



PREFACE

The objectives of the sixth edition of the *Textbook of Biochemistry with Clinical Correlations* remain unchanged from those for the previous editions. They are: (1) to present a clear and precise discussion of the biochemistry of eukaryotic cells, particularly those of mammalian tissues; (2) to relate biochemical events at the cellular level to physiological processes in the whole animal; and (3) to cite examples of abnormal biochemical processes in human disease. The text continues to have an emphasis on the biochemistry of mammalian cells because of the importance of biochemistry in understanding human diseases. Information from biochemical investigations of prokaryotes and other eukaryotes, however, is presented when these studies are the primary source of knowledge about a topic. The unraveling of many biological and physiological processes at the molecular level is due in part to the multiplicity of new innovative techniques and research approaches from different disciplines. The differences and research approaches between biochemistry, molecular biology, cell biology, cell physiology, and molecular pharmacology are becoming indistinct. Thus as biochemistry has spread through other disciplines, so have these disciplines permeated biochemistry. The continuing expansion of information in the biological sciences and the integration of disciplines have had a significant impact on the content of biochemistry courses, requiring inclusion of many topics heretofore presented in a more general descriptive manner. It also has had an impact on the content of textbooks. In the preparation of this revision, every chapter was updated with inclusion of new information and deletion of some material. Totally new topics are included in some chapters, such as sections on the basal lamina protein complex, and molecular motors, and two new chapters, **Fundamentals of Signal Transduction**, and **Cell Cycle, Programmed Cell Death and Cancer**, have been added.

The scope and depth of presentation in this book should fulfill the requirements of most upper-level undergraduate, graduate-level, and especially professional school courses in biochemistry. Topics for inclusion were selected to cover the essential areas of both biochemistry and physiological chemistry. The textbook is organized and written such that any sequence of topics considered most appropriate by an instructor can be presented. The content of the sixth edition is divided into five major parts, in which related topics are grouped together. **Part I, Structure of Macromolecules**, contains an introductory chapter on cell structure, followed by chapters on nucleic acid and protein structure. **Part II, Transmission of Information**, describes the synthesis of the major cellular macromolecules, that is, DNA, RNA, and protein. A chapter on biotechnology is included because information from

this area has had such a significant impact on the development of our current knowledge. Part II concludes with a chapter on the Regulation of Gene Expression in which mechanisms of both prokaryotes and eukaryotes are presented. **Part III, Functions of Proteins**, opens with a presentation of the structure-function relationship of four major families of proteins. This is followed by a discussion of enzymes, including a separate chapter on the cytochromes P450, then a chapter on membrane structure and transmembrane transport mechanisms. Part III concludes with a chapter covering the fundamentals of cellular signal transduction mechanisms. **Part IV, Metabolic Pathways and Their Control**, begins with a chapter on bioenergetics and oxidative metabolism, then separate chapters describing the synthesis and degradation of carbohydrates, lipids, amino acids, purine and pyrimidine nucleotides, and heme. Each chapter highlights the mechanism of control of the individual metabolic pathways. A chapter on the integration of these metabolic pathways in humans completes this part. **Part V, Physiological Processes**, covers those areas unique to mammalian cells and tissues beginning with a chapter on hormones that emphasizes their biochemical functions as messengers, and a chapter on molecular cell biology containing discussions of four major physiological signal transducing systems: the nervous system, the eye, muscle contraction and molecular motors, and blood coagulation. The textbook concludes with presentations of the biochemistry of digestion and absorption of basic nutritional constituents, and principles of human nutrition.

In each chapter, the relevancy of the topic being discussed to that of human life processes is presented in separate **Clinical Correlations**, which describe the aberrant biochemistry of disease states. A number of new correlations have been included because the genetic and biochemical bases of an ever increasing number of diseases have been described. There has been no attempt, however, to review all of the major diseases; rather the purpose of the Clinical Correlations is to present examples of disease processes where the ramifications of deviant biochemical processes are well established. References are included in the Clinical Correlations to facilitate exploration of the topic in more detail. In some instances, the same clinical condition is presented in different chapters, but each from a different perspective. All pertinent biochemical information is presented in the main text, and an understanding of the material does not require a reading of the Clinical Correlations. In some cases, clinical conditions are discussed as part of the primary text because of the significance of the medical condition to an understanding of the biochemical process.

Every chapter contains a **Bibliography** that serves as an entry point to the research literature; references are generally to review articles and seminal publications. A set of **Questions and Answers** concludes each chapter. They include multiple choice questions, some with clinical vignettes as they are the type used in national medical examinations, and problem solving questions. Brief annotated answers are given.

Illustrations were updated and new figures added including a number of protein structures. The adage "A picture is worth a thousand words" is appropriate and the reader is encouraged to study the illustrations because they are meant to clarify confusing aspects of a topic.

The Appendix, **Review of Organic Chemistry**, is designed as a ready reference for the nomenclature and structures of organic molecules encountered in biochemistry; it is not intended as a comprehensive review of organic chemistry. The material is presented in the Appendix rather than at the beginning of chapters dealing with the different biologically important molecules. The reader should become familiar with the content of the Appendix and then use it as a ready reference when reading related sections in the main text. A **Glossary** has been compiled for the sixth edition; the ever expanding language of the biochemical sciences indicated a need for a ready reference to the most common words. Pertinent **Biochemical Abbreviations** and **Normal Clinical Laboratory Values for Blood and Urine** are presented on the inside of the front and back covers, respectively.

We still believe that a **multi-contributor textbook** is the best approach to achieve an accurate and up-to-date presentation of biochemistry. Each contributor is involved actively in teaching biochemistry in a medical and/or graduate school, and has an active research interest in the field in which he or she has written. Thus, each has the perspective of the classroom instructor, with the

experience to select the topics and determine the emphasis required for students in a biochemistry course. Every contributor, however, brings to the book an individual approach, leading to some differences in presentation. Every chapter, however, was edited to have a consistent writing style and to eliminate unnecessary repetitions and redundancies. A few topics are presented in two different places in the book in order to make the individual discussions complete and self contained. This repetition should facilitate the learning process.

The contributors prepared their chapters for a **teaching book**, selecting the important and relevant information in their subject matter. The textbook is not intended as a compendium of biochemical facts or a review of the current literature, but each chapter, however, contains sufficient detail on the subject to make it useful as a resource. Contributors were requested not to reference individual researchers and not to dwell on the historical aspects of their topic; our apologies to the many scientists who deserve recognition for their outstanding research contributions.

One person must accept the responsibility for the final product in any project. The decisions concerning the selection of topics and format, reviewing the drafts, and responsibility for the final checking of the book were entirely mine. I welcome comments, criticisms, and suggestions from students, faculty, and professionals. It is our hope that this work will be of value to those embarking on the exciting experience of learning biochemistry for the first time as well as those returning to a topic in which the information is expanding so rapidly.

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