

***Toxicology of
Insecticides***

Second Edition

Toxicology of Insecticides

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*To Professor A. W. A. Brown and R. D. O'Brien
in appreciation of their
pioneering works and for many years of friendship.*

Preface to the Second Edition

The most rewarding aspect of writing a book is receiving encouraging comments from one's colleagues, since one always wonders whether fair coverage was made of the work of others or whether some omissions were made. I feel very fortunate that many colleagues took the time to read the first edition of this book and chose to use it as a textbook in their teaching. During the past few years they have given me valuable suggestions by pointing out areas that needed to be added to improve the book.

Toxicology is one of the fastest moving scientific fields. In the areas of insecticide toxicology many new advances have been made since this treatise first appeared. Therefore, it would not be easy to write even a review paper that would not be outdated by the time it was published. In revising this volume I have made a conscious effort to adhere to the basic principles which have been developed over the years. While I have retained the basic framework of the original book, advances that fundamentally change certain concepts or add a new horizon have been chosen for updating those fields where applicable. The main emphasis has been placed on the addition of new sections and new compounds developed since 1975. Since the first edition appeared, several books covering technical details in each group have been published. They are excellent encyclopedic resources in their chosen areas, and are listed in each section as recommended reading material.

What I hope to have presented is a book that describes the principles of the toxicology of insecticides and may be used as a textbook in teaching graduate students or as an introductory book for scientists in other disciplines seeking to understand the basics of insecticide toxicology.

Fumio Matsumura

Preface to the First Edition

Why are books written? Since I have read many works by my colleagues with admiration, this question has always intrigued me. Further, writing a book takes a good deal of time and effort, and I had imagined that I would never undertake such a demanding task. A few unexpected events and circumstances have changed my mind. The first was the pleasant experience of editing *Environmental Toxicology of Pesticides* with Drs. Mallory Boush and Tomomasa Misato. This fine symposium volume occasioned many interesting responses, including a suggestion to prepare a more complete treatise on the grounds that such "proceedings" volumes, by their very nature, do not satisfactorily offer a complete and coherent description of the field, but cater chiefly to specialists. I myself prefer single-authored books for basic understanding of a scientific field.

The second circumstance leading to the present volume was the availability of teaching notes from my course on the toxicology of insecticides. As the need to cultivate environmental awareness has increased, there has been a parallel increase in the enrollments of such courses both here and in other major institutions. Yet no comprehensive and up-to-date text has been available. The third factor which facilitated the effort was an especially pleasant sabbatical in Hawaii, where the availability of the excellent Hamilton Library at the University of Hawaii considerably eased my task.

The problems I confronted were mainly related to the scope of the field, the scarcity of sufficiently solid results in certain areas to warrant clear-cut conclusions (particularly in the field of environmental toxicology), and, more seriously, the necessity to provide coverage of the exceedingly diverse areas that contribute to research on insecticide toxicology. In each case, certain compromises were necessary to complete my original intentions.

The book that resulted then is designed for use by graduate students and the general scientific community rather than those already expert in the field. It is my intention that the volume be self-contained so that the reader can rapidly develop an understanding of the basic ideas of the field. The fundamental references and related material are amply documented for those who wish to study any aspect further.

To review and digest this colossal amount of information posed another problem. Because I have experienced disappointments with computer searches of the literature, I have relied solely on customary search methods, and trust I have missed no important papers. I have also taken the liberty of freely borrowing data from existing books and reviews for the chapters covering well-established fields (e.g., Chapter 3, on the characteristics of insecticides) and have collectively listed those useful references at the beginning of each chapter to clarify the source of information. They were most helpful in summarizing and extracting principles, and I would like publicly to thank their authors here.

Finally, I want to offer briefly my philosophy on pesticide pollution. In this treatise I wanted to examine all possibilities, even if it meant being scientifically risky or remote. This position derives from the special circumstance that problems in the environment are seldom discovered unless one specifically looks for them. The difficulties we confront with PCBs, dibenzodioxins, methyl mercury, etc., remain most refractory, and all point to the necessity of imaginative and daring approaches. My discussion of carcinogenicity and mutagenicity, for example, reflects such a view. On the other hand, I have also tried to examine critically the validity of all such unproven claims and hypothesis. Wherever possible, I avoided comparison of unrelated works, and instead relied on data that clearly are scientifically sound and repeatable. For instance, in arriving at a conclusion on the role of biomagnification in environmental toxicology, I relied on bioaccumulation data taken from the limited ecosystems where the history of contamination is known, thus avoiding unwarranted comparisons between fish from Santa Monica Bay and North Atlantic sea birds.

The book could not have been completed without the help of Ms. Claudia T. Ward, who diligently assisted me in detailed editorial matters.

I would also like to thank Dr. Wallace C. Mitchell and other staff members of the Entomology Department, University of Hawaii, for arranging my stay and the use of the library facilities.

I further thank the authors and publishers of numerous references for permission to reproduce figures which helped immensely to illustrate scientific principles.

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