
Preface

The discipline of developmental toxicology is, at its core, an integration of concepts, models, and methodologies based most heavily on the superimposition of toxicology principles upon the science of developmental biology. The science of developmental toxicology also borrows heavily from other research areas that are concerned with regulation of cell growth, migration, differentiation, and cell death, as such are central to the study of stem cells, cancer, and chronic diseases. Several methodological approaches used to investigate these aspects of developmental toxicology need to be modified and adapted to meet the unique restraints inherent in developing organisms. This volume seeks to illustrate some of these adaptations and to highlight the evolution of methods from classical teratology approaches to the dynamic, state-of-the-art molecular methods, systems biology, and next-generation models and procedures. We regret not being able to represent all emerging technologies and applications in this volume, but hope that the sections we have included will pique the interest of those less familiar with developmental toxicology. This work is primarily intended for basic scientists, academics, and industrial toxicologists whose research and interests include references to the period of life between fertilization and parturition, although isolated events during gestation are known to have profound consequences across the entire lifespan. This work should provide a valuable resource to those planning experiments to investigate consequences of environmental, nutritional, or chemical effects caused during development.

The chapters and topic areas are organized in order of descending biological complexity, beginning with whole animal or in vivo study models proceeding to the more focused in vitro models. The in vivo and in vitro sections are each prefaced with a brief overview. Subsequent chapters focus on specific areas of toxicology or developmental biology principles, such as biotransformation of chemicals, induction and regulation of antioxidant and protective pathways, assessment of specific diseases, and focused assessment of biological processes. Much is yet to be learned about the modes of action of environmental factors and chemicals during the critical growth and highly vulnerable stages of embryogenesis and fetogenesis. We look forward with great anticipation toward the creation and application of many new methods and models for developmental toxicology that can begin to answer many of the enigmatic questions that have puzzled researchers for decades.

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