

## BOOK REVIEWS



**Toxicology of Reptiles.** Susan C. Gardner and Eva Oberdörster (eds). CRC Press, Taylor and Francis Group, 6000, Broken Sound Parkway, Boca Raton, Florida 33487-2742, USA. 2006. 310 pp. Price: US \$149.95.

Compared to studies on other major vertebrate taxa, the field of reptilian toxicology is still in its infancy. However, a comprehensive understanding of reptilian toxicology is of importance to biologists due to the following reasons. (1) Reptiles are a familiar group that not only occupy a pivotal position on the phylogeny of vertebrates (i.e. direct ancestor to birds and mammals), but they also possess several unique biological attributes that, if better understood, could contribute significantly to understanding basic biology and the molecular mechanisms behind human health and diseases<sup>1</sup>. Indeed, there is a surprisingly high degree of similarity in basal ganglia structures and illness across diverse amniote species including lizards and humans<sup>2</sup>. (2) Many reptiles occupy key positions within the food-web and understanding their ecotoxicology could not only contribute to developing successful conservation programmes for reptiles, but also for other members of a particular food-web. Further, understanding reptilian toxicology is of paramount importance to Indian biologists because India is not only one of the richest countries with respect to reptilian fauna (home to more than 490 species of reptiles<sup>3</sup>), but also a large number of them are endemic. Thus, the book under review provides a comprehensive description of the current state of knowledge of reptilian toxicology with respect to life-history, reproduction, endocrinology, neurophysiology, immunology and ecology, and is an important reference source in biology and toxicology.

The volume contains ten contributed chapters by numerous authors. As always, the first chapter is an introduction to the book and one of the editors, Susan C. Gardner, provides an overview of the book's content under the title 'Introduction to reptile toxicology'. The second chapter 'Global threats affecting the status of reptile populations', jointly contributed by Lisa Irwin and Kelly Irwin, is intended to provide a global overview of the current threats affecting reptile populations. This chapter provides examples of known threats and life-history correlates that should be considered while studying reptile populations. Although this chapter is well illustrated with appropriate sub-headings and cleverly chosen examples, data used from the 2003 IUCN Red List are outdated (even before the publication of the book!). I suggest readers to visit the IUCN website for recent information on the global decline in reptile populations, which is frequently updated there.

William Hopkins provides an overview of the use of tissue residues in reptile toxicology in chapter three, entitled 'Use of tissue residues in reptile toxicology'. He rightly points out that the literature is full of contaminant residue studies, but there are few experimental attempts to evaluate relationships among tissue residue data, environmental concentrations and biological effects. Chapter four, 'Tools for assessing contaminant exposure and effects in reptiles', is the longest chapter in the book (occupies 60 pages). It is an essential reading for students and/or young scientists wanting to take up research in reptile toxicology. However, I am afraid, for those unfamiliar with molecular and biochemical techniques, the first few sections are difficult to follow (e.g. molecular biomarkers, biochemical biomarkers, etc.). However, this chapter provides a perfect launch pad for those who want to venture further. 'Hepatic, renal and adrenal toxicology' (chapter five) is a classical toxicology chapter and illustrates the connectivity between these important systems.

In chapters six to nine, toxicology from the perspective of different systems and methodological approaches is discussed. Unfortunately, there is lot of overlap between chapter 4 and the above chapters. This overlap makes reading unenjoyable at many places, although one of the editors, in the introduction to the book, justifies the need for intentional

overlap. However, Emily Willington's arguments in chapter six on development, reproduction, endocrine disrupting chemicals, a new paradigm in eco-toxicology, and emphasis on phylogenetic studies, and Joanna Burger's detailed discussion on behavioural data in toxicology in chapter seven under the title 'Neurotoxicology and behavioural effects in reptiles', keep readers' interest alive. Little information is available on immunotoxicological data in reptiles and is summarized in chapter eight by Jennifer Keller and co-authors, entitled 'Immunotoxicology and implications for reptilian health'. Interested readers can obtain more updated information on immunotoxicology of amphibians and reptiles from Fournier *et al.*<sup>4</sup>.

Genotoxicants are compounds that are able to damage DNA and induce heritable changes. Environmental genotoxicology is a relatively new discipline. Chapter nine, 'Reptilian genotoxicology' deals with this new discipline and Novillo and co-authors illustrate the sensitive as well as selective techniques that are available to monitor genotoxic effects in reptiles. In general, reptile species appear to be effective monitors of genotoxic contaminants. Inclusion of some cutting-edge potential techniques to detect DNA damage and a schematic representation of the possible temporal sequence of steps leading from the exposure of the organisms to genotoxicants to the expression of evolutionary effects, are the highlights of this chapter. However, long-term effects of environmental genotoxicants are largely unknown in reptiles and their application to reptilian communities remains limited.

The last chapter, 'Reptile ecotoxicology', is well compiled by Kyle W. Selcer. The author describes various life-history strategies that reptiles use and more importantly, on the basis of these life-history strategies he predicts systems that are likely to be disrupted. He argues correctly in this chapter that use of life-history parameters such as growth rate, age structure, fecundity, etc. as the main focus of ecotoxicological studies, may be more useful than the traditional abundance estimates for assessing the status of a population. He also describes the difficulties associated with population-level research in ecotoxicology, identification of model species and non-destructive sampling. Unfortunately, as many herpetologists have pointed out, the list of model species in this chapter is limited to

only a particular part of the world (i.e. America-centric).

Overall, this volume brings together a diversity of information and issues related to reptilian toxicology from various perspectives, although not for the first time. One can recall here SETAC's (The Society of Environmental Toxicology and Chemistry) 904 pages detailed 2000 volume *Ecotoxicology of Amphibians and Reptiles*, edited by D. W. Sparling, G. Linder and C. Bishop. The present book will become a good companion for the above. I started reading this book as a general herpetologist and by the time I reached the last page, I realized how important it is not only for herpetologists or toxicologists, but also to a wide community of biologists, as pointed out at the beginning of this review. However, this volume has a few shortcomings. For instance, some of the tables have not been carefully compiled and checked in the production. Errors are common. Fortunately, now the author(s) as well as publisher have realized these errors and are distributing corrected tables as supplementary sheets along with new purchases. The volume is devoid of coloured illustrations and few more flow charts that could have made understanding easy and reading enjoyable. Also, the book is expensive, considering the quality of production, putting it beyond the reach of many researchers, especially young research students.

1. Modi, W. S. and Crews, D., *Curr. Opin. Genet. Dev.*, 2005, **15**, 660–665.
2. Baxter Jr, L. R., *Physiol. Behav.*, 2003, **79**, 451–460.
3. Das, I., *A Photographic Guide to Snakes and other Reptiles of India*, Ralph Curtis Publishing Inc., Florida, USA, 2002, p. 6.
4. Fournier, M., Robert, J., Salo, H. M., Dautrempuits, C. and Brousseau, P., *Appl. Herpetol.*, 2005, **2**, 297–309.

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**The Legacy of Suśruta.** M. S. Valiathan. Orient Longman, Chennai. pp 830. Rs 875.

*The Legacy of Suśruta* by M. S. Valiathan is an epic volume of over 800 pages and is similar to his earlier publication, *The Legacy of Caraka*. The present volume consists of thematically arranged material, covering exhaustively all chapters of the original text with tabular presentation of data, a special feature of this important work. This version is a rich guide to the Brihattrayi text *Suśruta Samhitā*, one of the most important classic on ayurveda. This *Samhitā* is unique in many ways besides its commendable objectivity of approach in describing the concepts, theories and doctrines and their applications. *Suśruta Samhitā* is a treatise on the anatomy and surgery of the pre-Christian era. Hence without a study of *Suśruta Samhitā*, any study of classical ayurveda would remain incomplete. The literary evidence of the high surgical skill, instrumentation and para-surgical procedures like Kṣārakama, Agnikarma and Raktamokṣaṇa during Suśruta's time is the hallmark of our surgical inheritance. A comprehensive ayurvedic definition of swāsthya, the perception of continuum of three major forces of Nature, namely the moon, sun and air with the Tridoṣika bio-triangle of the living body is unique to Suśruta. It is only Suśruta who so precisely describes the six stages of evolution of a disease, i.e. Ṣaṭkriyākāla based on the pathophysiological rhythm of Doṣas, depicting the specific opportune time for therapeutic intervention.

Most ayurvedic *Samhitās* do not appear thematically organized in their presentation, a style which makes their pursuance difficult for a beginner. The ayurvedic *Samhitās* are a legendary encyclopaedia evolved over a long time and carry the impact of more than one authority or redactor. The superimpositions and additions are not difficult to identify. *The Legacy of Suśruta* is an account of the available text of *Suśruta Samhitā*, which is claimed to be the reduction of the original *Suśruta-Tantra*, which might have been written well before 600 BC. In order to overcome and account for obvious anachronisms, it is more than necessary to realize that the present form of the *Suśruta Samhitā* could be a work of around 1st century AD and is attributed to one Nāgārjuna, who seems to be of unknown identity. Precise historical evaluation is difficult.

Valiathan's book is written in a lucid language with an obvious effort to present the entire subject matter of *Suśruta Samhitā* thematically organized and

supported by tabular presentation of literary data illustrated with many useful tables, charts and diagrams. The author seems particularly cautious in his objectivity and scientific approach, without compromising the sense of historical perspectives. The common trend of over-toned interpretation of ancient descriptions, obvious in most of the contemporary books, seems to have been avoided in Valiathan's book. He attempts to limit himself to what the original text writes, and does not add much that is undue from his side.

The book describes *Suśruta Samhitā*'s subject matter in 15 sections divided into 87 chapters covering all chapters from the original *Samhitā* text representing almost the complete *Suśruta Samhitā*. However, the comprehensive introduction spread over 39 pages and the epilogue at the end of the book are highlights of this work. Forty-five figures and over 300 tables spread across the text make this book richly illustrated and lucid. Every chapter is appended with a list of original textual references from the *Samhitā* and keeps the book intimately linked with the text of *Suśruta Samhitā*, making it easier to refer to the Sanskr̥ta text when needed. The list of botanical names of medicinal plants of *Suśruta Samhitā*, the glossary of technical terms of ayurveda and the word index added in the book are of help in the study of this book in particular and the subject of ayurveda in general.

The preface and over 40 quotes from *Suśruta Samhitā* display important verses in Sanskr̥ta script with parallel Romanized versions and theme meaning. These quotes are legendary statements depicting the zenith of health science of the Suśrutarian era. However, quote 15 under this head seems to have some discrepancy, warranting correction.

In summary, Valiathan's book is a well-conceived scholarly work on an important ayurvedic classic, presenting a realistic account of the text with careful evaluation of the work of Suśruta and his time. It is obviously the most reliable and readable study guide to *Suśruta Samhitā* in particular and ayurveda in general. The book is useful to students and scholars of ayurveda, medical historians, professionals and researchers. It provides the best reading for those who do not belong to the formal ayurvedic fraternity, but are interested to know and work with it.

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