

MEDICAL TOXICOLOGY OF NATURAL SUBSTANCES

Foods, Fungi, Medicinal Herbs, Plants, and Venomous Animals

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To my wife, Kimberly, your loving support and encouragement created the environment to write this book, and your patience allowed me to focus on this book away from what I enjoy most—being with you.

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To my daughter, Shannon, sharing your knowledge for the treatment of animals and your passion for becoming a veterinarian is a great joy for me.

FOREWORD

Men and women live in a miraculous world, surrounded by natural beauty, diverse environmental conditions and habitats, and evolutionary marvels. Within this intricate assembly of flora and fauna, many plant and animals have evolved that are more than passive inhabitants of this planet. They are endowed with substances both offensive and defensive, namely, potent toxins capable of slowly poisoning or rapidly subduing very large animals, including humans. In addition, modern man utilizes plant and animal products and extracts for commercial, medical, religious, and other purposes. These exposures range from naturopathic cures to a casual encounter with cactus spines during a wilderness expedition, from a diver's encounters with the needles of sea urchins to covert politically motivated assassinations utilizing ricin from castor beans. Wild mushroom foragers grow old only if they are not too bold, while amateur aquarists who reach into their saltwater tanks learn about the toxicity under the cover of lionfish plumage.

We can never learn or know too much about how best to deal with natural toxins, whether we seek to eliminate them from our immediate food supply or treat acutely intoxicated victims. Furthermore, from the

understanding of syndromes and therapies, we are offered insights into their possible therapeutic value. No matter what the ultimate fate of man, the seeds, spores, fangs, and venom glands will survive. While the relationship of toxins to humans may not be always characterized as symbiotic, there will remain a coexistence that is predicted, yet always in part unpredictable.

The medical toxicology of natural substances is predicated upon their existence, which will diminish as humans continue to erode and consume their environment. Until then, we should continue to catalogue, record, evaluate, and teach. Medical practitioners and toxicologists should accept the responsibility to perpetuate these traditions because the wisdom of indigenous shamans is being lost as rapidly as the rainforests in which they reside.

What we do not seek to protect may soon disappear. It is my fervent wish that this book not only serve as a superb medical reference for those who seek to cure, but that all who read it are inspired to preserve the landscapes and seascapes that support the origination of everything that is natural and sustainable upon this Earth.

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PREFACE

Medical Toxicology of Natural Substances: Foods, Fungi, Medicinal Herbs, Plants, and Venomous Animals is designed to provide in-depth, evidence-based coverage of the most important natural toxins. This book is the first of a four volume series in Medical Toxicology, which will include drugs of abuse and psychoactive plants, occupational and environmental exposures, and pharmaceutical overdoses. Scientific knowledge in the field of Medical Toxicology increased considerably since I co-authored the First Edition of *Medical Toxicology: Diagnosis and Treatment of Human Poisoning* with the late Matthew J. Ellenhorn, published in 1988. That book was designed as an authoritative, concise volume for the immediate treatment of poisoning including natural toxins, pharmaceutical agents, and occupational exposures. In the last 20 years, sufficient interest has developed in natural toxins, food contamination, medicinal herbs, chronic occupational exposures, and bioterrorism to justify coverage of the field of Medical Toxicology by a book series rather than a single volume. *Medical Toxicology of Natural Substances: Foods, Fungi, Medicinal Herbs, Plants, and Venomous Animals* retains the consistent, formatted style I developed for the First Edition of *Medical Toxicology: Diagnosis and Treatment of Human Poisoning*. Once the reader is familiar with the templates used in my book series, the consistency of the organization allows the reader quickly to locate the appropriate information necessary for informed decisions regarding the sources, effect, regulation, recognition, and management of toxic exposures.

Conversions for length and temperature in metric and imperial systems are provided to ease the use of this book by an international readership, whereas the metric system for mass and concentrations are retained to limit any confusion about doses in the United States.

The following provides organizational details on the material under the headings for each toxin:

History provides interesting historical facts involving the use and recognized effects of the toxicity of natural substances.

Identifying Characteristics and Botanical Descriptions helps the reader identify the characteristics and geographic distribution of the specific toxin (e.g., venomous animal, toxic plant).

Exposure discusses the sources, uses, and regulation of exposures to these toxins.

Principal Toxins identifies the main toxins in the natural substances and provides data on the chemistry, structure, and physical properties of the toxin that are important for the reader's understanding of the clinical response to the toxin. This part discusses the basic science and the composition of the toxins along with factors that affect the delivery of the toxin including discussions of the venom apparatus and seasonal variation in the locations of the toxins. Additionally, this part covers the biochemical and pathophysiological basis for the toxic responses.

Dose Response covers data on the lethality and clinical effects of the toxin both in animals and in humans as well as factors that affect the potency of the toxin. The emphasis is on dose-related effects, but important adverse and idiosyncratic reactions are also discussed.

Toxicokinetics discusses the disposition of the principal toxins in the body including the distribution, absorption, and elimination of the principal toxins. The emphasis is on human data, but animal data may be included when human data are sparse.

PREFACE

Clinical Response provides data on the clinical features of poisoning following exposure to the toxin including the onset, duration, and type of clinical effects.

Diagnostic Testing covers information important to the interpretation of the clinical significance of the laboratory data. This section includes current laboratory methods to determine the presence of the toxin, effects of storage, biomarkers of exposure in blood, urine, and postmortem material, and the laboratory abnormalities detected by imaging studies and ancillary tests.

Treatment provides details on current methods to treat the poisoning including information important for first responders, life-threatening problems associated with the poisoning, the use of antidotes, and measures of supportive care.

Medical Toxicology of Natural Substances: Foods, Fungi, Medicinal Herbs, Plants, and Venomous Animals focuses on scientifically validated facts about specific toxins based on clinical experience and the medical literature. References are documented to validate the statements and to provide sources for further inquiry. The interdisciplinary, evidence-based approach is designed to reach beyond clinical settings to increase the scientific understanding of those in associated fields (analytical laboratories, universities, regulatory agencies, coroner's offices) involved with decisions regarding toxic exposures. My hope is that increased scientific communication between the fields aligned with Medical Toxicology will inspire more inquiry into the pathophysiology, clinical effects, biomarkers, treatment, and prevention of toxic exposures.

DONALD G. BARCELOUX, MD

June 12, 2008

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179	Jellyfish, Hydroids, Sea Anemones, and Corals (Phylum: Cnidaria)	1085
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181	Starfish, Sea Urchins, Sea Cucumbers, and Fireworms (Phylum: Echinodermata)	1105