Introduction to physiological and pathological Chemistry

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Preface to sixth edition

Before starting this revision, Mrs. Logan and I read a large number of comments and criticisms by teachers who had examined the fifth edition of *Introduction to Physiological and Pathological Chemistry*. This experience has made it crystal clear that it would be difficult, probably impossible, to write a text pleasing to every teacher. It was interesting to note, however, that the majority of the reviewers thought something should be added; only a few suggested deletions. For example, a number of people apparently want an extended discussion of organic chemistry. One teacher thought that more should have been written about buffers. Another thought the various clinical types of acidosis should have been explained. In view of recent developments, it was not surprising that several people thought the discussion of nucleic acids should have been lengthened. Still another thought that a table listing the radioactive isotopes used in medicine would have been desirable. We are grateful for these and numerous other suggestions, many of which have been incorporated in this edition.

The comments also made it evident that teachers of chemistry to students of nursing remain, as I have mentioned in the prefaces to previous editions, firmly entrenched in one of two camps: either they believe that chemistry should be taught with no reference to clinical medicine, or they believe that numerous references to clinical applications will stimulate the interest of the student. It is, of course, impossible to write a book satisfactory to both groups. I have chosen, as in the past, to provide a text for the latter camp. I have never been a nursing student, but I *have* been a medical student, and I remember all too vividly how most of those in my senior class wished they might have had some insight into the clinical importance of the basic sciences while they were freshmen and sophomores. I cannot imagine that the reactions of nursing students are very different. Even though the clinical situations chosen as examples may not be familiar to the student, the constant repetition of applications will, I think, prove as nothing else can that it is necessary to understand the basic sciences if modern clinical medicine and nursing are to be understood.

In each edition I have commented on the rapidity with which biochemistry is advancing. I believe I can say without reservation, however, that the last five years have surpassed all the others! I have attempted to avoid lengthening the book too greatly by making discussion as brief and as clear as possible and by placing a rather large amount of material in reduced type. In general, material is placed in reduced type to indicate that it is primarily of reference value or to indicate to teachers who teach short courses those topics that can be omitted or assigned as general reading.

Since so many teachers, including Mrs. Logan, have stressed the desirability of including more organic chemistry, this subject has been greatly expanded in this edition. Whereas in previous editions there was only one chapter on organic chemistry, in this edition there are four. The first two of these contain most of the information included previously. The third deals entirely with the isomerism of organic compounds. Some teachers may wish to omit this. It is so common these days, however, to encounter drugs that are trans- or cis- and to read about natural compounds that are D- or L- that it seems in order to provide students with an understanding of these terms. The fourth chapter devoted to organic chemistry gives a brief survey of aromatic and other cyclic compounds. To conserve space, the discussions of antibiotics, the section on chemical warfare, and the table listing organic radicals have been placed in the appendix. Mrs. Logan felt that these discussions should not be deleted, since she, at least, uses the information in her teaching.

So much new information has been added that it will be impossible to list all of it. In the first chapter, a new table of metric weights and measures includes the new units adopted in Paris in 1958 by the International Committee on Weights and Measures and more recently by our own National Bureau of Standards. The table listing the subatomic particles is bigger and more interesting than ever. Also, a brief account of the anti-particles, which also are included in the table, has been given.

In reading over the fifth edition, it suddenly occurred to me that van der Waals forces have not been discussed in any edition. Moreover, I did not find this topic mentioned in any of a half dozen or so texts for nurses that I examined. This is surprising, for without van der Waals forces there could be no liquids and no solids—only gas! It is not a difficult subject and something has been written about it in this edition. Hydrogen bonding, now known to be so important in the structures of proteins and nucleic acids, has been explained.

There is one group of diseases that is of undeniable biochemical importance, even to those who do not wish to teach applications. These are known as "inborn errors of metabolism" or as "diseases of enzymic defect." Brief discussions of a number of these have been included throughout the text and some have been assembled in a table in the chapter on enzymes. Also included in the chapter on enzymes is an example illustrating the general principle that many drugs act by reacting chemically with enzymes.

Several new applications of radioactive isotopes in diagnosis and experimental medicine have been mentioned. A table listing those radioactive isotopes that are widely used for treatment, diagnosis, and experimentation has also been included.

Recently discovered mechanisms for the synthesis of fatty acids, lecithins, and cholesterol have been described in reduced type. The increasily important hexose monophosphate shunt is mentioned in the chapter on carbohydrate metabolism.

A description of the recently postulated structure of the DNA molecule has been included, both in words and as illustrations. An explanation of the present thinking of many biochemists as to the role DNA and RNA play in protein synthesis and in heredity is given.

An illustration of the α helix is included, and a discussion of current concepts of protein structure has been given for the first time. The new shorthand system used in writing the structures of polypeptides and proteins has been explained. The formulas and shorthand symbols of the naturally occurring amino acids have been placed in a table in the appendix.

In the last few years a number of new bleeding dyscrasias have been reported. In almost every case the cause of the bleeding is due to the lack of a sufficient amount of one of the numerous factors now known to be involved in the clotting mechanism. Since many hospital laboratories now can test for these factors, it is almost a certainty that students will be confronted with them on hospital charts. Therefore, included in reduced type is a fairly comprehensive review of present knowledge in the field of blood clotting. Included with this is a discussion of the rationale of anticoagulant therapy and its control.

The discussion of clinical acidosis and alkalosis has been expanded. Since this is a subject that readily can become confusing to a student, special effort has been made to try to make the explanations as brief and as clear as possible.

Two newly recognized hormones are described in the chapter on that subject. Relaxin was discovered some years ago, but many scientists were skeptical of its existence until recently. There can no longer be any doubt that it is a true mammalian hormone—and, as a matter of fact, that it may be important in other animal species. Relaxin now is used in medicine as a drug. Not as much is known about the other hormone, erythropoietin. There is even controversy as to the organ of the body that makes it. Nevertheless, it is established beyond doubt that blood from anemic patients or animals contains a factor that stimulates the production of new blood cells.

I have believed all along that illustrations make a book more valuable. They add interest and are excellent teaching aids. This edition contains 166 illustrations—57 more than were in the last one. In a number of cases, old illustrations have been replaced by new ones.

The present edition, as was the first and all succeeding editions, is introduced by the excellent chapter written by Katharine D. Dreves, nee Katharine Densford. Since the last issue Miss Densford has assumed emeritus status at the University of Minnesota School of Nursing and is now Mrs. Carl A. Dreves. Those of

her friends who might wish to correspond with her will be interested to know that her present address is 853 West Nebraska Ave., St. Paul 17, Minn.

Once again I would like to express my great admiration for Dr. J. F. McClendon, who introduced me to the science of physiological chemistry in 1931. This remarkable man, who took his doctorate in 1906 at the University of Pennsylvania, has since that time maintained a vigorous and active research program. Even today, at his advanced age, he is pursuing important problems in the fields of nutrition and physiological chemistry.

Also, my deepest thanks go to Miss Maureen Wade, who typed most of this revision, and to Mrs. Rosalie Dippel and Mrs. Lynn Begemann, who assisted her; Mr. James Skillman, who provided a number of the beautiful illustrations and photographs used in this edition; and Dr. George Phillips and Dr. Robert L. Kroc, who provided some of the illustrations. I am greatly indebted to Mrs. Jane Lenahan, whom I consulted in order to write intelligently about blood clotting. My ever-patient wife, Jennie M. Arnow, has, as always, encouraged me to try to make this edition the finest available—even though this has meant many hours of separation for us on week-ends and evenings.

Finally, I cannot close without expressing my deep gratitude to Mrs. Marie C. D'Andrea Logan, who once again has worked with me during the revision of this book. Her wise counsel and honest criticism have been most helpful.

L. Earle Arnow

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