R 363 E801.3

<del>228353</del> ·

8201696

# PATHOLOGIC PHYSIOLOGY

## Mechanisms of Disease

Edited by

WILLIAM A. SODEMAN, M.D., SC.D., F.A.C.P.

DEAN AND PROFESSOR OF MEDICINE. JEFFERSON MEDICAL COLLEGE



Third Edition



W. B. SAUNDERS COMPANY

Philadelphia 1961

London



YDOIORYIN OF MARINE

© 1961, by W. B. Saunders Company

Copyright, 1950 and 1956, by W. B. Saunders Company

COPYRIGHT UNDER THE INTERNATIONAL COPYRIGHT UNION

All Rights Reserved. This book is protected by copyright. No part of it may be duplicated or reproduced in any manner without written permission from the publisher.

Made in the United States of America PRESS OF W. B. SAUNDERS COMPANY

Library of Congress Catalog Card Number 61-6737

### Contributors

#### BERNARD J. ALPERS, M.D.

Professor and Head of the Department of Neurology, Jefferson Medical College; Neurologist, Jefferson Medical College Hospital, Philadelphia.

#### WILLIAM BENNETT BEAN, M.D., F.A.C.P.

Professor and Head of the Department of Internal Medicine, College of Medicine, State University of Iowa, Iowa City, Iowa; formerly Associate Professor of Medicine, College of Medicine, University of Cincinnati, and formerly Commanding Officer, Armored Medical Research Laboratory, Fort Knox, Kentucky; Physician-in-Chief, University Hospitals, Iowa City, Iowa.

## WILLIAM BOSWORTH CASTLE, M.D., M.S. (Hon.), M.D. (Hon.)., Sc.D. (Hon.), F.A.C.P.

George Richards Minot Professor of Medicine, Harvard University; Director, Thorndike Memorial Laboratory, Boston City Hospital; Director, Second and Fourth (Harvard) Medical Services, Boston City Hospital, Boston.

#### ROBERT A. COOKE, M.D., F.A.C.P.†

Late Director, Institute of Allergy, The Roosevelt Hospital, New York.

#### ARTHUR CURTIS CORCORON, M.D., C.M., F.A.C.P.

Senior Research Fellow (HF-13, 190), National Heart Institute, Bethesda, Maryland; Director of Education, Head, Department of Clinical Investigation, St. Vincent Charity Hospital, Cleveland, Ohio.

† Deceased.

#### CHARLES AUSTIN DOAN, M.D., F.A.C.P.

Dean Emeritus, Professor of Medicine and Director of Medical Research, The College of Medicine, Ohio State University, Columbus, Ohio; Director, Division of Hematology, the University Hospital, Columbus, Ohio.

#### JOHN H. FOULGER, M.D., M.Sc. (London), Ph.D., F.A.C.P.

Director of Medical Research, and formerly Director of Haskell Laboratory for Toxicology and Industrial Medicine, E. I. Du Pont de Nemours and Company, Inc., Wilmington, Delaware.

#### RICHARD H. FREYBERG, M.D., M.S., F.A.C.P.

Professor of Clinical Medicine, Cornell University Medical College; Director of the Department of Rheumatic Diseases, Hospital for Special Surgery, New York Hospital-Cornell Medical Center, New York.

#### BENJAMIN R. GENDEL, M.D.

Professor of Internal Medicine, Emory University School of Medicine; Attending Physician, Emory University and Grady Memorial Hospitals, Atlanta, Georgia; Consultant, Veterans Administration Hospital, Atlanta, Georgia.

#### FRANZ GOLDSTEIN, M.D.

Associate in Medicine, Jefferson Medical College; Assistant Physician, Jefferson Medical College Hospital and Gastroenterology Clinic, Philadelphia.

#### **GEORGE T. HARRELL, M.D.**

Professor of Medicine and Dean of the College of Medicine, University of Florida; Chief of Staff, University of Florida Teaching Hospital and Clinics, Gainesville, Florida.

#### EDGAR HULL, M.D., F.A.C.P.

Professor of Medicine and Associate Dean, Louisiana State University School of Medicine; Senior Visiting Physician in Medicine, LSU Unit, Charity Hospital of Louisiana at New Orleans; Visiting Physician and Director of Heart Station, Mercy and Hotel Dieu Sisters' Hospitals; Visiting Physician, Touro Infirmary and Southern Baptist Hospital, New Orleans, Louisiana.

#### FRANZ J. INGELFINGER, M.D.

Professor of Medicine, Boston University School of Medicine; Associate Physician-in-Chief, Massachusetts Memorial Hospitals, Boston.

#### FRANKLIN D. JOHNSTON, M.D.

Professor of Internal Medicine, University of Michigan Medical School, Ann Arbor, Michigan.

#### JOHN H. KILLOUGH, Ph.D., M.D.

Associate Professor of Medicine, Jefferson Medical College; Assistant Attending Physician, Director of the Cardiopulmonary Laboratory, Jefferson Medical College Hospital, Philadelphia.

#### JOSEPH B. KIRSNER, Ph.D., M.D.

Professor of Medicine, Department of Medicine, University of Chicago; Attending Physician, Albert Merritt Billings Hospital, Chicago.

#### MAURICE E. KRAHL, Ph.D.

Professor of Physiology, School of Medicine, University of Chicago, Chicago.

#### JOHN S. LA DUE, M.D., Ph.D., F.A.C.P.

Associate Professor of Clinical Medicine, Cornell University Medical School; Director, Section of Cardiology, Sloan-Kettering Institute; Associate Attending Physician and Director, Section of Cardiology, Memorial Center for Cancer and Allied Diseases; Assistant Attending Physician, New York Hospital; Chief, Medical Service, Medical Arts Center, New York.

#### ELLIOTT L. MANCALL, M.D.

Assistant Professor of Neurology, Jefferson Medical College, Philadelphia; Assistant in Neurology, Jefferson Medical College Hospital; Chief of Section, Neurology Division, Philadelphia General Hospital; Consultant in Neurology, New Jersey State Hospital, Ancora, New Jersey.

#### WALTER L. PALMER, M.D., Ph.D., F.A.C.P.

Richard T. Crane Professor of Medicine, University of Chicago, Chicago.

#### C. THORPE RAY, M.D.

Professor of Medicine and Chairman of the Department of Medicine, University of Missouri School of Medicine; Chief of Medical Service and Physician, University Hospitals, Columbia, Missouri.

#### EDWARD C. REIFENSTEIN, Jr., M.D., F.A.C.P.

Consultant in Endocrinology and Metabolism; Senior Associate Medical Director, The Squibb Institute for Medical Research, E. R. Squibb and Sons Division, Olin Mathieson Chemical Corporation; Assistant Clinical Professor of Medicine, New York Medical College; Assistant Attending Physician, Flower and Fifth Avenue Hospitals, New York.

#### HENRY T. RICKETTS, M.D., F.A.C.P.

Professor of Medicine, School of Medicine, University of Chicago, Chicago.

#### JOSEPH THOMAS ROBERTS, M.S., M.D., Ph.D., F.A.C.P.

Lecturer in Medicine, University of Buffalo School of Medicine; formerly Dean, Professor of Medicine and Head of the Department of Medicine, University of Arkansas School of Medicine, Little Rock, Arkansas; Chief, Cardiology Section, Veterans Administration Hospital, Buffalo, New York.

#### JOHN H. SEABURY, M.S., M.D.

Associate Professor of Medicine, Louisiana State University Medical Center; Director of the Lung Station of the Charity Hospital of Louisiana at New Orleans, New Orleans, Louisiana.

#### LEON SCHIFF, M.D., Ph.D., F.A.C.P.

Professor of Medicine and Director of Gastric Research Laboratory, University of Cincinnati College of Medicine; Attending Physician and Director, Gastric Laboratory, Cincinnati General Hospital; Attending Physician, Jewish Hospital; Consultant, Veterans Administration Hospital, Cincinnati.

#### WILLIAM BOWEN SHERMAN, M.D., F.A.C.P.

Associate Clinical Professor of Medicine, Columbia University College of Physicians and Surgeons; Associate Attending Physician, Presbyterian Hospital; Associate Attending Physician and Director, Institute of Allergy, Roosevelt Hospital, New York.

#### WILLIAM A. SODEMAN, M.D., F.A.C.P.

Dean and Professor of Medicine, Jefferson Medical College, Philadelphia; formerly Professor of Medicine and Chairman of the Department of Medicine, School of Medicine, University of Missouri, Columbia, Missouri; Consultant, United States Public Health Service, Washington, D. C.; Consultant, Office of the Surgeon General, U. S. Air Force, Washington, D. C.; Consultant, U. S. Naval Hospital, Philadelphia.

# Preface to the Third Edition

THE RAPID ADVANCE in our knowledge of pathologic physiology of disease has again made necessary a revision of the text. The Editor and Contributors have taken advantage of this opportunity to make certain other revisions as well. While maintaining the same approach to the subject, they have attempted as far as possible to reduce normal physiology to the minimum to insure a satisfactory understanding and interpretation of the abnormal. Certain sections have been revised completely or have been rewritten. The section on genetics by Dr. Benjamin Gendel now approaches the subject through recent new techniques which have given us a better understanding of many problems in human disease. Dr. Thorpe Ray has completely redone the section on water and electrolyte balance. Dr. John Killough revised almost completely the material on protective mechanisms of the lungs, and Dr. Franz Goldstein has rewritten the section on the gallbladder and pancreas. A most important change is the approach to diseases of the nervous system, completely rewritten by Drs. Bernard Alpers and Elliot Mancall. In general the interrelationship of certain facts and material in the various sections has been worked out for a more effective integration of thought and concept.

The esprit de corps of the contributors in completing the third edition has been high. The efforts and cooperation of the W. B. Saunders Company have gained the heartfelt thanks of all of us. The Editor also wishes to thank his wife, Mary Agnes Sodeman, for her help and support through the long

hours of the preparation of this work.

Philadelphia

WILLIAM A. SODEMAN, M.D.

# Preface to the First Edition

This volume, a collaborative effort by 25 authors, approaches problems of disease in the field of internal medicine from the standpoint of disturbed physiology. Unlike the usual text, which is devoted to discussions of etiology, pathology, symptoms and treatment, this work analyzes symptoms and signs and the mechanisms of their development. The monograph is not intended to take the place of standard texts on physiology or textbooks of medicine. It does not aim at the completeness of either, but does try to bridge the gap between them by presenting a clinical picture of disease seen as physiologic dysfunction. An attempt is made to promote understanding of how and why symptoms appear, so that the student or physician may have a reasonable explanation for the findings he elicits. Neurologic problems are considered only as they are related to the various disease groups. The same is true of metabolic disturbances and disorders of acid-base balance.

The Editor thanks the contributors for their ready cooperation in covering certain aspects of disease in which presentation of material is at times most difficult. He thanks the Saunders Company for their help and guidance, and also Miss Brent S. Robertson for her long hours of hard work and patience in reading and checking manuscripts.

New Orleans, Louisiana

WILLIAM A. SODEMAN, M.D.

### Contents

#### PART I. PATHOLOGIC PHYSIOLOGY

| Pathologic Physiology   | 3                                    |
|---|--------------------------------------|
| Primary Factors   | 3<br>4<br>5<br>6                     |
| PART II. GENETICS AND DISEASE   |                                      |
| CHAPTER 2   |                                      |
| Genetics and Disease  | 9                                    |
| The Physical Basis of Inheritance  Genes  Chromosomes  Mitosis and Meiosis  Determination of Sex  Nondisjunction  Hereditary Variations  Mechanisms of Inheritance  Dominant Inheritance  Recessive Inheritance  Intermediate Inheritance or Incomplete Dominance  Sex-Linked Inheritance  Sex-Influenced Inheritance | 0<br>2<br>2<br>4<br>5<br>6<br>7<br>8 |

#### Contents

|       | Types of Genetic Diseases                      | 20  |
|-------|--|-----|
|       | The Mutant Gene and Mechanisms of Gene Action. | 20  |
|       | Lethals  | 20  |
|       | Morphologic-Embryologic Defects                | 20  |
|       | Inborn Errors of Metabolism                    | 21  |
|       | Abiotrophic Disturbances                       | 26  |
|       | Immunologic Disturbances                       | 26  |
|       | Susceptibility to Infectious Diseases          | 27  |
|       | Detoxification of Drugs                        | 27  |
|       | Chromosomal Accidents                          | 29  |
|       | Klinefelter's Syndrome                         | 29  |
|       | Turner's Syndrome                              | 30  |
|       | Mongolism                                      | 31  |
|       | Miscellaneous Conditions                       | 31  |
|       | References                                     | 32  |
|       |  |     |
|       | PART III. METABOLISM AND THE ENDOCRINE GLANDS  |     |
|       | METABOLISM AND THE ENDOCKINE GLANDS            |     |
|       | CHAPTER 3                                      |     |
| Nutri | itional Factors; Protein and Fat Metabolism    | 35  |
|       | By WILLIAM A. SODEMAN                          |     |
|       | Introduction                                   | 35  |
|       | Proteins                                       | 38  |
|       | Protein Deficiency                             | 41  |
|       | FATS   | 43  |
|       | Calories                                       | 45  |
|       | General Metabolism                             | 45  |
|       | Obesity  | 47  |
|       | Caloric Deficiency                             | 48  |
|       | VITAMINS                                       | 49  |
|       | Vitamin A                                      | 50  |
|       | The Vitamin B Complex                          | 51  |
|       | Ascorbic Acid (Vitamin C)                      | 58  |
|       | Vitamin D and Calcium                          |     |
|       |  | 61  |
|       | Vitamin E                                      | 63  |
|       | Vitamin K                                      | 63  |
|       | Hypervitaminoses                               | 64  |
|       | Minerals                                       | 65  |
|       | Magnesium                                      | 66  |
|       | Cobalt   | -66 |
|       | Copper   | 66  |
|       | Iodine   | 66  |
|       | Fluorine                                       | 67  |
|       | Iron   | 67  |
|       | References                                     | 68  |
|       |  |     |

|          | Contents   | xiii |
|----------|--|------|
|          | CHAPTER 4  |      |
| Carboh   | ydrate Metabolism  | 70   |
|          | By HENRY T. RICKETTS AND MAURICE E. KRAHL  |      |
|          | THE CHEMISTRY OF CARBOHYDRATE UTILIZATION REGULATORY MECHANISMS OF CARBOHYDRATE METAB- | 70   |
|          | OLISM  | 71   |
|          | The Pancreas   | 72   |
|          | Other Endocrine Glands   | 73   |
|          | Physiologic Effects of the Oral Hypoglycemic   |      |
|          | AGENTS   | 74   |
|          | THE GLUCOSE TOLERANCE TEST   | 75   |
|          | CLINICAL ABNORMALITIES OF CARBOHYDRATE METAB-  | 77   |
|          | OLISM  | 77   |
|          | Inborn Metabolic Errors  | 77   |
|          | Diabetes Mellitus  | 82   |
|          | Organic Hypoglycemia   | 82   |
|          | Functional Hypoglycemia  | 83   |
|          | References   | 84   |
|          | ALL MALINGES   |      |
|          |  |      |
|          | CHAPTER 5  |      |
| Water    | and Electrolyte Balance  | 86   |
| vv di ci | By C. THORPE RAY   |      |
|          |  | 88   |
|          | Volumes and Composition of Body Fluids Measurements of the Volumes of Body Fluids      | 88   |
|          | Characteristics of Intracellular and Extracel-   | 00   |
|          | lular Fluids   | 89   |
|          | Exchanges of Fluids between Cellular and   |      |
|          | Extracellular Spaces   | 90   |
|          | Exchanges of Fluids between Vascular and   |      |
|          | Extravascular Spaces   | 91   |
|          | EXTERNAL EXCHANGES OF FLUIDS—WATER BALANCE   | 93   |
|          | The Effect of Solute Load on Water Excretion   | 94   |
|          | The Effect of the Antidiuretic Hormone on  | 95   |
|          | Water Excretion  | 97   |
|          | Turnover of Body Water   | 97   |
|          | Sodium   | 97   |
|          | Sodium Content of the Body   | 98   |
|          | Shifts of Sodium Between Compartments  | 98   |
|          | Sodium Balance   | 99   |
|          | Factors Which Influence Sodium Excretion   |      |
|          | by the Kidneys   | 99   |

#### Contents

| Balance  Chloride  The Chloride Content of the Body Chloride Balance  Factors Influencing Renal Excretion ride  Clinical Examples of Disorders in Balance  Potassium  Potassium Content of the Body Shifts of Potassium between Contents | on of Chlo-               | 100<br>104<br>104<br>104 |
|--|---------------------------|--------------------------|
| The Chloride Content of the Body Chloride Balance Factors Influencing Renal Excretion ride Clinical Examples of Disorders in Balance Potassium Potassium Content of the Body   | on of Chlo-               | 104<br>104               |
| Chloride Balance   | on of Chlo-               | 104                      |
| Factors Influencing Renal Excretion ride   | on of Chlo-<br>n Chloride |                          |
| ride   | n Chloride                | 105                      |
| Clinical Examples of Disorders in Balance  | n Chloride                | 105                      |
| Potassium Content of the Body .  |                           |                          |
| Potassium Content of the Body .  |                           |                          |
| Potassium Content of the Body .  |                           | 105                      |
| Potassium Content of the Body .  |                           | 105                      |
| Shifts of Potassium between Con  |                           | 106                      |
| omits of rotassium between con   | npartments                | 106                      |
| Potassium Balance  |                           | 107                      |
| Factors Which Influence Renal E  |                           |                          |
| Potassium  |                           | 108                      |
| Clinical Examples of Disorders in  |                           |                          |
| Balance  |                           | 108                      |
| CALCIUM AND MAGNESIUM  |                           | 113                      |
| Calcium  |                           | 113                      |
| Magnesium  |                           | 114                      |
| ACID-BASE EQUILIBRIUM  |                           | 115                      |
| Mechanisms of Production of Alkalosis an   |                           | 116                      |
| Respiratory Acidosis   |                           | 116                      |
| Respiratory Alkalosis  |                           | 117                      |
| Metabolic Acidosis   |                           | 117                      |
| Metabolic Alkalosis  |                           | 119                      |
| References   | • • • • • • •             | 120                      |
| Contract   |                           |                          |
| CHAPTER 6  |                           |                          |
| Endocrine Glands   |                           | 122                      |
| By EDWARD C. REIFENSTEIN, JR.  |                           |                          |
| General Considerations   |                           | 122                      |
| Definitions  |                           | 122                      |
| General Outline of Hormone Relat   |                           | 122                      |
| Classification of Hormone Actions  |                           | 123                      |
| Objectives of Hormone Therapy .  |                           | 124                      |
| Natural versus Artificial "Hormone   |                           | 125                      |
| The Hormone Content of the Gland   | ls                        | 125                      |
| Intermediary Metabolism in Diseas  | se                        | 126                      |
| Résumé of Glandular Physiology   |                           | 126                      |
| Hypothalamus   |                           | 126                      |
| Anterior Pituitary   |                           | 127                      |
| Posterior Pituitary  |                           | 128                      |
| Ovary  |                           | 129                      |
|  |                           | 130                      |

| Contents  | ×   |
|---|-----|
| Adrenal Cortex                                  | 130 |
| Adrenal Medulla                                 | 132 |
| Thyroid   | 133 |
| Parathyroids                                    | 133 |
| Pancreas  | 134 |
| Placenta  | 135 |
| Dynamic Physiology of the Hormones              | 136 |
| PATHOLOGIC PHYSIOLOGY OF THE MAIN ENDOCRINE AB- |     |
| NORMALITIES                                     | 142 |
| Hypothalamic Precocity                          | 143 |
| Fröhlich's Syndrome                             | 143 |
| Adolescent Mammoplasia                          | 144 |
| Hypothalamic or Psychogenic Amenorrhea .        | 144 |
| Acromegaly                                      | 146 |
| Panhypopituitarism (Simmonds' Cachexia,         |     |
| Sheehan's Syndrome, Pituitary Dwarfism)         | 149 |
| Pituitary Amenorrhea                            | 151 |
| Cushing's Syndrome                              | 151 |
| Primary Hyperaldosteronism (Conn's Syn-         |     |
| drome)  | 154 |
| Primary Hypoaldosteronism                       | 155 |
| Adaptation Syndrome                             | 155 |
| Disorders of Adaptation; Effects of Pituitary   |     |
| Adrenocorticotropic Hormone and of Ad-          |     |
| renal Cortical Steroid Hormones in Non-         | 150 |
| endocrine Disorders                             | 156 |
| Addison's Disease and Adrenal Cortical In       | 150 |
| sufficiency                                     | 159 |
| Adrenogenital Syndrome                          | 160 |
| Adrenal Androgen Hyperfunction Syndromes        |     |
| (Stein-Leventhal Syndrome; Large, Pale          | 161 |
| Ovary Syndrome)                                 | 163 |
| Diabetes Insipidus                              | 163 |
| Menopause and the Menopausal Syndrome.          | 164 |
| Postmenopausal and Senile Osteoporosis          | 165 |
| Gonadal Dysgenesis (Ovarian Agenesis,           | 103 |
| Turner's Syndrome, Ovarian Short-Sta-           |     |
| ture Syndrome, Functional Prepuberal            |     |
| Castration)                                     | 167 |
| Amenorrhea                                      | 168 |
| Dysfunctional Uterine Bleeding (Metropathia     | 100 |
| Hemorrhagica)                                   | 170 |
| Presumptive Test for Pregnancy                  | 172 |
| Dysmenorrhea and Endometriosis                  | 172 |
| Premenstrual Tension                            | 175 |
| Anorexia Nervosa                                | 175 |

xvi

#### Contents

|         | Arrhenoblastoma                                   | 176  |
|---------|---|------|
|         | Granulosa Tumors, Theca Cell Tumors, and          |      |
|         | Luteomas  | 176  |
|         | Hypoleydigism                                     | 176  |
|         | Hypospermatogenesis                               | 177  |
|         | Seminiferous Tubule Dysgenesis (Gyneco-           |      |
|         | mastia-and-Small-Testes Syndrome, Kline-          |      |
|         | felter's Syndrome)                                | 178  |
|         | Cryptorchidism                                    | 179  |
|         | Male "Climacteric"                                | 181  |
|         | Teratoma, Chorio-epithelioma, and Chorio-         |      |
|         | carcinoma   | 181  |
|         | Leydig Cell Tumor                                 | 182  |
|         | Cretinism and Myxedema (Hypothyroidism)           | 182  |
|         | Thyrotoxicosis (Hyperthyroidism)                  | 182  |
|         | Exophthalmic Goiter (Graves' Disease)             | 184  |
|         | Simple Goiter                                     | 185  |
|         | Thyroiditis                                       | 185  |
|         | Hypoparathyroidism                                | 185  |
|         | Pseudohypoparathyroidism                          | 186  |
|         | Hyperparathyroidism                               | 186  |
|         | Diabetes Mellitus                                 | 188  |
|         | Hyperinsulinism                                   | 188  |
|         | Pregnancy Toxemia Complicating Diabetes Mellitus  | 189  |
|         | Recurrent and Theatened Abortion                  | 190  |
|         | Postpartum Breast Manifestations                  | 191  |
|         | Endocrine Therapy for Neoplastic Disease          | 192  |
|         | _   | 192  |
|         | References  | 193  |
|         | REFERENCES  | 133  |
|         |   |      |
|         | PART IV. INFECTION AND ALLERGY                    |      |
|         | PARI IV. INTECTION AND ALLEROT                    |      |
|         | CHAPTER 7   |      |
| Fastana | Affecting Infections                              | 197  |
| ractors |   | 131  |
|         | By GEORGE T. HARRELL, JR.                         |      |
|         | FACTORS CONCERNED IN THE NUMBER OF INFECTING      |      |
|         | Organisms   | 198  |
|         | Sources of Infection                              | 198  |
|         | Agents of Disease                                 | _19° |
|         | Portal of Entry                                   | 201  |
|         | Transmission by Vectors                           | 201  |
|         | Growth in the Body                                | 202  |
|         | Factors Concerned in the Virulence of the Infect- | 001  |
|         | ing Organism                                      | 204  |

|         | Contents  | xvii       |
|---------|---|------------|
|         | Primary and Secondary Infections Conditions Necessary for Infection | 204<br>205 |
|         | Routes of Spread  | 205        |
|         | Increase in Virulence   | 206        |
|         | Reduction in Virulence  | 207        |
|         | Variations in Strains   | 208        |
|         | FACTORS CONCERNED IN RESISTANCE                                     | 209        |
|         | Nonspecific Factors   | 210        |
|         | Specific Resistance   | 214        |
|         | -   | 214        |
|         | References  |            |
|         |   |            |
|         | CHAPTER 8 of Infection  | 215        |
| Effects | By GEORGE T. HARRELL, JR.   |            |
|         | Inflammation and Fever  | 215        |
|         | Damage to Organs  | 216        |
|         | Direct or Immediate Effects   | 216        |
|         | Indirect or Long-Term Effects                                       | 221        |
|         | The Lungs   | 221        |
|         | The Kidneys   | 222        |
|         | The Heart   | 223        |
|         | Effects Not Accompanied by Anatomic Change                          | 224        |
|         | Circulatory Disturbances  | 224        |
|         | Chills  | 224        |
|         | Rash  | 225        |
|         | Central Circulatory Failure   | 225        |
|         | Peripheral Circulatory Failure                                      | 226        |
|         | Disturbances of Venous Circulation                                  | 230        |
|         | Disturbances of the Lymphatic Circulation .                         | 232        |
|         | INDIRECT EFFECTS ASSOCIATED WITH DISTANT INFEC-                     |            |
|         | TION  | 232        |
|         | References  | 233        |
|         | Chapter 9   |            |
| Docove  | ery from Infection  | 235        |
| Kecove  | By GEORGE T. HARRELL, JR.   |            |
|         | Immunity  | 235        |
|         | Application to Diagnosis  | 236        |
|         | Circulating Antibodies  | 237        |
|         | Cellular Antibodies   | 239        |
|         | Criterion of Cure   | 240        |
|         | Response to Reinfections  | 241        |
|         | Harmful Effects   | 242        |

| xviii   | Contents                                   |            |
|---------|--|------------|
|         | Supportive Therapy                         | 243        |
|         | Rest                                       | 243        |
|         | Diet                                       | 244        |
|         | Vitamins                                   | 245        |
|         | Fluids                                     | 247        |
|         | Minerals                                   | 248        |
|         | Measures to Decrease Metabolism            | 248        |
|         | Measures to Support the Circulation        | 249        |
|         | References                                 | 250        |
|         |  |            |
|         |  |            |
|         | Chapter 10                                 |            |
| Alterat | tion of the Course of an Infection         | 251        |
|         | By GEORGE T. HARRELL, JR.                  |            |
|         |  | 251        |
|         | Prevention                                 | 251<br>251 |
|         | Control of Environment                     | 253        |
|         | Active Immunization                        | 254        |
|         | _  | 255        |
|         | CHEMOTHERAPY Anticontice                   | 258        |
|         | Antiseptics                                | 259        |
|         | Antibiotics                                | 260        |
|         | Other Chemotherapeutic Agents              | 261        |
|         | Toxic Effects                              | 262        |
|         | Immune Therapy                             | 263        |
|         | Hypersensitivity Reactions                 | 265        |
|         | Other Measures                             | 265        |
|         | Physical Therapy                           | 265        |
|         | Biologic Therapy                           | 266        |
|         | Desensitization                            | 266        |
|         | Breakdown of Granulomas                    | 267        |
|         | Inhibition of Antigen-Antibody Reactions   | 267        |
|         | References                                 | 268        |
|         |  |            |
|         |  |            |
|         | CHAPTER 11                                 |            |
| Allerg  | y  | 269        |
|         | By ROBERT A. COOKE AND WILLIAM B. SHERMAN  |            |
|         | Introduction                               | 269        |
|         | Anaphylaxis in Experimental Animals        | 270        |
|         | Arthus Phenomenon                          | 272        |
|         | Anaphylaxis in Man                         | 272        |
|         | Serum Sickness                             | 273        |
|         | Clinical Allergies                         | 274        |
|         | Allergies with Immediate Wheal Reactions . | 274        |