BOOK REVIEW

Gupta RG. *Reproductive and Developmental Toxicology*. Academic Press, Elsevier; 2011, 1202pp, \$250 (hardcover), ISBN 9780123820327.

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As a trained toxicologist, I realized early on the complexity of the specialized field of reproductive and developmental toxicology. Understanding the toxicological impact and changes occurring at the interface of the complicated 3 component system: parent, placenta, and fetus, is by no means an easy task. This book, *Reproductive and Developmental Toxicology*, provides the most intricate and comprehensive overview of both historical and current knowledge of reproductive and developmental toxicology. The book is divided into 15 sections that address various aspects of this field of toxicology. Each section is further comprised of individual chapters that cover detailed background and recent information pertinent to the discussed topic. While the primary focus of the book is on human species, it also provides unique coverage of the toxicological impact on other organisms, ranging from those used in toxicological testing to wildlife species. The reference list at the end of each chapter offers an invaluable resource for up-to-date information on a wide array of reproductive and developmental toxicology topics. The book is in hardcover, well indexed, and packed with figures and tables, with an additional elegant color plate section at the end of the book.

The first 2 sections of the book focus on general topics that pertain to reproductive and developmental toxicology, providing solid background introductions to reproductive anatomy and physiology, pharmacokinetics of the mother and fetal compartments during pregnancy, physiologically-based pharmacokinetic models for reproductive and developmental toxicity, and the excretion of medical as well as environmental pollutants into breast milk. The book then transitions into a comprehensive review of various *in vitro* and *in vivo* models assessing reproductive and developmental toxicity. A detailed description of the internationally recognized guidelines for toxicity testing is provided, with elaborate explanation of the different available models, both validated and nonvalidated, as well as the novel techniques of *in silico* and CAESAR (computer-assisted evaluation of industrial chemical substances according to regulation) methods. Commonly used animal models including zebra fish, *C.elegans*, as well as primate models are further explained

with particular emphasis on neuro- and immune-toxicity aspects. An in-depth discussion of the *in vitro* biomarkers of developmental neurotoxicity is provided in a separate chapter, followed by detailed description of *in vivo* biomarkers of reproductive and developmental toxicity, with particular emphasis on examples of biomonitoring of exposure to pesticides.

The next 8 sections of the book are dedicated to an in-depth description of reproductive and developmental toxicity of a wide array of toxic agents. The compounds discussed include nanoparticles and radiation; gases and solvents; cigarette smoking, alcohol, and drugs of abuse; food additives; pharmaceuticals and nutraceuticals; metals; pesticides and environmental contaminants; phytotoxins; and biotoxins. Each chapter starts with a comprehensive introduction that provides a historical background as well as basic knowledge of the chemical addressed. I enjoyed the systematic coverage of the toxicity of individual chemicals, particularly the detailed *in vitro* as well as *in vivo* studies addressing the risk and mechanism of such toxicity. The chapters are further enriched by summary tables that recapitulate toxicity reports, proposed mechanisms, or effects observed in experimental animals. A distinctive feature of this book is dedicating a few chapters to the toxicities of select compounds (eg, melamine and cyanuric acid) in livestock, poultry, cats, and dogs.

Section 11 of the book includes coverage of special topics highly relevant to the field of reproductive and developmental toxicology. Each chapter discusses 1 of the topics, ranging from stem cell and pharmacogenomics application, to epigenetic regulation of gene and genome expression. Chapter 61 focuses on a detailed description of the role of mitochondrial dysfunction in reproductive and developmental toxicity. The chapter integrates latest information with basic knowledge of mitochondrial function and extends further to describe the role of mitochondria in germ line cells, followed by a summary of various studies that examined the use of mitochondria as a marker of injury during toxicity studies, especially for spermatogenesis and reproductive toxicity. In this section, 3 chapters offer an ample overview of developmental neurotoxicity. Different aspects of the toxicity are discussed, including cell signaling mechanisms and inflammation and oxidative injury, as well as dysregulation of cholesterol homeostasis. Most recent information regarding the role of cholesterol disruption effects on brain development and their impact on developmental disorders, as fetal alcohol syndrome and retinoic acid embryopathy, are discussed.

The next section of the book, section 12, starts with the topic of endocrine disruption, providing a thorough background, proper definitions of various terms and

important concepts, and followed by a detailed discussion of different aspects of endocrine disruption including documented adverse effects in humans as well as wildlife species, mechanisms, and available screening systems. The rest of the section is dedicated to mutagenicity, carcinogenicity, genotoxicity, and infertility topics. Similar to previous sections, summary tables and figures enrich this section providing a concise synopsis of a surplus of currently available data.

The final 3 sections of the book culminate in a detailed explanation of the toxicologic pathology of the reproductive system, placental toxicity, and reproductive toxicity in domestic, wildlife, and aquatic species. An extensive introduction of the hormonal regulation of both male and female reproductive systems starts off the section, followed by an elaborate description of the toxic effects documented for various toxicants and their mechanisms. I personally appreciate the in-depth coverage of placental development and its role as a maternal-fetal exchange platform and the currently available *ex vivo*, *in vitro*, and *in vivo* models of examining the different facets of hemochorial placentation. Such introduction provides the perfect background for the ensuing chapters that heavily describe placental toxicity of various types

of chemicals: abused drugs, metals, and insecticides, and the pathological features of placental injury. Finally, the book ends with an entire section dedicated to reproductive and developmental toxicity observed in domestic animals, wildlife, and fish. This section adds to the exceptionality of the book. It provides the only available resource that integrates human and other species developmental and reproductive toxicity.

As I reflect on the massive information that this book offers, I can certainly attest to its uniqueness and thoroughness in addressing one of the hardest fields of toxicology. It provides a matchless resource to the field of reproductive and developmental toxicology serving health care students and professionals as well as toxicology researchers. In addition, it is a superb handbook for toxicologists involved in the regulation of toxic substance exposure. Indeed, this book is a reliable resource to the field of reproductive and developmental toxicology.

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