

cost justifications, and interpretation of manufacturers' claims. The 15 articles are divided into three sections: Systems Techniques, Cost Control, and Evaluation of Equipment.

Staff Review ■

Predictive Toxicometrics—Basic Methods for Estimating Poisonous Amounts of Foods, Drugs, and Other Agents. By ELDON M. BOYD. Williams & Wilkins, Baltimore, MD 21202, 1972. vi + 408 pp. 14 × 22 cm. Price \$32.00.

Even though there is increasing interest in the broad field of toxicology, one is often hard put to find a suitable text which can be used in undergraduate and graduate programs. A few years ago, Dr. Ted A. Loomis published a modern text on toxicology under the title *Essentials of Toxicology* (Lea & Febiger, 1968). The book has served a very useful purpose for those teachers presenting an introductory course in toxicology. For those courses in which methodology was emphasized, a book edited by Dr. G. E. Paget, *Methods of Toxicology* (F. A. Davis Co., 1970), became popular. More recently, a revised text by Drs. Linton H. Thienes and Thomas J. Haley, under the title *Clinical Toxicology* (5th Edition, Lea & Febiger, 1972), became available. To these three texts now can be added *Predictive Toxicometrics*, authored by a recognized toxicologist, Dr. Eldon M. Boyd, Professor of Pharmacology, Queen's University, Canada. The book is primarily directed toward methods of testing and evaluating the toxicity of drugs and other agents using many examples taken from the author's own laboratory. One of the unique features of this book is that many little details are presented that other books have not included.

In thumbing through the text, one is immediately confronted with words which often are not used by toxicologists in this country. These include "toxicometrics," "uniposal toxicometrics," and "multiposal predictive toxicometrics." This should not really cause the reader to shy away from the book, since the terms become well defined on reading the text. On the first page of the book, Boyd defines "toxicometrics" by drawing attention to two Greek words, *toxicon*, or poisons, and *metrikos*, or measures. One versed in etymology would thus have no difficulty with this work. "Predictive toxicometrics" can then be considered as determining "the effect of a range of doses (toxic and nontoxic) of a substance in representative groups of plants, animals, or man and, from the results, predict the effect of such doses on the human or animal or plant population."

In the introductory chapter, Boyd reviews very briefly the training required to undertake toxicometric studies. He also presents a list of general references, texts, and journals which fit into the field of toxicometrics. Several paragraphs are also directed at the history of predictive toxicometrics, while several pages deal with food and drug legislation, including both Canadian and U. S. laws. Boyd clearly identifies at the end of the first chapter the scope and direction of the book:

I shall confine my discussion of predictive toxicometrics to what I consider to be the essential or minimal amount of information which should be obtained by the predictive toxicologist. There is practically no limit to the total amount of data he could collect. I shall also confine my review to areas in which I have had practical experience.

The remaining portions of the book are divided into three segments, with appropriate chapters under each segment. The first segment is called "Factorial Toxicometrics," with further subdivisions entitled "Host Factors," "Factors Associated with Drug Administration," and "Factors Associated with the Environment." A second segment is entitled "Uniposal Toxicometrics," which can be defined as the toxicity of a substance as a single dose (or a series of doses repeated at short intervals usually from several minutes to an hour). The last segment is called "Multiposal Predictive

Toxicometrics" or the toxicity of a substance administered daily for varying periods of time.

Coming back to the first segment, "Factorial Toxicometrics," the author includes seven chapters under "Host Factors." These range from a discussion on species and strains of animals to idiosyncratic toxicity. In this same segment, but under the classification of "Factors Associated with Drug Administration," he includes chapters on physical and chemical properties of drugs, route of drug administration, simultaneous administration of other agents, and tolerance to repeated drug administration. The segment ends with a review on the effect the environment can play on altering toxicity of a substance. Environment here includes the presence of the same animals (as a group rather than single), other species (including man), and the physical environment. For example, the attention the animal care personnel direct to animals may have a dramatic effect upon the biological response. Both the uniposal and multiposal segments of the book are filled with very valuable information for the experimental toxicologist. Chapter 14, under uniposal considerations, presents an interesting account of the effect various solvents can play in altering toxic response. Unfortunately, in many toxicity studies, the investigators have not given sufficient attention to the solvent. Boyd suggests in this chapter that pilot studies employing one to five animals be used in order to save time before a full study is to be undertaken. Chapter 15 deals with clinical parameters which should be observed in toxicity studies. He stresses the importance of cage-side observation by a person who is knowledgeable in the normal behavior of the animals he or she is studying. Further emphasis is given to daily clinical measurements such as change in body weight, food intake, water intake, colonic temperature, urinary volume, and urinary analysis. Even though many toxicologists employ routinely hematology studies, Boyd feels that the information derived may be minimal in relation to the time required to perform the tests.

In Chapter 16, the author reviews uniposal autopsy parameters and describes these under four headings: (1) gross pathology, (2) histopathology, (3) organ weights, and (4) organ water levels. He pays close attention to many details which unfortunately are not generally followed by many toxicologists for one or more reasons. For instance, he shows by examples changes in water content of body organs of rats stored for 24 hr. under several different temperatures. Even though many toxicologists have not placed much emphasis on organ weights in toxicology studies, Boyd emphasizes that this measurement is extremely useful since it can be a very sensitive indicator of toxicity. Under the segment on "Multiposal Predictive Toxicometrics," specifically Chapter 19, Boyd presents the disadvantages of administering a substance in the diet if the agent, such as a drug, is to be taken orally on a daily basis. He prefers to administer the drug to animals by gastric lavage.

Other chapters appear in the last segment which deal with duration of daily dosing, analysis of clinical signs, analysis of autopsy signs, and multiposal toxicity syndromes.

One of the interesting aspects of this very valuable collection of toxicology information is that the author does not refer to such terms as "acute toxicity," and prefers the terms "uniposal" and "multiposal" to "chronic toxicity." He does not discuss his reasons for this in the book, but in no way does this detract from the book once the terms are understood.

If I were to find a fault with the book, it would be that the author has perhaps included too many details and data which may, at times, hinder a student of toxicology from following the theme the author wishes to emphasize. This fault is minor, however. This book should be of great value in particular to teachers presenting graduate courses in toxicology and to those toxicologists in the field who can always use a little help in refreshing their knowledge.

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