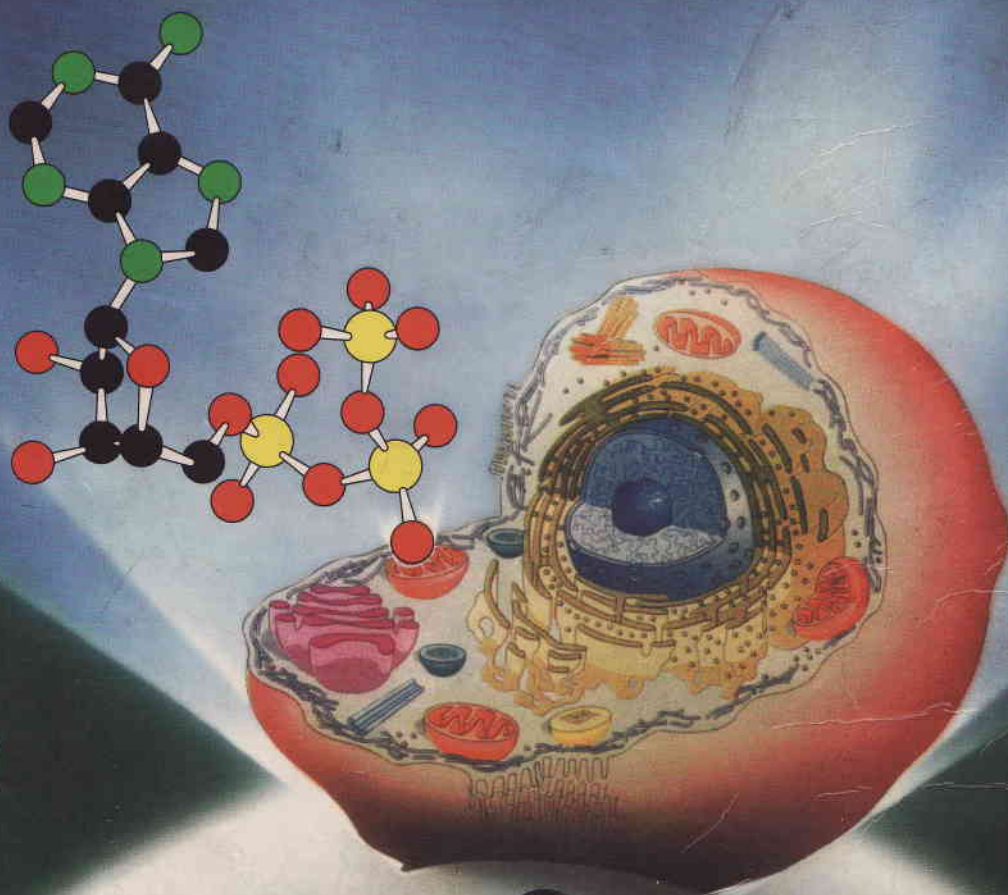


Biochemistry

U. Satyanarayana
U. Chakrapani



Third
Edition

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Biochemistry

Dr. U. Satyanarayana

M.Sc., Ph.D., F.I.C., F.A.C.B.

*Professor of Biochemistry
Siddhartha Medical College
(NTR University of Health Sciences)
Vijayawada, A.P., India*



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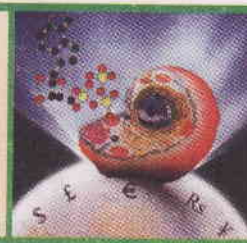


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Preface to the Third Edition



The response to the first and the second editions of my book 'Biochemistry' (reprinted several times in just 6 years) from the students and teachers is simply overwhelming. I was flooded with highly appreciative letters from all corners of India and abroad! This gives me immense satisfaction and encouragement in this academic venture.

I have corresponded with many biochemistry teachers, inviting their comments and opinions for further improving the book. Most of them have been kind enough to offer constructive suggestions. I also visited several colleges and had personal interaction with faculty members and students. These exercises, spread over the past 6 years, have helped me to get direct feedback on my book, besides realising the additional requirements of students.

I have great pleasure in presenting the third edition of my book with several unique/novel features, some high-lights of which are listed below.

- A thorough revision and updating of each chapter with latest advances.
- Multicoloured illustrations for a better understanding of chemical structures and biochemical reactions.
- Increase in the font size of the text for more pleasant and comfortable reading.
- Incorporation of a new Section on Molecular Biology and Biotechnology.
- Addition of ten new chapters—human genome project, gene therapy, bioinformatics, free radicals and antioxidants, tissue proteins and body fluids, environmental biochemistry, genetics, immunology etc.
- An improved orientation and treatment of human biochemistry in health and disease.
- Addition of practical biochemistry and clinical biochemistry laboratory in the appendix.

It is true that I represent a selected group of individuals authoring books, having some time at disposal, besides hard work, determination and dedication. I consider myself an eternal learner and a regular student of biochemistry. However, it is beyond my capability to keep track of the evergrowing advances in biochemistry due to the exponential growth of the subject. And this makes me nervous, whenever I think of revising the book. I honestly admit that I have to depend on mature readers for subsequent editions of this book.

AN INVITATION TO READERS

It is not all the time possible for me to meet the readers individually and get their feedback, despite my fervent wish. Of course, I do write to some people personally seeking their opinions. However, I wish to have the comments and suggestions of each one of the readers of my book. I sincerely invite the readers to feel free and write to me expressing their frank opinions, critical comments and constructive suggestions.

Dr. U. SATYANARAYANA

Acknowledgements



I owe a deep debt of gratitude to my parents, the late Sri U. Venkata Subbaiah, and Smt. Vajramma, for cultivating in me the habit of early rising. The writing of this book would never have been possible without this healthy habit. I am grateful to Dr. B. S. Narasinga Rao (former Director, National Institute of Nutrition, Hyderabad) for disciplining my professional life, and to my eldest brother Dr. U. Gudarū (former Professor of Power Systems, Walchand College of Engineering, Sangli) for disciplining my personal life.

My elder son, U. Chakrapani (MBBS) deserves a special place in this book. He made a significant contribution at every stage of its preparation—writing, verification, proof-reading and what not. I had the rare privilege of teaching my son as he happened to be a student of our college. And a major part of this book was written while he was learning biochemistry. Thus, he was the first person to learn the subject of biochemistry from my handwritten manuscript. The student-teacher relation (rather than the father-son) has helped me in receiving constant feedback from him and restructure the book in a way an undergraduate student would expect a biochemistry textbook to be.

Next, I thank Dr. G. Pitcheswara Rao (former Professor of Anatomy, SMC, Vijayawada) for his constructive criticism and advice, and Dr. B. Sivakumar (Director, National Institute of Nutrition, Hyderabad) for his helpful suggestions on the microfigures. I am grateful to my nephew, Mr. U. Srinivasa Rao, for helping me in drawing some figures.

Last but not least, I thank my wife Krishna Kumari and my younger son, Amrutpani, without whose cooperation and encouragement this book could never have been written. The manuscript was carefully nurtured like a new born baby and the book has now become a full-pledged member of our family.

ACKNOWLEDGEMENTS TO THE THIRD EDITION

I am indebted to a large number of friends, pen-friends and students who helped me to revise and improve the quality of this book. I have individually and personally thanked all of them (who number a few hundreds!). I once again express my gratitude to them.

I thank my friend and colleague, Mr. M.S.T. Jagan Mohan, who has helped me with his frequent interactions to improve the book, and make it more student-friendly. I would like to place on record my deep sense of appreciation to my post-graduate (M.D.) students, Dr. (Mrs.) U.B. Vijaya Lakshmi and Dr. (Mrs.) Vidya Desai Sripad, whose periodical academic interaction and feedback have contributed to the improvement of the biomedical/clinical aspects in some chapters. I acknowledge the help of my friend, Dr. P. Ramanujam (Reader in English, Andhra Loyola College, Vijayawada) for his help and encouragement in revising the book.

I express my gratitude to Mr. Arunabha Sen, Director, Books & Allied (P) Ltd. Kolkata, for his wholehearted support and constant encouragement in revising the book in multicolour, and taking all the pains to bring it out to my satisfaction. I thank Mr. Shyamal Bhattacharya for his excellent page-making and graphics-work in the book. I am indebted to Mr. Prasenjit Halder for the cover design of this book.

I thank my wife, Krishna Kumari, and my younger son, Amrutpani, for their constant support and encouragement. I am grateful to Uppala Author-Publisher Interlinks, Vijayawada, for sponsoring and supporting me to bring out this edition.

Dr. U. SATYANARAYANA

Scope of Biochemistry



The term *Biochemistry* was introduced by *Carl Neuberg* in 1903. Biochemistry broadly deals with the chemistry of life and living processes. There is no exaggeration in the statement, '*The scope of biochemistry is as vast as life itself!*' Every aspect of life—birth, growth, reproduction, aging and death, involves biochemistry. For that matter, every movement of life is packed with hundreds of biochemical reactions. Biochemistry is the most rapidly developing and most innovative subject in medicine. This becomes evident from the fact that over the years, the major share of Nobel Prizes earmarked for Medicine and Physiology has gone to researchers engaged in biochemistry.

The discipline of biochemistry serves as a torch light to trace the intricate complexities of biology, besides unravelling the chemical mysteries of life. Biochemical research has amply demonstrated that all living things are closely related at the molecular level. Thus biochemistry is the subject of unity in the diversified living kingdom.

Advances in biochemistry have tremendous impact on human welfare, and have largely benefited mankind and their living styles. These include the application of biochemistry in the laboratory for the diagnosis of diseases, the products (insulin, interferon, growth hormone etc.) obtained from genetic engineering, and the possible use of gene therapy in the near future.

Organization of the Book

This textbook, comprising 43 chapters, is organized into seven sections in the hierarchical order of learning biochemistry.

- **Section I** deals with the chemical constituents of life—carbohydrates, lipids, proteins and amino acids, nucleic acids and enzymes.
- **Section II** physiological chemistry includes digestion and absorption, plasma proteins, hemoglobin and porphyrins, and biological oxidation.
- **Section III** incorporates all the metabolisms (carbohydrates, lipids, amino acids, nucleotides, minerals)
- **Section IV** covers hormones, organ function tests, water, electrolyte and acid-base balance, tissue proteins and body fluids, and nutrition.
- **Section V** is exclusively devoted to molecular biology and biotechnology (DNA-replication, recombination, and repair, transcription and translation, regulation of gene expression, recombinant DNA and biotechnology)
- **Section VI** gives relevant information on current topics such as human genome project, gene therapy, bioinformatics, prostaglandins, diabetes, cancer, AIDS etc.
- **Section VII** deals with the basic aspects for learning and understanding biochemistry (bioorganic chemistry, biophysical chemistry, tools of biochemistry, genetics, immunology).

Each chapter in this book is carefully crafted with colour illustrations, headings and subheadings to facilitate quick understanding. The important applications of biochemistry to human health and disease are put together as biomedical/clinical concepts. Icons are used at appropriate places to serve as 'landmarks'.

The origins of biochemical words, confusables in biochemistry, practical biochemistry and clinical biochemistry laboratory, given in the appendix are novel features.

The book is so organized as to equip the readers with a comprehensive knowledge of biochemistry.

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