

Barbara L. Bullock
Pearl Philbrook Rosendahl

*Adaptations and
Alterations in Function*

Patho physiology

Second Edition

NOT FOR RESALE

Pathophysiology

Adaptations and Alterations in Function

SECOND EDITION

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*To my husband, Pete, and children,
with my love and appreciation.*
—B.L.B.

Preface

Pathophysiology can be defined as the study of the physiologic and biologic manifestations of disease. This second edition of *Pathophysiology: Adaptations and Alterations in Function* provides a basis for this study by expanding the student's knowledge in the sciences and exploring how alterations in structure (anatomy) and function (physiology) disrupt the human body as a whole. Written for undergraduate and graduate students in nursing and other health-oriented disciplines, this text blends the conceptual and systems approaches: the overall mechanisms of disease are introduced and described first to set the stage for coverage of specific disease processes within each system.

Integral to the study of pathophysiology is an understanding of how the human body uses its adaptive powers to maintain the steady state. *Pathophysiology* begins its discussion of this adaptive power at the basic level, which is the cell. Because alterations cause a disruption in normal cellular processes, ultimately leading to tissue or organ alterations, the body's adaptive and compensatory mechanisms also occur at the cellular level. For this reason, the text discusses cellular processes and alterations in these processes throughout. The concept of feedback and information sharing within the body is also explored in depth. In health the body functions in a negative feedback pattern that allows return to the normal or steady state. Some pathologic processes, however, establish a positive feedback pattern that, if unchecked, will result in death.

The understanding of disease processes is continually being updated and clarified by research. Continuing studies examine the fundamental nature of life and how it is altered by pathologic conditions. In this second edition of *Pathophysiology*, every attempt has been made to provide the most current information available. Many new topics have been added and many of those carried over have been expanded. Two new chapters demonstrate how important Shock and Pain are in understanding some manifestations of disease. New chapters on Alterations in Cardiac Rhythms and Sexually Transmitted Diseases (including a major section on AIDS) reflect the growing need for knowledge about these states in the health care field. The contributors have taken great care to provide currency, detail, and concept synthesis for every topic in the book.

This new edition retains many features of the first edition, including its basic organization and presentation of topics. Physical and laboratory findings are emphasized in appropriate sections, but treatment regimens are included only to illustrate or clarify a process. The students are referred to the many current nursing and medical texts for information about treatment and nursing management.

New to this edition are several features designed to make the text easier to use. A second color, used throughout, highlights both illustrations and text. The artwork, an essential component in the first edition, is expanded and

refined so that it will be more useful in helping students to visualize complex subjects. As in the first edition, students are encouraged to use the *Chapter Outlines* and *Chapter Objectives* as guides before reading each chapter and for review of content. End-of-chapter *Study Questions* have been added to provide some synthesis of the major topics. For students and faculty who wish to pursue specific topics in greater depth, each chapter is thoroughly referenced; a bibliography is provided at the end of each unit.

Pathophysiology, Second Edition, comes with a complete set of supplements to help both student and instructor. The *Instructor's Manual*, written by Anita Mikasa of Seattle University, has terms, chapter summaries, teaching strategies, and a bank of test questions. Answers to the study questions are also provided in the *Instructor's Manual*. The *Study Guide*, written by Helen Carcio of Curry College, goes beyond the usual workbook format by providing students with an outline summary of major chapter concepts and varied learning exercises encouraging students to review the text. With a *computerized test bank*, available for Apple and IBM PCs and compatibles, instructors can generate both tests from the data bank and new questions of their own. *Transparency Masters* of select illustrations in the text are also available.

Putting together a book of this magnitude requires contributions by many people. The author gratefully acknowledges the contributors to the first edition, whose material provided the beginnings of this entire project. Those contributors and their respective topics are as follows: Gloria Anderson, Erythrocyte Function; Joseph L. Andrews, Jr., Oxygen-Carbon Dioxide Exchange; Pamela Appleton, Normal Structure and Function of Skin, Traumatic Alterations to Skin; Sue H. Baldwin, Pituitary Function; Anne Roome Bavier, Motility and Motor Dysfunction of the Gastrointestinal Tract; Joan P. Buffalino, Alterations of Skin Integrity; Concepcion Y. Castro, Gastrointestinal Secretions; Jules Constant, Heart Sounds and Murmurs; Virginia Earles, Aging; Ann Estes Edgil, Genetic Disorders; Thomas Mark Fender, Skeletal System Function; Shirley Freeburn, Endocrine Mechanisms of Reproduction; Janet L. Gelein, General Systems Theory; Doris J. Heaman, Pancreatic Function and Diabetes; Reet Henze, Normal Structure and Function of the Central and Peripheral Nervous System, Adaptation and Alterations of the Special Senses, Traumatic Alterations of the Nervous System; Joan T. Hurlock, Disorders of Reproduction; Karen E. Jones, Degenerative and Other Alterations of the Nervous System; June H. Larrabee, Alterations in Movement; John A. R. Marino, Diabetes Mellitus; Gretchen S. McDaniel, Tumors and Infections of the Central Nervous System; M. S. Megahed, Alterations in Sensation, Consciousness, and Higher Cortical Function; Francis Donovan Monahan, Absorption in the Gastrointestinal System; Jennie L. Moore, Muscular System Function; Emilie Musci, Wound Healing, Neoplasia; Betty

Norris, Hypertension; Leah F. Oakley, Compromised Pumping Ability of the Heart, Alterations in Systemic Circulation; Donna Rogers Packa, Valvular Heart Disease, Pericarditis, Endocarditis; Marilyn Nelsen Pase, Infectious Agents and Leukocyte Function; Helen F. Ptak, Fluid and Electrolyte Balance, Burn Injury; Cammie M. Quinn, Normal Urinary Function, Obstruction of Genitourinary System, Renal Failure; Pearl Philbrook Rosendahl, Heart Sounds and Murmurs, Endocrine Function of the Pancreas, Alterations in Higher Cortical Function; Sharron P. Schlosser, Normal and Altered Male and Female Function; Therese B. Shipps, Nutrition and Metabolism; Eileen Ledden Sjoberg, Lung Clearance and Defense; Carol A. Stephenson, Ventilation, Diffusion, and Perfusion; Camille P. Stern, Functions of the Adrenal, Thyroid, and Parathyroid Glands; Metta Fay Street, Alterations That Result from Aging; Joan M. Vitello, Valvular Heart Disease, Pericarditis, Endocarditis; Linda Hudson Williams, Neoplasia; and Joan W. Williamson, Skeletal System Function. The contributors to the second edition refined, updated, and expanded that original material. Their efforts are also deeply appreciated.

The author also acknowledges the support and guidance provided by many talented persons at Scott, Foresman/Little, Brown College Division, specifically, Ann West, Nursing Editor, who has helped me for years to make dreams become reality. Her enthusiasm and moral support have kept me going and made me believe that I really could accomplish the task; Andrea Cava, Book Editor, for

tireless attention to the details of the project. She endured my disorganization and frustrations with positive assistance; Marcia Williams, Medical Illustrator, who handled all the major revisions of select pieces of art, making many suggestions for wonderful changes. The results are truly outstanding; and Sarah Clark, Permissions Editor, who diligently followed through on my sketchy notes to properly credit publication sources.

I am also very grateful to Michele McCarren, who took on the typing and word processing of the entire manuscript and helped me to meet the deadlines. She produced virtually error-free copy and cheerfully endured my changes, revisions, and terrible handwriting. My thanks also go to the second edition reviewers, for their helpful comments and suggestions: Ruth Mauldin at the University of North Carolina at Charlotte; Ardelina Baldonado of the Marcella Nehoff School of Nursing at Loyola University in Chicago; Sarah Jane Tobiason of Arizona State University; and Rosemary H. Wittstadt of Towson State University in Towson, Maryland. Many other instructors throughout the country have provided useful feedback on their classroom experience with the first edition. I am very grateful for this input, and welcome it again for this new edition.

I could not have completed this project without the continuing support of my husband, Pete, and my children, to whom this book is dedicated.

B.L.B.

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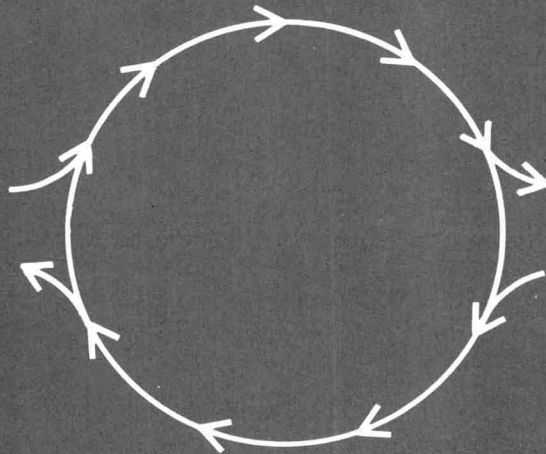
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SECTION I

***Introduction to
Pathophysiology***

***Adaptations and Alterations
in Cellular Function***



UNIT 1

Cellular Dynamics

Richard P. Pflanzner / *Cells: Structure, Function, Organization*

Dorothy Gauthier and Ann Estes Edgil / *Genetic Disorders*

Barbara L. Bullock / *Alterations in Cellular Processes*

Because the cell is the basis of life, it is appropriate to begin the study of pathophysiology with a review of normal cellular processes. Understanding of these processes is necessary for the understanding of concepts in every other unit of the text. The material can be found in many anatomy and physiology textbooks, but is presented here as a convenient, accessible reference. Sources for the more detailed aspects of cellular function are listed in the bibliography at the end of Unit 1.

Chapter 1 describes normal cellular function, with special emphasis on the cellular organelles and on movement of materials across the cell membrane. Chapter 2 explains the principles of inheritance and relates them to the more common genetic disorders. Chapter 3 details the alterations in cells when they are exposed to a changing, hostile environment. Cellular adaptation, injury, and death are explored in terms of their effect on body function. Mechanisms by which the steady state can be maintained, even at the expense of altered intracellular metabolism, are explored. Altered cellular function ending in lethal change is described.

The reader is encouraged to use the learning objectives at the beginning of each chapter as a study guide outline for essential concepts. Study questions at the end of each chapter provide an assessment of learning achieved. The bibliography at the end of the unit provides general and specific resources for further study.