

## A Closer Look at Kidney Development

THE KIDNEY: FROM NORMAL DEVELOPMENT TO CONGENITAL DISEASE

by Peter D. Vize, Adrian S. Woolf, and Johnathan B.L. Bard

Academic Press, New York, NY, 2003, 519 p, \$159.95

Early stages of kidney development get relatively short shrift in many embryology textbooks, so when I first saw the galleys of *The Kidney: From Normal Development to Congenital Disease*, edited by Peter Vize, Adrian Woolf, and Johnathan Bard, at an American Society of Nephrology meeting, I felt I had stumbled on to the lost Ark and could not wait for the final version to be published. Since my copy arrived, I have had a hard time putting it down, and when I do, I frequently find it in the arms of my post-doctoral fellow. Finally, an entire textbook devoted to the embryology of the kidney!

This book is well organized and beautifully illustrated and covers the full spectrum of renal development, beginning with Malpighian tubules of *Drosophila melanogaster*, followed by detailed discussions of vertebrate renal maturation; and ending with clinical correlations. Particularly welcome to this reader are the chapters covering the pronephros and mesonephros, which compose the first quarter of the 519-page book.

The book is divided into three sections, moving from early to late kidney development, followed by clinical correlations. Each section begins with a brief overview of what is be-

ing made, and then discusses how this development is accomplished, including brief introductions to molecular mechanisms and experimental techniques. Each chapter provides appropriate references and is authored by active investigators in the field, adding important insight and perspective to each topic.

Section I: *Embryonic Kidneys and Models*, covers Malpighian tubules in *Drosophila* in Chapter Two before delving into vertebrate kidney development. Chapters Three through Five discuss pronephros development, including induction of pronephric tubules in fish and amphibia, formation of the nephric duct, the glomus and vasculature. Both Malpighian and pronephric tubules are posited as models for tubulogenesis, and advantages of each as an experimental model are discussed in some detail. This seems almost unnecessarily apologetic; these stages are intrinsically important and interesting. The section on comparative pronephros morphology among several species appeals not only to evolutionary biologists but also to clue-seekers and problem-solvers in general. The next two chapters discuss the mesonephros. These chapters are a bit thinner than others in the section, but it is not the fault of the authors. Most of the work done in the mesonephros involves its anatomy or contribution to other organ systems, and these topics are nicely summarized. Nevertheless, there is room for expansion here: the mesonephros may be an ideal model to

study how the distal tubule connects to the collecting duct; anterior-posterior patterning, proliferation, apoptosis, induction, and tubulogenesis are all topics well suited for future studies involving the mesonephros.

Section II is entitled *The Adult Kidney*, although it really discusses the metanephros, which also develops in embryonic life and is the definitive kidney only in higher vertebrates. It comprises, however, a wonderfully detailed discussion of metanephric development. Section II begins with an overview of the anatomy and histology of the mature human urinary system, then takes the reader stepwise through development of the ureteric bud, the metanephric mesenchyme, and nephron development. Gene expression patterns and genetic manipulation offer new insight into long-studied topics such as mesenchymal to epithelial transformation, establishment of polarity, development of the glomerular capillary and basement membrane. Colorful illustrations complement the excellent text descriptions, and these chapters are simply outstanding. The chapter on development of function of the metanephric kidney bridges the gap between many embryology textbooks and renal physiology and will be of particular interest to clinicians.

Discussions of molecular mechanisms and experimental methods are found at the end of both sections. Comparison of these four chapters reveals significant conservation of gene expression patterns

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at all three stages of kidney development; the molecular mechanisms chapters might well have been combined. Both of the *Experimental, Genetic, and Molecular Tools* chapters will prove to be excellent resources for laboratory trainees, although I anticipate that they will be revised and updated considerably in future editions.

The chapters dealing with congenital disorders illustrate and emphasize the molecular mechanisms of renal induction and maturation, relate carcinogenesis to embryology, and demonstrate the consequences of tubular maldevelopment. The clinical correla-

tions provided are good, but more are needed. The chapter about cystic diseases in particular would benefit from expansion to include recent reports regarding fluid and anion secretion, cell proliferation, and cilia in cyst development.

What's wrong with this book? Not much. Aside from occasionally confusing nomenclature, it's well organized and well written. It provides a comprehensive overview of kidney development as understood in 2002. It would be a shame if this book is not the first of many future editions, hopefully including discussions of the stroma, expansion of the chapters

on the mesonephros and congenital disorders, and updates on molecular mechanisms and experimental techniques. Until then, this book is an excellent reference for students and senior scientists who want to review the fundamentals of renal development, as well as anyone who loves clear explanations and beautiful illustrations.

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