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Case Files 是美国麦格劳 - 希尔教育出版公司医学图书中的著名品牌系列图书，被世界多所著名医学院校选定为教学用书。北京大学医学出版社与麦格劳 - 希尔教育出版公司合作，全套影印出版了该丛书。包括：

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该丛书具有以下特点：

一、形式上，原版图书影印，忠实展现原版图书的原汁原味，使国内读者直接体会医学原版英文图书的叙述方式和叙述风格。

二、内容上，每个分册包含几十个经典案例。基础学科强调与临床的结合，临床学科强调临床思维的培养。

三、以案例和问题导入，互动式学习，尤其适合 PBL（问题为中心的学习）和 CBL（案例为中心的学习）。

本系列书可作为医学院校双语教学或留学生教学的教材或教学辅导用书，也是医学生学习医学英语的优秀读物。在世界范围内，该系列书还是参加美国医师执照考试的必备用书。

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DEDICATION

To my friend, mentor, and role model, Dr. Benton Baker III, who taught me by his example the importance of integrity, unselfishness, and teamwork.

—ECT

To my wife, Heidi, and to Koen and Kort, for their unwavering love and support and for reminding me daily of what is really important in life.

—KPH

To Dr. John A. DeMoss, Founding Chair of the Department of Biochemistry and Molecular Biology of the University of Texas Medical School at Houston. Dr. DeMoss served as Department Chair from 1971 until he stepped down from that office in 1992, serving as Professor until 2001 when he became Emeritus Professor, his present position. Dr. DeMoss is that unique kind of scholar who excels at both research and teaching. He loves teaching and he is gifted at it. Dr. DeMoss not only has taught and continues to teach generations of students, but he also teaches faculty, especially young faculty, how to teach and to love teaching. Therefore, it is in gratitude for his teaching of us that we dedicate this book to Dr. John A. DeMoss.

—WES & HWS

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PREFACE

We appreciate all the kind remarks and suggestions from the many medical students during the last 5 years. Your positive reception has been an incredible encouragement, especially in light of the short life of the *Case Files* series. In this third edition of *Case Files: Biochemistry*, the basic format of the book has been retained. Improvements were made in updating many of the chapters. New cases include adenosine deaminase deficiency, maple syrup urine disease, alcoholic ketoacidosis, glucose-6-phosphate dehydrogenase deficiency, medium chain fatty acyl dehydrogenase deficiency, pheochromocytoma, and pediatric methomoglobinemia. We reviewed the clinical scenarios with the intent of improving them; however, their "real-life" presentations patterned after actual clinical experience were accurate and instructive. The multiple-choice questions have been carefully reviewed and rewritten to ensure that they comply with the National Board and USMLE format. Through this third edition, we hope that the reader will continue to enjoy learn diagnosis and management through the simulated clinical cases. It certainly is a privilege to be teachers for so many students, and it is with humility that we present this edition.

The Authors

ACKNOWLEDGMENTS

The inspiration for this basic science series occurred at an educational retreat led by Dr. Maximilian Buja, who, at the time, was the dean of the medical school. It has been such a joy to work together with Drs. William Seifert and Henry Strobel, who are both accomplished scientists and teachers, as well as the other excellent authors and contributors. It has been rewarding to collaborate with Dr. Konrad Harms, whom I have watched mature from a medical student to resident and now a brilliant faculty member. I would like to thank McGraw-Hill for believing in the concept of teaching by clinical cases. I owe a great debt to Catherine Johnson, who has been a fantastically encouraging and enthusiastic editor. It has been amazing to work together with my daughter Allison, who is a senior nursing student at the Scott and White School of Nursing. She is an astute manuscript reviewer and already in her early career she has a good clinical acumen and a clear writing style.

At the University of Texas Medical School at Houston, we would like to recognize Dr. Rodney E. Kellems, Chair of the Department of Biochemistry and Molecular Biology, for his encouragement and delight in this project; Johnna Kincaid, former Director of Management Operations for her support; Nina Smith and Bonnie Martinez for their help in preparing the manuscript; and Amy Gilbert for her assistance with the figures. We also would like to thank the many students who have allowed us to teach them over the years and who have in the process taught us. Dr. Seifert thanks his wife Margie for her encouragement, patience, and support.

At Methodist Hospital, I appreciate Drs. Mark Boom, Alan Kaplan, and Judy Paukert. At St. Joseph Medical Center, I would like to recognize our outstanding administrators: Pat Mathews and Paula Efird. I appreciate Linda Bergstrom's advice and assistance. Without the help from my colleagues, Drs. Konrad Harms, Priti Schachel, Gizelle Brooks-Carter, and Russell Edwards, this book could not have been written. Most important, I am humbled by the love, affection, and encouragement from my lovely wife, Terri and our 4 children, Andy and his wife Anna, Michael, Allison, and Christina.

Eugene C. Toy

Drs. Seifert and Strobel want to recognize Alan Levine, who joined our Department of Biochemistry and Molecular Biology when the basic faculties of the Dental Branch and the Medical School were combined in 2005, as he was a gifted and innovative teacher. He plunged into our teaching programs with great enthusiasm for the material he taught, for seeking ways in which the material could be better communicated, but especially for the students who would use the biochemical principles to become excellent physicians, dentists, and researchers. An enormously generous and selfless man, teaching came naturally to Alan and that gift was widely recognized in our institution. We miss his presence.

Often, the medical student will cringe at the "drudgery" of the basic science courses and see little connection between a field such as biochemistry and clinical problems. However, clinicians often wish they knew more about the basic sciences, because it is through the science that we can begin to understand the complexities of the human body and, thus, have rational methods of diagnosis and treatment.

Mastering the knowledge in a discipline such as biochemistry is a formidable task. It is even more difficult to retain this information and to recall it when the clinical setting is encountered. To accomplish this synthesis, biochemistry is optimally taught in the context of medical situations, and this is reinforced later during the clinical rotations. The gulf between the basic sciences and the patient arena is wide. Perhaps one way to bridge this gulf is with carefully constructed clinical cases that ask basic science-oriented questions. In an attempt to achieve this goal, we have designed a collection of patient cases to teach biochemistry related points. More importantly, the explanations for these cases emphasize the underlying mechanisms and relate the clinical setting to the basic science data. We explore the principles rather than emphasize rote memorization.

This book is organized for versatility: to allow the student "in a rush" to go quickly through the scenarios and check the corresponding answers and to provide more detailed information for the student who wants thought-provoking explanations. The answers are arranged from simple to complex: a summary of the pertinent points, the bare answers, a clinical correlation, an approach to the biochemistry topic, a comprehension test at the end to reinforcement or emphasis, and a list of references for further reading. The clinical cases are arranged by system to better reflect the organization within the basic science. Finally, to encourage thinking about mechanisms and relationships, we intentionally did not primarily use a multiple-choice format. Nevertheless, several multiple-choice questions are included at the end of each scenario to reinforce concepts or introduce related topics.

HOW TO GET THE MOST OUT OF THIS BOOK

Each case is designed to introduce a clinically related issue and includes open-ended questions usually asking a basic science question, but at times, to break up the monotony, there will be a clinical question. The answers are organized into 4 different parts:

PART I

1. **Summary**
2. A **straightforward answer** is given for each open-ended question.
3. Clinical Correlation—A discussion of the relevant points relating the basic science to the clinical manifestations, and perhaps introducing the student to issues such as diagnosis and treatment.

PART II

An **approach to the basic science concept** consisting of 3 parts:

1. **Objectives**—A listing of the 2 to 4 main principles critical for understanding the underlying biochemistry to answer the question and relate to the clinical situation.
2. **Definitions of basic terminology**
3. **Discussion of topic**

PART III

Comprehension Questions—Each case includes several multiple-choice questions that reinforce the material or introduces new and related concepts. Questions about the material not found in the text are explained in the answers.

PART IV

Biochemistry Pearls—A listing of several important points, many clinically relevant reiterated as a summation of the text and to allow for easy review, such as before an examination.

CONTENTS

SECTION I

Applying the Basic Sciences to Clinical Medicine

Part 1. Approach to Learning Biochemistry

Biochemistry is best learned by a systematic approach, first by learning the **language** of the discipline and then by understanding the **function** of the various processes. Increasingly, cellular and molecular biology play an important role in the understanding of disease processes and also in the treatment of disease. Initially, some of the terminology must be memorized in the same way that the alphabet must be learned by rote; however, the appreciation of the way that the biochemical words are constructed requires an understanding of mechanisms and a manipulation of the information.

Part 2. Approach to Disease

Physicians usually tackle clinical situations by taking a history (asking questions), performing a physical examination, obtaining selective laboratory and imaging tests, and then formulating a diagnosis. The conglomeration of the history, physician examination, and laboratory tests is called the **clinical database.** After reaching a diagnosis, a treatment plan is usually initiated, and the patient is followed for a clinical response. Rational understanding of disease and plans for treatment are best acquired by learning about the normal human processes on a basic science level; likewise, being aware of how disease alters the normal physiologic processes is understood on a basic science level.

Part 3. Approach to Reading

There are 6 key questions that help to stimulate the application of basic science information to the clinical setting. These are:

1. *What is the most likely biochemical mechanism for the disease causing the patient's symptom or physical examination finding?*
2. *Which biochemical marker will be affected by treating a certain disease, and why?*
3. *Looking at graphical data, what is the most likely biochemical explanation for the results?*
4. *Based on the deoxyribonucleic acid (DNA) sequence, what is the most likely amino acid or protein result, and how will it be manifest in a clinical setting?*
5. *What hormone–receptor interaction is likely?*
6. *How does the presence or absence of enzyme activity affect the biochemical (molecular) conditions, and how does that in turn affect the patient's symptoms?*

1. **What is the most likely biochemical mechanism for the disease causing the patient's symptom or physical examination finding?**
   This is the fundamental question that basic scientists strive to answer—the underlying cause of a certain disease or symptom. Once this underlying mechanism is discovered, then progress can be made regarding methods of diagnosis and treatment. Otherwise, our attempts are only *empiric*—in other words, only by trial and error and observation of association. Students are encouraged to think about the mechanisms and underlying cause rather than just memorizing by rote.

   For example, in sickle cell disease, students should connect the various facts together, setting the foundation for understanding disease throughout their life. In sickle cell disease, valine (a hydrophobic amino acid) is substituted for glutamate (a charged, hydrophilic amino acid) in the sixth position in the β-globin chain of hemoglobin. This decreases the solubility of hemoglobin when it is in the deoxygenated state, resulting in its precipitation into elongated fibers in the red blood cell.

   This causes the red blood cell to have less distensibility and, thus, to *sickle*, leading to rupture of the red blood cell (hemolysis) and blockage in small capillaries. The *sludging* in small capillaries leads to poor oxygen delivery, ischemia, and pain.

2. **Which biochemical marker will be affected by therapy?**
   After a diagnosis has been made and therapy initiated, then the patient response should be monitored to assure improvement. Ideally, the patient response should be obtained in a scientific manner: unbiased, precise, and consistent. Although more than one physician or nurse may be measuring the response, it should be as carefully performed with little intervariation (one person to the next) or intravariation (one person measuring) as possible. One of the therapeutic measures includes serum or imaging markers; for example, in diabetic ketoacidosis, the serum glucose and pH levels would be measured to confirm improvement with therapy. Another example would be to follow the volume of a pulmonary mass imaged by computed tomography following chemotherapy. The student must know enough about the disease process to know which marker to measure and the expected response over time.

3. **Looking at graphic data, what is the most likely biochemical explanation for the results?**
   Medicine is art and science. The **art** aspect consists of the way that the physician deals with the human aspect of the patient, expressing empathy, compassion, establishing a therapeutic relationship, and dealing with uncertainty; the **science** is the attempts to understand disease processes, making rational treatment plans, and being objective in observations. The physician as scientist must be precise about how to elicit data and then carefully make sense of the information, using up-to-date evidence. Exercises to develop the skills of data analysis require interpretation of data in various representations, such as in tables or on graphs.