

Preface

Although there have been some books on chemistry and some on toxicology of organophosphorus compounds (OPs), no books have been published which deal with different aspects of these compounds. Consequently, this book aims to bring existing knowledge of OPs together and act as a comprehensive manual on the Basic and Clinical Toxicology of OPs which can be used by toxicologists, health professionals and students.

Since they were first discovered, OPs have been employed as pesticides, petroleum additives, and chemical warfare nerve agents. They act as toxins through inhibiting the cholinesterase enzyme. Inhibition of this enzyme especially in cases of acute human exposure causes mild to severe symptoms and signs associated with cholinergic receptor hyper-stimulation. OPs have been used as pesticides for over 50 years and unfortunately no suitable alternatives have been found to replace them. Between 750,000 and 3,000,000 human OP intoxications occur globally every year, most of them resulting from occupational, accidental and intentional exposure. Mortality is higher in the developing countries where OP pesticides are readily available and may be used for suicide, and is estimated to cause 300,000 fatalities annually.

On the other hand, chronic OP toxicity in humans has become a new concern worldwide as they can reach humans through several sources from food and the environment. Unfortunately, diagnosis of human chronic OP poisoning is not easy and needs highly experienced physicians, particularly clinical toxicologists and sophisticated toxicology laboratories. Chronic exposure to OPs is thought to increase the rate of chronic diseases such as different types of cancers, diabetes, neurodegenerative diseases like Parkinson's, Alzheimer's, and Amyotrophic Lateral Sclerosis (ALS), birth defects, reproductive disorders, respiratory problems particularly asthma and chronic obstructive pulmonary disease, cardiovascular disease such as atherosclerosis and coronary artery disease, chronic nephropathies, autoimmune diseases like systemic lupus erythematosus and rheumatoid arthritis, chronic fatigue syndrome, and aging.

OPs with high levels of toxicity can unfortunately be used as the chemical warfare nerve agents (CWNAs). They were first synthesized in Germany (so called G-agents) before World War II, but fortunately they were not used during that war. After the war, CWNAs were made in the UK and USA. New CWNAs called Novichoks

were also introduced by Russian researchers, which have caused even more concern internationally.

Examples of OPs used as CWNAs include the nerve agent Tabun (GA) which was used on the battlefield for the first time in 1984 and Sarin (GB) used in 1988 by the Iraqi army against Iranian combatants, and even on civilians (Halabjah massacre), which resulted in high morbidities and mortalities. Terrorist attacks using Sarin in Japan, Matsumoto (June 27, 1994) and the Tokyo subway (March 20, 1995) are other cases of OP nerve agent incidents.

This book is a practical guide for different agricultural, occupational, environmental, toxicological, medical and health professionals and also for authorities who are involved in different aspects of OPs. Lack of scientific knowledge on OPs in some developing countries with no pesticides control has caused many morbidities and mortalities. Unsafe use of OP pesticides has led to occupational poisonings, environmental disruption and accumulation of pesticide residues in fruits, vegetables, and dairy foods. Misuse of readily available OP pesticides results in many acute accidental and intentional poisonings worldwide.

This book has 9 chapters explaining the chemistry and toxicity of OPs in clinical, environmental and occupational exposures and proposes preventive and protective measures. We would thus recommend it to all scientists, students and experts in different fields of toxicology and related sciences as well as to all health professionals, particularly clinical toxicologists and emergency physicians and those involved in arm control and regulatory agencies.

We would like to thank the contributors of the chapters for their kind efforts in creating this text, despite their heavy engagements with different scientific and clinical affairs. We would also like to acknowledge the support of the Springer staff, particularly Ms Manika Power and Ms Sally Thompson.

We welcome any comments and feedback from the experts in the field on this book to consider for future edition.

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