <i>Bruce A. Chabner</i>	1018
157	ONCOGENES, <i>J. Michael Bishop</i>	1025
158	THE EPIDEMIOLOGY OF CANCER, <i>William J. Blot</i>	1027
159	PARANEOPLASTIC SYNDROMES, <i>Paul A. Bunn, Jr.</i>	1032
160	TUMOR MARKERS, <i>Paul A. Bunn, Jr.</i>	1034
161	ENDOCRINE MANIFESTATIONS OF TUMORS: "ECTOPIC" HORMONE PRODUCTION, <i>Stephen B. Baylin</i>	1037
162	NONMETASTATIC EFFECTS OF CANCER ON THE NERVOUS SYSTEM, <i>Jerome B. Posner</i>	1041
163	CUTANEOUS MANIFESTATIONS OF INTERNAL MALIGNANCY, <i>Frank Parker</i>	1044
164	PRINCIPLES OF CANCER THERAPY, <i>Sydney E. Salmon</i>	1049
165	ONCOLOGIC EMERGENCIES, <i>Stephen M. Hahn and Angelo Russo</i> ..	1067
166	APPROACH TO THE PATIENT WITH METASTATIC CANCER, PRIMARY SITE UNKNOWN, <i>Daniel C. Ihde</i>	1072

PART XIV METABOLIC DISEASES

167	INTRODUCTION, <i>James B. Wyngaarden</i>	1075
Disorders of Carbohydrate Metabolism		
168	GALACTOSEMIA, <i>Stanton Segal</i>	1076
169	THE GLYCOGEN STORAGE DISEASES, <i>Harry L. Greene</i>	1078
170	FRUCTOSE INTOLERANCE, <i>Harry L. Greene</i>	1080
171	PRIMARY HYPEROXALURIA, <i>Lloyd H. Smith, Jr.</i>	1081
Disorders of Lipoprotein Metabolism		
172	THE HYPERLIPOPROTEINEMIAS, <i>John D. Brunzell</i>	1082
173	FABRY'S DISEASE (ALPHA-GALACTOSIDASE A DEFICIENCY), <i>Robert J. Desnick</i>	1090
174	GAUCHER DISEASE, <i>Edwin H. Kolodny</i>	1091
175	NIEMANN-PICK DISEASE, <i>Edwin H. Kolodny</i>	1093

Inborn Errors of Amino Acid Metabolism

176	HYPERAMINOACIDURIA (WITH A CLASSIFICATION OF THE INBORN AND DEVELOPMENTAL ERRORS OF AMINO ACID METABOLISM), <i>Charles R. Scriver</i>	1094
177	THE HYPERPHENYLALANINEMIAS, <i>Charles R. Scriver</i>	1101
178	ALCAPTONURIA, <i>James B. Wyngaarden</i>	1103
179	THE HYPERPROLINEMIAS AND HYDROXYPROLINEMIA, <i>Lloyd H. Smith, Jr.</i>	1104
180	DISEASES OF THE UREA CYCLE, <i>Lloyd H. Smith, Jr.</i>	1104
181	BRANCHED-CHAIN AMINOACIDURIA, <i>Lloyd H. Smith, Jr.</i>	1105
182	HOMOCYSTINURIA, <i>S. Harvey Mudd</i>	1106

Disorders of Purine and Pyrimidine Metabolism

183	GOUT, <i>James B. Wyngaarden</i>	1107
184	OTHER DISORDERS OF PURINE METABOLISM, <i>Edward W. Holmes</i>	1115
185	DISORDERS OF PYRIMIDINE METABOLISM, <i>Lloyd H. Smith, Jr.</i>	1118

Inherited Disorders of Connective Tissue

186	THE MUCOPOLYSACCHARIDOSES, <i>William S. Sly</i>	1118
187	THE MARFAN SYNDROME, <i>Peter H. Byers</i>	1122
188	EHLERS-DANLOS SYNDROME, <i>Peter H. Byers</i>	1123
189	OSTEOGENESIS IMPERFECTA, <i>David W. Rowe</i>	1124
190	PSEUDOXANTHOMA ELASTICUM, <i>Jouni Uitto</i>	1125

Disorders of Porphyrins or Metals

191	THE PORPHYRIAS, <i>Paul E. Anderson</i>	1126
192	WILSON'S DISEASE, <i>Andrew Deiss</i>	1132
193	HEMOCHROMATOSIS (IRON STORAGE DISEASE), <i>Arno G. Motulsky</i>	1133
194	PHOSPHORUS DEFICIENCY AND HYPOPHOSPHATEMIA, <i>Lloyd H. Smith, Jr.</i>	1136
195	DISORDERS OF MAGNESIUM METABOLISM, <i>Lloyd H. Smith, Jr.</i>	1138

Other Hereditary Disorders

196	FAMILIAL MEDITERRANEAN FEVER, <i>Daniel G. Wright</i>	1140
197	THE AMYLOID DISEASES, <i>Joel N. Buxbaum</i>	1141
198	HEREDITARY SYNDROMES INVOLVING MULTIPLE ORGAN SYSTEMS, <i>Arno G. Motulsky</i>	1145

PART XV NUTRITIONAL DISEASES

199	NUTRIENT REQUIREMENTS, <i>Robert M. Russell</i>	1147
200	NUTRITIONAL ASSESSMENT, <i>Robert M. Russell</i>	1151
201	PROTEIN-ENERGY MALNUTRITION, <i>Robert B. Baron</i>	1155
202	THE EATING DISORDERS, <i>Douglas A. Drossman</i>	1158
203	OBESITY, <i>F. Xavier Pi-Sunyer</i>	1162
204	DISORDERS OF VITAMIN METABOLISM: DEFICIENCIES, METABOLIC ABNORMALITIES, AND EXCESSES, <i>Richard S. Riadin</i>	1170
205	DISTURBANCES OF TRACE MINERAL METABOLISM, <i>Clifford Tasman-Jones</i>	1183
206	PRINCIPLES OF NUTRITIONAL SUPPORT: ENTERAL NUTRITIONAL THERAPY, <i>David H. Alpers</i>	1185
207	PARENTERAL NUTRITION, <i>Ray E. Clouse</i>	1189

PART XVI ENDOCRINE AND REPRODUCTIVE DISEASES

208	PRINCIPLES OF ENDOCRINOLOGY, <i>Gordon N. Gill</i>	1194
209	THE ENDORPHIN FAMILY OF OPIOID PEPTIDES: BIOCHEMISTRY, ANATOMY, AND PHYSIOLOGY, <i>Stanley J. Watson</i>	1204
210	PROSTAGLANDINS AND RELATED COMPOUNDS, <i>Garret A. FitzGerald</i>	1206
211	NATRIURETIC HORMONES, <i>Dennis A. Ausiello</i>	1212
212	NEUROENDOCRINE REGULATION AND ITS DISORDERS, <i>Lawrence A. Frohman</i>	1215
213	THE ANTERIOR PITUITARY, <i>Lawrence A. Frohman</i>	1224
214	THE POSTERIOR PITUITARY, <i>Thomas E. Andreoli</i>	1239
215	THE PINEAL GLAND, <i>Alfred J. Lewy</i>	1246
216	THE THYROID, <i>P. Reed Larsen</i>	1248
217	DISORDERS OF THE ADRENAL CORTEX, <i>J. Blake Tyrrell</i> and <i>John D. Baxter</i>	1271
217.1	STRUCTURE AND DEVELOPMENT OF THE ADRENAL CORTEX, <i>John D. Baxter</i>	1271
217.2	SYNTHESIS, CIRCULATION, AND METABOLISM OF ADRENAL STERIODS, <i>John D. Baxter</i>	1272

217.3	REGULATION OF ADRENAL STEROID PRODUCTION, <i>John D. Baxter</i>	1275
217.4	ACTIONS OF ADRENAL STEROIDS, <i>John D. Baxter</i>	1277
217.5	LABORATORY EVALUATION OF ADRENOCORTICAL FUNCTION, <i>J. Blake Tyrrell</i>	1279
217.6	ADRENOCORTICAL HYPOFUNCTION, <i>J. Blake Tyrrell</i>	1281
217.7	CUSHING'S SYNDROME, <i>J. Blake Tyrrell</i>	1284
217.8	MINERALOCORTICOID EXCESS STATES, <i>John D. Baxter</i>	1288
218	DIABETES MELLITUS, <i>Jerrold M. Olefsky</i>	1291
219	HYPOGLYCEMIC DISORDERS, <i>F. John Service</i>	1310
220	PANCREATIC ISLET CELL TUMORS, <i>Carl Grunfeld</i>	1317
221	DISORDERS OF SEXUAL DIFFERENTIATION, <i>Julianne Imperato-McGinley</i>	1320
222	THE TESTIS AND MALE SEXUAL FUNCTION, <i>Alvin M. Matsumoto</i>	1333
223	DISEASES OF THE PROSTATE, <i>Charles B. Brendler</i>	1351
224	THE OVARIES, <i>Robert W. Rebar</i>	1355
225	HIRUTISM, <i>Roger S. Rittmaster</i>	1370
226	NONMALIGNANT DISEASES OF THE BREAST, <i>Douglas J. Marchant</i>	1375
227	BREAST CANCER, <i>Brian J. Lewis</i>	1381
228	POLYGLANDULAR DISORDERS, <i>John N. Loeb</i>	1386
229	THE ADRENAL MEDULLAE, <i>Philip E. Cryer</i>	1390
230	THE CARCINOID SYNDROME, <i>Philip E. Cryer</i>	1394
231	OVARIAN CARCINOMA, <i>Howard W. Jones, III</i>	1395

PART XVII DISEASES OF BONE AND BONE MINERAL METABOLISM

232	MINERAL AND BONE HOMEOSTASIS, <i>Stephen J. Marx</i>	1395
233	VITAMIN D, <i>Daniel D. Bikle</i>	1404
234	OSTEOMALACIA AND RICKETS, <i>Daniel D. Bikle</i>	1406
235	THE PARATHYROID GLANDS, HYPERCALCEMIA, AND HYPOCALCEMIA, <i>Allen M. Spiegel</i>	1412
236	CALCITONIN AND MEDULLARY THYROID CARCINOMA, <i>Leonard J. Defeo</i>	1420
237	RENAL OSTEODYSSTROPHY, <i>Eduardo Slatopolsky</i>	1423
238	OSTEOPOROSIS, <i>B. Lawrence Riggs</i>	1426
239	PAGET'S DISEASE OF BONE (OSTEITIS DEFORMANS), <i>Frederick R. Singer</i>	1431
240	OSTEONECROSIS, OSTEOSCLEROSIS, AND OTHER DISORDERS OF BONE, <i>Gordon J. Stewler</i>	1433
241	BONE TUMORS, <i>Henry J. Mankin</i>	1436

PART XVIII DISEASES OF THE IMMUNE SYSTEM

242	INTRODUCTION, <i>J. Claude Bennett</i>	1438
243	COMPLEMENT, <i>John E. Volanakis</i>	1443
244	PRIMARY IMMUNODEFICIENCY DISEASES, <i>Rebecca H. Buckley</i>	1446
245	URTICARIA AND ANGIOEDEMA, <i>Michael M. Frank</i>	1453
246	ALLERGIC RHINITIS, <i>John E. Salvaggio</i>	1457
247	ANAPHYLAXIS, <i>Allen P. Kaplan</i>	1462
248	INSECT STING ALLERGY, <i>Lawrence M. Lichtenstein</i>	1465
249	IMMUNE COMPLEX DISEASES, <i>Robert R. Rich</i>	1467
250	THE MAJOR HISTOCOMPATIBILITY COMPLEX AND DISEASE SUSCEPTIBILITY, <i>Benjamin D. Schwartz</i>	1470
251	DRUG ALLERGY, <i>Charles E. Reed</i>	1479
252	MASTOCYTOSIS, <i>Dean D. Metcalfe</i>	1483
253	DISEASES OF THE THYMUS, <i>Daniel P. Stites</i>	1485

PART XIX MUSCULOSKELETAL AND CONNECTIVE TISSUE DISEASES

254	APPROACH TO THE PATIENT WITH MUSCULOSKELETAL DISEASE, <i>James F. Fries</i>	1488
255	CONNECTIVE TISSUE STRUCTURE AND FUNCTION, <i>Steffen Gay</i> and <i>Renate E. Gay</i>	1491
256	TISSUE INJURY IN RHEUMATIC DISEASES, <i>Gerald Weissmann</i>	1496
257	SPECIALIZED PROCEDURES IN THE MANAGEMENT OF PATIENTS WITH RHEUMATIC DISEASES, <i>William J. Arnold</i> and <i>Robert W. Ilke</i>	1503
258	RHEUMATOID ARTHRITIS, <i>Frank C. Arnett</i>	1508
259	THE SPONDYLOARTHRITIDES, <i>Andrei Calin</i>	1515

CONTENTS

260	INFECTIOUS ARTHRITIS, <i>Stephen E. Malawista</i>	1520
261	SYSTEMIC LUPUS ERYTHEMATOSUS, <i>Alfred D. Steinberg</i>	1522
262	SYSTEMIC SCLEROSIS (SCLERODERMA), <i>E. Carwile LeRoy</i>	1530
263	SJÖGREN'S SYNDROME, <i>Norman Talal</i>	1535
264	THE VASCULITIC SYNDROMES, <i>Sheldon M. Wolff</i>	1537
265	POLYARTERITIS NODOSA GROUP, <i>Sheldon M. Wolff</i>	1539
266	WEGENER'S GRANULOMATOSIS AND MIDLINE GRANULOMA, <i>Barton F. Haynes</i>	1541
267	POLYMYALGIA RHEUMATICA AND GIANT CELL ARTERITIS, <i>Gene Hunder</i>	1544
268	POLYMYOSITIS, <i>Robert L. Wortmann</i>	1546
269	BEHÇET'S DISEASE, <i>Eugene V. Ball</i>	1550
270	PNICULITIS AND DISORDERS OF THE SUBCUTANEOUS FAT, <i>Gerald S. Lazarus</i>	1550
271	CRYSTAL DEPOSITION ARTHROPATHIES, <i>H. Ralph Schumacher, Jr.</i>	1552
272	RELAPSING POLYCHONDRITIS, <i>H. Ralph Schumacher, Jr.</i>	1554
273	OSTEOARTHRITIS (DEGENERATIVE JOINT DISEASE), <i>David S. Howell</i>	1554
274	THE PAINFUL SHOULDER, <i>David S. Howell</i>	1557
275	THE PAINFUL BACK, <i>David S. Howell</i>	1558
276	SYSTEMIC DISEASES IN WHICH ARTHRITIS IS A FEATURE, <i>Eugene V. Ball</i>	1560
277	MISCELLANEOUS FORMS OF ARTHRITIS, <i>Eugene V. Ball</i>	1561
278	NONARTICULAR RHEUMATISM, <i>Eugene V. Ball</i>	1562
279	ARTICULAR TUMORS, <i>Eugene V. Ball</i>	1563
280	ERYTHROMELALGIA, <i>Eugene V. Ball</i>	1563
281	MULTIFOCAL FIBROSCLEROSIS, <i>H. Ralph Schumacher, Jr.</i> ,	1564

PART XX INFECTIOUS DISEASES

Section One Introduction

282	INTRODUCTION TO MICROBIAL DISEASE, <i>Gerald L. Mandell</i>	1566
283	INTRODUCTION TO BACTERIAL DISEASE, <i>Gerald L. Mandell</i>	1567
284	THE FEBRILE PATIENT, <i>David C. Dale</i>	1567
285	THE PATHOGENESIS OF FEVER, <i>Bruce Beutler</i> and <i>Steven M. Beutler</i>	1568
286	THE ACUTE PHASE RESPONSE, <i>Charles A. Dinarello</i>	1571
287	THE COMPROMISED HOST, <i>Philip A. Pizzo</i>	1573
288	SHOCK SYNDROMES RELATED TO SEPSIS, <i>John N. Sheagren</i>	1584
289	PREVENTION AND CONTROL OF HOSPITAL-ACQUIRED INFECTIONS, <i>William Schaffner</i>	1589
290	ADVICE TO TRAVELERS, <i>Bruce M. Greene</i>	1594
291	ANTIMICROBIAL THERAPY, <i>Lowell S. Young</i>	1596

Section Two Bacterial Diseases

292	PNEUMOCOCCAL PNEUMONIA, <i>Richard J. Duma</i>	1608
293	MYCOPLASMA INFECTIONS, <i>Stephen G. Baum</i>	1615
294	PNEUMONIA CAUSED BY AEROBIC GRAM-NEGATIVE BACILLI, <i>Waldemar G. Johanson, Jr.</i>	1619
295	RECURRENT ASPIRATION PNEUMONIA, <i>Waldemar G. Johanson, Jr.</i>	1621
296	LEGIONELLOSIS, <i>Paul H. Edelstein</i>	1623

Streptococcal Diseases

297	STREPTOCOCCAL DISEASES, <i>Richard M. Krause</i>	1625
298	RHEUMATIC FEVER, <i>Alan L. Bisno</i>	1632

Endocarditis

299	INFECTIVE ENDOCARDITIS, <i>David T. Durack</i>	1638
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Staphylococcal Infections

300	STAPHYLOCOCCAL INFECTIONS, <i>John N. Sheagren</i>	1648
-----	--	------

Bacterial Meningitis, *Morton N. Swartz*

301	BACTERIAL MENINGITIS	1655
302	MENINGOCOCCAL DISEASE	1661
303	INFECTIONS CAUSED BY <i>HAEMOPHILUS</i> SPECIES	1667

Osteomyelitis

304	OSTEOMYELITIS, <i>Francis A. Waldvogel</i>	1672
-----	--	------

Whooping Cough

305	WHOOPING COUGH (PERTUSSIS), <i>Richard B. Johnston, Jr.</i>	1674
-----	---	------

Diphtheria

305	DIPHTHERIA, <i>Erik L. Hewlett</i>	1676
-----	--	------

Clostridial Diseases, *John G. Bartlett*

307	CLOSTRIDIAL MYONECROSIS AND OTHER CLOSTRIDIAL DISEASES	1678
308	PSEUDOMEMBRANOUS COLITIS	1681

309	BOTULISM	1682
310	TETANUS	1683

Anaerobic Bacteria

311	DISEASES CAUSED BY NON-SPORE-FORMING ANAEROBIC BACTERIA, <i>Sherwood L. Gorbach</i>	1685
-----	--	------

Enteric Infections

312	INTRODUCTION, <i>Bruce M. Greene</i>	1689
313	TYPHOID FEVER, <i>Thomas Butler</i>	1690
314	SALMONELLA INFECTIONS OTHER THAN TYPHOID FEVER, <i>Donald Kaye</i>	1691
315	SHIGELLOSIS, <i>Thomas Butler</i>	1694
316	CAMPYLOBACTER ENTERITIS, <i>Richard L. Guerrant</i>	1696
317	CHOLERA, <i>William B. Greenough, III</i>	1699
318	ENTERIC <i>ESCHERICHIA COLI</i> INFECTIONS, <i>Richard L. Guerrant</i>	1701
319	THE DIARRHEA OF TRAVELERS, <i>R. Bradley Sack</i>	1705

Other Bacterial Infections

320	EXTRAINTestinal INFECTIONS CAUSED BY ENTERIC BACTERIA, <i>Elizabeth J. Ziegler</i>	1706
321	YERSINIA INFECTIONS, <i>Thomas Butler</i>	1709
322	TULAREMIA, <i>Richard B. Hornick</i>	1712
323	ANTHRAX, <i>Jonas A. Shulman</i>	1714
324	DISEASES CAUSED BY PSEUDOMONADS, <i>Stephen C. Schimpff</i>	1717
325	LISTERIOSIS, <i>Alan M. Stamm</i>	1721
326	ERYSIPLOID, <i>W. Edmund Farrar</i>	1723
327	ACTINOMYCOSIS, <i>Ward E. Bullock</i>	1723
328	NOCARDIOSIS, <i>Ward E. Bullock</i>	1725
329	BRUCELLA, <i>Robert A. Salata</i>	1727
330	CAT SCRATCH DISEASE, <i>Andrew M. Margileth</i>	1729
331	BARTONELLOSIS, <i>C. Glenn Cobbs</i>	1732

Diseases Due to *Mycobacteria*

332	TUBERCULOSIS, <i>Emanuel Wolinsky</i>	1733
333	OTHER MYCOBACTERIOSES, <i>Emanuel Wolinsky</i>	1742
334	LEPROSY-HANSEN'S DISEASE, <i>Zanvil A. Cohn and Gilla Kaplan</i> ..	1745

Sexually Transmitted Diseases, *P. Frederick Sparling*

335	INTRODUCTION AND COMMON SYNDROMES	1751
336	GONOCOCCAL INFECTIONS	1755
337	LYMPHOGRANULOMA VENEREUM	1759
338	GRANULOMA INGUINALE (DONOVANOSIS)	1760
339	CHANCROID	1760
340	SYPHILIS	1761

Spirochetal Diseases Other Than Syphilis

341	NONSYPHILITIC TREPONEMATOSES, <i>Thomas Butler</i>	1770
342	RELAPSING FEVER, <i>Thomas Butler</i>	1771
343	LYME DISEASE, <i>Stephen E. Malawista</i>	1772
344	LEPTOSPIROSIS, <i>J. Bruce McClain</i>	1777

Diseases Caused by *Chlamydiae*, *Walter E. Stamm*

345	INTRODUCTION	1779
346	TRACHOMA	1780
347	NEONATAL CHLAMYDIAL INFECTIONS	1781
348	INFECTIONS DUE TO <i>CHLAMYDIA PSITTACI</i> AND <i>CHLAMYDIA PNEUMONIAE</i>	1782

Rickettsial Diseases, *Richard B. Hornick*

349	INTRODUCTION	1783
350	THE TYPHUS GROUP	1785
351	ROCKY MOUNTAIN SPOTTED FEVER	1788
352	OTHER TICK-BORNE RICKETTSIOSES	1791
353	RICKETTSIALPOX	1792
354	SCRUB TYPHUS	1793
355	TRENCH FEVER	1794
356	Q FEVER	1794

Zoonoses

357	ZOONOSES, <i>J. Bruce McClain</i>	1796
-----	---	------

Section Three Viral Diseases

358	INTRODUCTION TO VIRAL DISEASES, <i>R. Gordon Douglas, Jr.</i>	1798
359	ANTIVIRAL THERAPY, <i>Mark Middlebrooks</i> and <i>Richard J. Whitley</i>	1801

Viral Infections of the Respiratory Tract

360	THE COMMON COLD, <i>Albert Z. Kapikian</i>	1806
361	VIRAL PHARYNGITIS, LARYNGITIS, CROUP, AND BRONCHITIS, <i>Maurice A. Mufson</i>	1810
362	RESPIRATORY SYNCYTIAL VIRUS, <i>Robert M. Chanock</i>	1812
363	PARAINFLUENZA VIRAL DISEASES, <i>Robert M. Chanock</i>	1813
364	INFLUENZA, <i>R. Gordon Douglas, Jr.</i>	1815

365	ADENOVIRUS DISEASES, <i>Stephen G. Baum</i>	1819
366	VIRAL GASTROENTERITIS, <i>Albert Z. Kapikian</i>	1821
367	MEASLES (MORBILLI, RUBELLA), <i>Philip A. Brunell</i>	1825
368	RUBELLA (GERMAN MEASLES), <i>Philip A. Brunell</i>	1827
369	FOOT-AND-MOUTH DISEASE, <i>John W. Gnann, Jr.</i>	1829
370	MUMPS, <i>John W. Gnann, Jr.</i>	1829
371	HERPES SIMPLEX VIRUS INFECTIONS, <i>Mark Middlebrooks</i> and <i>Richard J. Whitley</i>	1831
372	CYTOMEGALOVIRUS INFECTION, <i>David J. Lang</i>	1835
373	INFECTIOUS MONONUCLEOSIS (EPSTEIN-BARR VIRUS INFECTION), <i>Elliott D. Kieff</i>	1838
374	VARICELLA, <i>Philip A. Brunell</i>	1840
375	VARIOLA AND VACCINIA, <i>Donald A. Henderson</i>	1842
376	RETROVIRUSES THAT CAUSE HUMAN DISEASE, <i>William A. Blattner</i> ..	1845
377	ENTEROVIRAL DISEASES, <i>Michael N. Oxman</i>	1851
378	EPIDEMIC PLEURODYNIA (BORNHOLM DISEASE), <i>Michael N. Oxman</i> ..	1856
379	MYOCARDITIS AND PERICARDITIS CAUSED BY ENTEROVIRUSES, <i>Michael N. Oxman</i>	1857
380	MUCOCUTANEOUS SYNDROMES CAUSED BY ENTEROVIRUSES, <i>Michael N. Oxman</i>	1861
381	ACUTE HEMORRHAGIC CONJUNCTIVITIS, <i>Michael N. Oxman</i>	1863
Arthropod-Borne Viral Diseases		
382	INTRODUCTION, <i>Robert E. Shope</i>	1866
383	DENGUE, <i>Jay P. Sanford</i>	1867
384	WEST NILE FEVER, <i>Jay P. Sanford</i>	1868
385	PHLEBOTOMUS FEVER, <i>Jay P. Sanford</i>	1868
386	RIFT VALLEY FEVER, <i>Jay P. Sanford</i>	1869
387	ALPHAVIRUSES ASSOCIATED WITH POLYARTHRITIS, <i>Jay P. Sanford</i> ..	1869
388	COLORADO TICK FEVER, <i>Theodore C. Eickhoff</i>	1871
389	ARTHROPOD-BORNE VIRAL ENCEPHALITIDES, <i>R. Gordon Douglas, Jr.</i>	1872
Viral Hemorrhagic Fevers, <i>Robert E. Shope</i>		
390	INTRODUCTION	1879
391	YELLOW FEVER	1879
392	HEMORRHAGIC FEVER CAUSED BY DENGUE VIRUSES	1881
393	TICK-BORNE FLAVIVIRUS DISEASES: KYASANUR FOREST DISEASE AND OMSK HEMORRHAGIC FEVER	1882
394	CRIMEAN-CONGO HEMORRHAGIC FEVER	1883
395	HEMORRHAGIC DISEASES CAUSED BY ARENAVIRUSES (ARGENTINE AND BOLIVIAN HEMORRHAGIC FEVERS AND LASSA FEVER)	1883
396	AFRICAN HEMORRHAGIC FEVER (MARBURG-EBOLA DISEASE)	1884
397	HEMORRHAGIC FEVER WITH RENAL SYNDROME	1885
Section Four The Mycoses		
398	INTRODUCTION, <i>William E. Dismukes</i>	1886
399	HISTOPLASMOSIS, <i>William E. Dismukes</i>	1887
400	COCCIDIOIDOMYCOSIS, <i>John N. Galgiani</i>	1890
401	BLASTOMYCOSIS, <i>William E. Dismukes</i>	1892
402	PARACOCIDIOIDOMYCOSIS, <i>William E. Dismukes</i>	1893
403	CRYPTOCOCOSIS, <i>William E. Dismukes</i>	1894
404	SPOROTRICHOSIS, <i>William E. Dismukes</i>	1897
405	CANDIDIASIS, <i>William E. Dismukes</i>	1898
406	ASPERGILLOSIS, <i>David A. Stevens</i>	1901
407	ZYGOMYCOSIS (MUCORMYCOSIS), <i>Sandy F. S. Chun</i> and <i>David A. Stevens</i>	1903
408	MYCETOMA, <i>Michael S. Saag</i>	1905
409	DEMATIACEOUS FUNGAL INFECTIONS, <i>Michael S. Saag</i>	1906

PART XXI HIV AND ASSOCIATED DISORDERS

	INTRODUCTION, <i>Michael S. Saag</i>	1908
410	IMMUNOLOGY RELATED TO AIDS, <i>Bruce D. Walker</i>	1908
411	BIOLOGY OF HUMAN IMMUNODEFICIENCY VIRUSES, <i>George M. Shaw</i> ..	1913
412	EPIDEMIOLOGY OF HIV INFECTION AND AIDS, <i>James W. Curran</i>	1918
413	PREVENTION OF HIV INFECTION, <i>Michael S. Saag</i>	1925
414	NEUROLOGIC COMPLICATIONS OF HIV-1 INFECTION, <i>Richard W. Price</i>	1928
415	PULMONARY MANIFESTATIONS OF AIDS: SPECIAL EMPHASIS ON PNEUMOCYSTOSIS, <i>Fred R. Sattler</i>	1932
416	GASTROINTESTINAL MANIFESTATIONS OF AIDS, <i>John G. Bartlett</i>	1942
417	CUTANEOUS SIGNS OF AIDS, <i>Neal S. Penneys</i>	1945
418	OPHTHALMOLOGIC MANIFESTATIONS OF AIDS, <i>Mark A. Jacobson</i>	1945
419	HEMATOLOGY/ONCOLOGY IN AIDS, <i>Jerome E. Groopman</i> and <i>David T. Scadden</i>	1947

420	RENAL, CARDIAC, ENDOCRINE, AND RHEUMATOLOGIC MANIFESTATIONS OF HIV INFECTION, <i>Michael S. Saag</i>	1952
421	TREATMENT OF AIDS AND RELATED DISORDERS, <i>Robert Yarchoan</i> and <i>Samuel Broder</i>	1957
422	CHRONIC MANAGEMENT AND COUNSELING FOR PERSONS WITH HIV INFECTION, <i>John A. Bartlett</i>	1965

PART XXII DISEASES CAUSED BY PROTOZOA AND METAZOA

423	INTRODUCTION TO PROTOZOAN AND HELMINTHIC DISEASES, <i>Adel A. F. Mahmoud</i>	1971
424	MALARIA, <i>Donald J. Krogstad</i>	1972
425	AFRICAN TRYPANOSOMIASIS (SLEEPING SICKNESS), <i>Thomas C. Quinn</i>	1975
426	AMERICAN TRYPANOSOMIASIS (CHAGAS' DISEASE), <i>Franklin A. Noya</i>	1978
427	LEISHMANIASIS, <i>Franklin A. Noya</i>	1982
428	TOXOPLASMOSIS, <i>Henry Masur</i>	1987
429	CRYPTOSPORIDIOSIS, <i>Rosemary Soave</i>	1991
430	GIARDIASIS, <i>David P. Stevens</i>	1993
431	AMEBIASIS, <i>Jonathan I. Ravdin</i>	1994
432	OTHER PROTOZOAN DISEASES, <i>David P. Stevens</i>	1996
433	CESTODE INFECTIONS, <i>Charles H. King</i>	1997
434	SCHISTOSOMIASIS (BILHARZIASIS), <i>Adel A. F. Mahmoud</i>	2001
435	HERMAPHRODITIC FLUKES, <i>S. K. K. Seah</i>	2006
436	NEMATODE INFECTIONS, <i>James W. Kazura</i>	2009
437	FILARIASIS	2015
437.1	INTRODUCTION, <i>Eric A. Ottesen</i>	2015
437.2	LYMPHATIC FILARIASIS, <i>Eric A. Ottesen</i>	2015
437.3	TROPICAL EOSINOPHILIA, <i>Eric A. Ottesen</i>	2017
437.4	ONCHOCERCIASIS (RIVER BLINDNESS), <i>Bruce M. Greene</i>	2018
437.5	LOIASIS, <i>Eric A. Ottesen</i>	2019
437.6	DRACUNCULIASIS, <i>Donald R. Hopkins</i>	2020
437.7	OTHER FILARIAL INFECTIONS, <i>Eric A. Ottesen</i>	2020
438	ARTHROPODS AND LEECHES, <i>William L. Krinsky</i>	2021
439	SNAKE BITES, <i>Jay P. Sanford</i>	2028
440	VENOMOUS AND POISONOUS MARINE ANIMALS, <i>John Williamson</i>	2030

PART XXIII NEUROLOGY

Section One Principles of Clinical Neurologic Diagnosis

441	CLINICAL STUDY OF THE PATIENT	2033
441.1	APPROACH TO THE PATIENT, <i>Fred Plum and</i> <i>Jerome B. Posner</i>	2033
441.2	CLINICAL DIAGNOSIS, <i>Fred Plum and Jerome B. Posner</i> ..	2033
441.3	THE NEUROLOGIC HISTORY, <i>Jerome B. Posner</i>	2034
441.4	THE NEUROLOGIC EXAMINATION, <i>Fred Plum</i>	2035
441.5	NEUROLOGIC DIAGNOSTIC PROCEDURES, <i>Jonathan D. Victor</i>	2035
441.6	RADIOLOGIC IMAGING TECHNIQUES, <i>Michael Deck</i>	2038
442	NEUROLOGIC PROBLEMS ASSOCIATED WITH AGING, <i>Fred Plum</i>	2047

Section Two Disorders of Cerebral Function

443	DISTURBANCES OF CONSCIOUSNESS AND AROUSAL, <i>Fred Plum</i>	2048
444	SUSTAINED IMPAIRMENTS OF CONSCIOUSNESS, <i>Fred Plum</i>	2049
445	BRAIN DEATH, <i>Fred Plum</i>	2059
446	BRIEF LOSS OF CONSCIOUSNESS, <i>Fred Plum</i>	2060
447	SLEEP AND ITS DISORDERS, <i>Anthony Kales</i>	2063
448	DIAGNOSIS OF REGIONAL CEREBRAL DYSFUNCTION, <i>Antonio R. Damasio</i>	2067
449	DISTURBANCES OF MEMORY AND LANGUAGE, <i>Antonio R. Damasio</i> ..	2071
450	ALZHEIMER'S DISEASE AND RELATED DEMENTIAS, <i>Antonio R. Damasio</i>	2075
451	PSYCHIATRIC DISORDERS IN MEDICAL PRACTICE, <i>Gary J. Tucker</i>	2079

Section Three Pathophysiology and Management of Major Neurologic Symptoms

452	AUTONOMIC DISORDERS AND THEIR MANAGEMENT, <i>Clifford B. Saper</i>	2091
453	THE SPECIAL SENSES, <i>Robert W. Baloh</i>	2098
454	DISORDERS OF MOTOR FUNCTION	2112
454.1	ASTHENIA, WEAKNESS, AND FATIGUE, <i>Fred Plum</i>	2112
454.2	ATAXIA AND RELATED GAIT DISORDERS, <i>Fred Plum</i>	2113
454.3	EPISODIC LOSS OF MOTOR FUNCTION, <i>Jerome B. Posner</i>	2115

CONTENTS

455	DISORDERS OF SENSATION, <i>Jerome B. Posner</i>	2116
Section Four Alcohol and Nutritional Complications		
456	NUTRITIONAL DISORDERS OF THE NERVOUS SYSTEM, <i>Ivan Diamond</i>	2125
Section Five The Extrapyramidal Disorders, <i>Joseph Jankovic</i>		
457	INTRODUCTION	2128
458	PARKINSONISM	2130
459	TREMORS	2133
460	DYSTONIAS	2134
461	CHOREAS, ATHETOSIS, AND BALLISM	2135
462	TICS, MYOCLONUS, AND STEREOTYPES	2136
Section Six Degenerative Diseases of the Nervous System, <i>Robert B. Layzer</i>		
463	HEREDITARY CEREBELLAR ATAXIAS AND RELATED DISORDERS	2138
464	HEREDITARY SPASTIC PARAPLEGIAS	2139
465	HEREDITARY AND ACQUIRED INTRINSIC MOTOR NEURON DISEASES	2140
466	SYRINGOMYELIA	2142
467	THE PHAKOMATOSES	2143
Section Seven Cerebrovascular Diseases, <i>William A. Pulsinelli and David E. Levy</i>		
468	CEREBROVASCULAR DISEASES—PRINCIPLES	2145
469	ISCHEMIC CEREBROVASCULAR DISEASES	2152
470	HEMORRHAGIC CEREBROVASCULAR DISEASES	2162
Section Eight Infections and Inflammatory Disorders of the Nervous System, <i>Roger P. Simon</i>		
471	PARAMENINGEAL INFECTIONS	2170
472	NEUROSYPHILIS	2175
Section Nine Viral Infections of the Nervous System		
473	INTRODUCTION, <i>Richard W. Price</i>	2177
474	ACUTE VIRAL MENINGITIS AND ENCEPHALITIS, <i>Richard W. Price</i>	2178
475	POLIOMYELITIS, <i>Richard W. Price</i>	2181
476	HERPESVIRUS INFECTIONS OF THE NERVOUS SYSTEM, <i>Richard W. Price</i>	2182
477	RABIES, <i>Richard W. Price</i>	2186
478	SLOW VIRUS INFECTIONS OF THE NERVOUS SYSTEM	2187
478.1	INTRODUCTION, <i>Richard W. Price</i>	2187
478.2	HUMAN IMMUNODEFICIENCY VIRUS INFECTION AND THE AIDS DEMENTIA COMPLEX, <i>Richard W. Price</i>	2188
478.3	HUMAN T CELL LYMPHOTROPIC VIRUS TYPE I-ASSOCIATED MYELOPATHY AND TROPICAL SPASTIC PARAPARESIS, <i>Richard W. Price</i>	2189
478.4	SUBACUTE SCLEROSING PANENCEPHALITIS AND PROGRESSIVE RUBELLA PANENCEPHALITIS, <i>Richard W. Price</i>	2190
478.5	PROGRESSIVE MULTIFOCAL LEUKOENCEPHALOPATHY, <i>Richard W. Price</i>	2191
478.6	CREUTZFELDT-JAKOB DISEASE, <i>Paul E. Bendheim</i>	2191
Section Ten Neurologic Disorders Associated with Altered Immunity or Unexplained Host-Parasite Alterations, <i>Jerry S. Wolinsky</i>		
479	CENTRAL NERVOUS SYSTEM COMPLICATIONS OF VIRAL INFECTIONS AND VACCINES	2193
480	REYE SYNDROME	2194
481	NEUROLOGIC COMPLICATIONS IN THE IMMUNOLOGICALLY COMPROMISED HOST	2195
Section Eleven The Demyelinating Diseases		
482	THE DEMYELINATING DISEASES, <i>Donald H. Silberberg</i>	2196
Section Twelve The Epilepsies		
483	THE EPILEPSIES, <i>Jerome Engel, Jr.</i>	2202
Section Thirteen Intracranial Tumors and States of Altered Intracranial Pressure		
484	INTRACRANIAL TUMORS: GENERAL CONSIDERATIONS, <i>Nicholas A. Vick</i>	2213
485	SPECIFIC TYPES OF BRAIN TUMORS AND THEIR MANAGEMENT, <i>Nicholas A. Vick</i>	2218
486	DISORDERS OF INTRACRANIAL PRESSURE, <i>Nicholas A. Vick and David A. Rottenberg</i>	2221
Section Fourteen Injury to the Head and Spinal Cord, <i>Lawrence F. Marshall</i>		
487	HEAD INJURY	2224
488	SPINAL CORD INJURY	2228

Section Fifteen Mechanical Lesions of the Spine and Related Structures, *Jerome B. Posner*

489	ANATOMY, PHYSIOLOGY, AND DIFFERENTIAL DIAGNOSIS	2230
490	INTERVERTEBRAL DISC DISEASE	2235
491	NEOPLASMS OF THE SPINAL CANAL	2236
492	INFLAMMATORY DISEASES COMPRESSING THE SPINAL CANAL	2238
493	VASCULAR DISORDERS COMPRESSING THE SPINAL CANAL	2239
494	CONGENITAL ANOMALIES OF THE CRANIOVERTEBRAL JUNCTION, SPINE, AND SPINAL CORD	2239

Section Sixteen Diseases of the Peripheral Nervous System, *Herbert H. Schaumburg*

495	INTRODUCTION AND BASIC TERMINOLOGY	2240
496	ANATOMIC CLASSIFICATION OF NEUROPATHY	2241
497	ACUTE AND CHRONIC INFLAMMATORY DEMYELINATING POLYRADICULONEUROPATHIES (AIDP AND CIDP)	2242
498	DIABETIC AND OTHER ENDOCRINE NEUROPATHIES	2244
499	HEREDITARY NEUROPATHIES	2245
500	TOXIC NEUROPATHIES	2246
501	MISCELLANEOUS DISEASE-SPECIFIC NEUROPATHIES	2247
502	ACUTE PHYSICAL INJURY AND CHRONIC COMPRESSION-ENTRAPMENT NEUROPATHIES	2248

Section Seventeen Diseases of Muscle (Myopathies) and Neuromuscular Junction, *Andrew G. Engel*

503	GENERAL APPROACH TO MUSCLE DISEASES	2250
504	MUSCULAR DYSTROPHIES	2253
505	MORPHOLOGICALLY DISTINCT CONGENITAL MYOPATHIES	2256
506	INFLAMMATORY MYOPATHIES	2256
507	METABOLIC MYOPATHIES	2258
508	MISCELLANEOUS MYOPATHIES	2264
509	DISORDERS OF NEUROMUSCULAR TRANSMISSION	2265

PART XXIV EYE DISEASES, *John W. Gittinger, Jr.*

510	VISUAL LOSS	2269
511	CATARACT	2270
512	GLAUCOMA	2270
513	DISC SWELLING AND OPTIC ATROPHY	2272
514	UVEITIS	2273
515	OCULAR INFECTIONS	2274
516	ORBITAL DISEASE AND TUMORS	2275
517	INTRACULAR TUMORS	2275
518	EPISCLERITIS, SCLERITIS, AND THE DRY EYE	2276
519	OCULAR VASCULAR DISEASE	2276
520	THE EYE AND MEDICATIONS	2278

PART XXV SKIN DISEASES, *Frank Parker*

521	INTRODUCTION	2280
522	THE STRUCTURE AND FUNCTION OF SKIN	2280
523	EXAMINATION OF THE SKIN AND AN APPROACH TO DIAGNOSING SKIN DISEASES	2286
524	PRINCIPLES OF THERAPY	2292
525	SKIN DISEASES OF GENERAL IMPORTANCE	2296

PART XXVI OCCUPATIONAL AND ENVIRONMENTAL MEDICINE

526	PRINCIPLES OF OCCUPATIONAL MEDICINE, <i>Charles E. Becker</i>	2331
527	OCCUPATIONAL PULMONARY DISORDERS, <i>Dean Sheppard</i>	2333
528	PHYSICAL, CHEMICAL, AND ASPIRATION INJURIES OF THE LUNG, <i>Claude A. Piantadosi</i>	2341
529	OCCUPATIONAL DISEASES OF THE SKIN, <i>Edward A. Enmatt</i>	2349
530	RADIATION INJURY, <i>Theodore L. Phillips</i>	2351
531	ELECTRICAL INJURY, <i>Cleon W. Goodwin</i>	2356
532	DISORDERS DUE TO HEAT AND COLD, <i>James P. Knochel</i>	2358
533	TRACE METAL POISONING, <i>Donald B. Louria</i>	2361

PART XXVII LABORATORY REFERENCE INTERVAL VALUES OF CLINICAL IMPORTANCE

534	REFERENCE INTERVALS AND LABORATORY VALUES OF CLINICAL IMPORTANCE, <i>Ronald J. Elin</i>	2370
INDEX		i

TABLE 199-2. ESTIMATED SAFE AND ADEQUATE DAILY DIETARY INTAKES OF SELECTED VITAMINS AND MINERALS*

Category	Age (years)	Vitamins		Trace Elements ^b				
		Biotin (μg)	Pantothenic Acid (mg)	Copper (mg)	Manganese (mg)	Fluoride (mg)	Chromium (μg)	Molybdenum (μg)
Infants	0-0.5	10	2	0.4-0.6	0.3-0.6	0.1-0.5	10-40	15-30
	0.5-1	15	3	0.6-0.7	0.6-1.0	0.2-1.0	20-60	20-40
Children and adolescents	1-3	20	3	0.7-1.0	1.0-1.5	0.5-1.5	20-80	25-50
	4-6	25	3-4	1.0-1.5	1.5-2.0	1.0-2.5	30-120	30-75
	7-10	30	4-5	1.0-2.0	2.0-3.0	1.5-2.5	50-200	50-150
	11+	30-100	4-7	1.5-2.5	2.0-5.0	1.5-2.5	50-200	75-250
Adults		30-100	4-7	1.5-3.0	2.0-5.0	1.5-4.0	50-200	75-250

*Because there is less information on which to base allowances, these figures are not given in Table 199-1 and are provided here in the form of ranges of recommended intakes.

^bSince the toxic levels for many trace elements may be only several times usual intakes, the upper levels for the trace elements given in this table should not be habitually exceeded.

ENERGY

Energy needs vary with body size, growth phase, age, sex, and activity. Factors that increase energy requirements are cold exposure, pregnancy, lactation, infection, fever, hyperthyroidism, and trauma. Recommended energy allowances for all ages are presented in Table 199-4. A normal variation of ± 20 per cent is accepted for younger adults, the ranges being wider for children. In pregnancy, energy allowances should be increased 300 Kcal per day for the second and third trimesters of pregnancy. Lactation increases energy requirements by 500 Kcal per day. The energy allowances for children from birth through age 10 are World Health Organization figures. The allowances for adults are based on median weights and heights from the second U.S. Health and Nutrition Examination Survey (NHANES II) for moderate work (e.g., walking, shopping, playing golf). In addition to the age groups 19 to 24 and 25 to 50 years, energy recommendations for older people are provided for those over age 50. The aging process normally results in a progressive decrease in energy needs, primarily as a result of a decrease in energy expenditure.

Protein and carbohydrate supply approximately 4 Kcal per gram, alcohol 7 Kcal per gram, and fat 9 Kcal per gram. Resting energy expenditure (REE) is the amount of oxygen consumed under resting conditions extrapolated to 24 hours. A simple rule of thumb to estimate REE is 25 Kcal per kilogram body weight. However, this formula is not useful in overweight people. Since adipose tissue is relatively inert from a metabolic point of view, the relationship between REE and body weight becomes nonlinear in overweightness. A more accurate estimate of REE for healthy individuals is the Harris-Benedict equation:

$$\text{Men: REE} = 66 + (13.7 \text{ weight in kg}) + (5 \times \text{height in cm}) - 6.8 (\text{age in years})$$

$$\text{Women: REE} = 665 + (9.6 \times \text{weight in kg}) + (1.7 \times \text{height in cm}) - 4.7 (\text{age in years})$$

Depending on factors such as activity level and illness, energy needs may be increased many times over the basal level. Ingestion and metabolism of food increase the caloric requirement by about 7 per cent of the REE, provided that a mixed diet is being consumed. Activity increases energy requirements over a wide range (1.1 to 10.3 Kcal per kilogram per hour) depending on the

intensity and type of work being done. The number of daily calories that should be provided in addition to the REE are 400 to 800 Kcal for sedentary activity, 800 to 1200 Kcal for light activity (e.g., sewing, desk work), and 1200 to 1800 Kcal for moderate work (e.g., walking). The number of kilocalories to be added for heavy work (e.g., running, swimming) ranges from 1800 to 4500 Kcal per day. Although fasting and malnutrition reduce energy expenditure, the stress of illness increases caloric requirements. For each 1°C of fever, a 13 per cent increase in calories is required. In catabolic patients, an additional 50 to 100 per cent of the REE may be necessary to prevent further tissue breakdown.

PROTEIN

A constant supply of protein (i.e., amino acids) is needed to maintain body function and structure. On a protein-free diet, the average net loss of body protein by males is about 0.34 gram per kilogram of body weight. However, when allowance is made for incomplete utilization of dietary protein and for variability in needs, the allowance recommended for adults rises to 0.75 gram of protein per kilogram. Protein needs are dependent, in part, on energy intake. Increased energy intake results in protein conservation and decreased energy intake results in the diversion of protein to meet energy needs. Pregnancy and lactation increase the body's protein requirement.

There is a continuum of food protein quality depending on the digestibility of the protein and its amino acid composition. Nine essential amino acids must be provided in the diet, since the human body lacks the ability to synthesize them. These are lysine, leucine, isoleucine, valine, methionine, phenylalanine, tryptophan, threonine, and possibly histidine, especially for infants.

High-quality proteins are those that have a high degree of bioavailability (i.e., they are easily digested and absorbed) and have a high biologic value (a measure of the efficiency of utilization of absorbed protein, which in turn is dependent on adequate amounts and proportions of essential amino acids). The highest quality proteins are found in eggs and milk. Seeds and nuts, rice, corn, and grain proteins are of lesser quality. It is recommended that 10 to 15 per cent of caloric intake be derived from protein. Amino acids supplied in excess of the body's requirement are not

TABLE 199-3. EXAMPLES OF DRUG-NUTRIENT INTERACTIONS

Drug	Increased Requirement	Potential Mechanism	Deficiency Symptoms
Antacids (aluminum and magnesium hydroxides)	Phosphate	Formation of insoluble salts	Malaise, paresthesias, anorexia
Anticonvulsants (phenobarbital, phenytoin)	Vitamin D	Induction of hepatic microsomal enzymes resulting in inactive vitamin D metabolites	Rickets, osteomalacia
Oral contraceptives (norethindrone/mestranol)	Folic acid	Inhibition of polyglutamic folate absorption	Megaloblastic anemia
Antituberculous drugs (isoniazid, cycloserine)	Vitamin B ₆	Excretion of pyridoxal hydrazone complex	Peripheral neuropathy
Anticoagulants (coumarin, warfarin)	Vitamin K	Inhibition of vitamin K recycling	Hypoprote thrombinemia
Diuretics (benzothiadiazides)	Potassium	Enhancement of renal excretion	Hypokalemia

TABLE 199-4. MEDIAN REFERENCE HEIGHTS AND WEIGHTS AND RECOMMENDED ENERGY INTAKE

Category	Age (years) or Condition	Weight		Height		REE ^a (Kcal/day)	Average Energy Allowance (Kcal) ^b	
		(kg)	(lb)	(cm)	(in)		Multiples per Kg per Day ^c of REE	
Infants	0.0-0.5	6	13	60	24	320	108	650
Children	0.5-1.0	9	20	71	28	500	98	850
	1-3	13	29	90	35	740	102	1,300
	4-6	20	44	112	44	950	90	1,800
	7-10	28	62	132	52	1,130	70	2,000
Males	11-14	45	99	157	62	1,440	1.70	55
	15-18	66	145	176	69	1,760	1.67	45
	19-24	72	160	177	70	1,780	1.67	40
	25-50	79	174	176	70	1,800	1.60	37
	51+	77	170	173	68	1,530	1.50	30
Females	11-14	46	101	157	62	1,310	1.67	47
	15-18	55	120	163	64	1,370	1.60	40
	19-24	58	128	164	65	1,350	1.60	38
	25-50	63	138	163	64	1,380	1.55	36
	51+	65	143	160	63	1,280	1.50	30
Pregnant	1st trimester							+0
	2nd trimester							+300
	3rd trimester							+300
Lactating	1st 6 months							+500
	2nd 6 months							+500

^aCalculation based on Food and Agricultural Organization equations, then rounded.

^bIn the range of light to moderate activity, the coefficient of variation is $\pm 20\%$.

^cFigure is rounded.

Source: Food and Nutrition Board, National Academy of Sciences-National Research Council, Recommended Dietary Allowances, revised 1989.

stored but are degraded to metabolic products (urea, uric acid, etc.), and the carbon skeleton is converted to carbohydrate and fat or oxidized for energy. It is important that a mixed diet be consumed so that adequate amounts of each essential amino acid are received. Some amino acids are complementary; for example, tyrosine may in part meet the body's requirement for phenylalanine, and cystine may in part meet the body's requirement for methionine. The ability of the body to utilize protein is impaired if one essential amino acid is missing, underscoring the need for mixed sources of dietary proteins.

In parenterally fed patients, zero nitrogen balance may be achieved with as little as 0.5 gram per kilogram per day of mixed amino acids (including all essential amino acids). However, patients with abnormal losses or increased demands (burns, trauma, wound repair) may require 1.2 to 1.6 grams per kilogram of desirable body weight per day.

In the clinical setting, the state of nitrogen balance can be crudely estimated by measuring the 24-hour urinary urea nitrogen excretion:

$$\text{Nitrogen balance} = \frac{\text{protein intake (g)}}{6.25} - [\text{urinary urea nitrogen (g)} + 4]$$

CARBOHYDRATE

Carbohydrate supplies 65 per cent of the world's food energy (50 per cent in developed countries, 75 per cent in developing countries), and of this 10 to 50 per cent is from simple sugars. Although a diet low in carbohydrate may result in ketosis, there is no fixed requirement for carbohydrate in the diet. Carbohydrate may be divided into available (i.e., digestible and utilizable as sugars) and unavailable (i.e., dietary fiber). The primary sources of both available and unavailable carbohydrates are of vegetable origin. Dietary fiber reaches the large intestine intact but then may undergo fermentation by bacteria, with the subsequent absorption of breakdown products and some "rescue" of calories. Dietary fiber is made up of crude fiber (cellulose, lignin), mucilages, pectins, hemicellulose, and water-soluble gums. Each type of fiber has different characteristics with regard to water holding, cation exchange, and adsorptive properties (e.g., for bile acids and drugs). For example, mucilages have a high capacity for water holding, and pectins avidly adsorb bile acids. Increases in stool weight and faster intestinal transit result from increases in dietary fiber. Primarily because of epidemiologic disease patterns (e.g., for colon cancer and diverticulitis), an increase of dietary fiber has been suggested. At least 20 to 25 grams of dietary fiber per day are needed for a therapeutic effect in the

irritable bowel syndrome. Gums and pectins have been shown to have a beneficial effect on diabetes by delaying the absorption of glucose. As with most dietary components, too much fiber may be harmful. Large amounts of dietary fiber may contribute to trace metal deficiency in certain parts of the world by adsorbing divalent cations (e.g., zinc) and making them unavailable for gastrointestinal absorption. Carbohydrate intolerance syndromes (e.g., lactose intolerance) are described in Ch. 102.

FAT

Fat, a concentrated source of calories, serves as a carrier for fat-soluble vitamins and as a source of essential fatty acids. All body cells with the exception of the central nervous system and erythrocytes can directly utilize fatty acids as a source of energy. Polyunsaturated essential fatty acids (linoleic, linolenic) and their derivatives serve as precursors for eicosanoids, which include the leukotrienes, prostaglandins, and thromboxanes. They are also needed for membrane structure and integrity. Polyunsaturated fatty acids have been shown to promote carcinogenesis in experimental animals, however, and may reduce circulating HDL cholesterol and promote gallstone formation. Thus, an upper limit of 10 per cent of calories taken in as polyunsaturated fats is advised. Monounsaturated fatty acids are effective for optimizing plasma lipoproteins. There is recent interest in the role of N-3 polyunsaturated fatty acids, derived from linolenic acid or from fish oils, in the prevention of ischemic heart disease. However, more investigation is needed on the interaction between N-6 and N-3 fatty acids in human tissue before sound dietary recommendations can be made. Linoleic acid is a prominent component of dietary fats, but deficiency has been recognized only among patients on prolonged parenteral feedings containing no fat. Two per cent of calories in the form of linoleic acid and 0.5 per cent as linolenic acid are sufficient for preventing essential fatty acid deficiency.

VITAMINS AND MINERALS

Requirements for vitamins and minerals are discussed in Ch. 204 and 205.

NUTRITIONAL RECOMMENDATIONS

The Surgeon General's Report on Nutrition and Health published in 1988 outlines prudent dietary recommendations for the United States population in order to avoid diseases and disabilities that appear to have a relation to diet. Other sets of similar

recommendations have been proposed by organizations such as the American Heart Association and the National Cancer Institute. Such dietary goals include a reduction in the percentage of calories ingested as fat by the United States public from 37 per cent to 30 per cent (<10 per cent saturated, <10 per cent polyunsaturated). At least 12 per cent of total calories should be ingested as protein. Further recommendations are that total calories ingested as carbohydrate be increased to approximately 60 per cent, with an increase in complex carbohydrates (e.g., starches, fiber) and naturally occurring sugars to approximately 50 per cent. Refined and processed sugar ingestion should be decreased to about 10 per cent of the total caloric intake. With a view toward reducing coronary artery disease, the American Heart Association recommends, in addition, a restriction of dietary cholesterol to less than 300 mg per day and of sodium to less than 3 grams per day. The judicious diet is outlined in detail in Ch. 12.

Diet and Health. Washington, D.C., National Academy of Sciences, 1959. A comprehensive analysis of the scientific literature on the role of diet in the etiology and prevention of chronic disease in the United States.

Energy and Protein Requirements. Report of a Joint FAO/WHO/UNU Expert Consultation. Geneva, WHO, 1985.

National Research Council: Recommended Dietary Allowances, 10th ed. Washington, D.C., National Academy of Sciences, 1989.

Roe DA: Drug Induced Nutritional Deficiencies, 2nd ed. Westport, CT, AVI Publishing Company, Inc., 1985.

The Surgeon General's Report on Nutrition and Health. US Dept of Health and Human Services (DHHS) Publication No 88-50211. Washington, D.C., 1988. This report's major conclusion is that overconsumption of fat at the expense of foods high in complex carbohydrates is detrimental to health.

200 Nutritional Assessment

Robert M. Russell

The recognition and treatment of malnutrition that accompanies illness play important roles in optimizing patient care. New modes of delivering nutrients to sick patients by both the parenteral and enteral routes may result in reductions in morbidity and mortality and shorten the length of hospitalization for both medical and surgical patients (Ch. 206 and 207).

Methods of nutritional assessment that have been used for some time to judge the severity of malnutrition among populations in lesser developed countries (e.g., anthropometric measures) are now being applied to hospitalized patients. An unexpectedly high prevalence (up to 40 per cent) of protein-energy malnutrition has been identified among Western patients. Reasons for the lack of recognition of malnutrition in hospitalized patients include preoccupation with the treatment of the disease process, neglect of the overall nutritional status of the patient (e.g., failure to obtain regular weights or to observe a patient's dietary intake), lack of sensitivity of casual observation in the recognition of protein-energy malnutrition, absence of a single indicator for diagnosis of malnutrition, and latent onset of clinical signs of malnutrition and relative lack of specificity of these signs. A single nutrient deficiency rarely occurs in a patient; rather, a complex and confusing array of deficiencies is most often present.

The diagnosis of malnutrition should be made on the basis of several consolidated pieces of information, including dietary history, anthropometric and laboratory measurements, and clinical examination. By using all of this information in a coordinated fashion, a more accurate diagnosis of the malnourished can be achieved, and an effective plan of treatment can be instituted.

DIET

It is not expected that the physician will interpret dietary records of a patient in detail. However, a physician should be able to perform a dietary evaluation by assessing the intakes of major food groups (milk-yogurt-cheese, meat-poultry-fish-eggs, fruits-vegetables, breads-cereals-grains, alcohol, fats such as oil, butter, bacon, and gravy) and the quality of selection within these groups. This is best done by asking the patient to recall all foods eaten within the last 24 hours (including snacks) and the

approximate portion sizes. A mixed diet is a desirable goal, when advising patients on healthful diets (Ch. 12). Moreover, the clinician should be aware of the key questions to ask patients, which provide clues about whether or not the patient's dietary intake requires adjustment (Table 200-1). A detailed medical and social history can alert the physician to an existing dietary problem or the likelihood of a dietary problem occurring in the future. For example, poverty, physical or mental disability, complaints of dysphagia, anorexia, nausea, abdominal pain while eating, ill-fitting dentures, and alcoholism may all be factors that prevent adequate dietary intake. Increased nutritional requirements can result from diarrhea, fever, open wounds or burns, malabsorption, diabetes, and hyperthyroidism. The physician should be able to counsel patients regarding general dietary guidelines (Ch. 12) and recognize cases for referral to a dietitian for more detailed counseling.

The elderly are a group with an increased risk of malnutrition. The reasons for this include poverty, the inability to move around easily, the cumulative effects of chronic disease necessitating multiple medications, social isolation, and the lack of knowledge for adequate preparation of meals (particularly among elderly men). Problems often arise when interviewing the elderly person for dietary habits (e.g., by 24-hour dietary recall, food frequency questionnaires) if the individual is senile or has impaired short-term memory. Even a 3- to 7-day dietary record, wherein the patient records everything eaten during that period, has proven difficult for the elderly patient to keep. A family member may therefore be of great assistance when obtaining dietary information. Finally, appropriate standards for judging the elderly person's diet are not currently available. The Recommended Dietary Allowances (see Table 199-1) were developed as population standards (not individual requirements) and are set to meet the needs of most healthy individuals. The standards for adults are based almost exclusively on young adults. As a result, they may not be appropriate for meeting the needs of the elderly patient who has an array of chronic diseases or aging disorders, or both.

ANTHROPOMETRIC MEASUREMENTS

Sophisticated and specialized methods to assess body composition are available, e.g., underwater weighing for body density, CT scanning, neutron activation analysis, and ⁴⁰K counting. However, none of these methods is available for widespread clinical use. Anthropometric reference values derived from measurements on normal populations provide inexpensive, quick, and convenient estimates of a patient's nutritional status in terms of protein and fat reserves. The most useful anthropometric meas-

TABLE 200-1. KEY QUESTIONS TO ASK AS PART OF THE NUTRITIONAL ASSESSMENT OF THE ADULT

1. Is there recent weight gain or weight loss? How much?
2. Are there alterations in appetite, sense of smell, or taste?
3. Are there problems with chewing or swallowing? Does the patient have poor dentition or poorly fitting dentures?
4. Are there symptoms of gastrointestinal disorders: diarrhea, constipation, nausea, vomiting, early satiety?
5. Does the patient live alone? If not, who prepares meals? Does he/she know how to cook?
6. What type of cooking facilities and refrigeration are in the patient's home?
7. Does the patient purchase a variety of foods? If not, is it due to financial difficulties?
8. How many meals are eaten per day? How many snacks? Are one or more meals eaten outside of the home? If so, where?
9. Is the patient physically or mentally handicapped? Does this prevent the individual from shopping, cooking, or feeding herself or himself?
10. Does the patient take any dietary supplements (e.g., vitamins)?
11. How much alcohol does the patient consume?
12. Does the patient use prescription or nonprescription drugs?
13. Are there any religious or ethnic beliefs or food intolerances that prevent adequate food intake?
14. Does the patient follow a dietary restriction? Is it prescribed or self-imposed?
15. Is the patient depressed?