# Preface

Congenital heart disease is the leading cause of infant death and affects approximately one in every 100 babies born in the USA. Aberrant cardiovascular development is the reason for congenital heart diseases and the pathogenesis of majority congenital heart disease remains unclear. Cardiovascular system is the first system to begin functioning and plays critical roles in embryo development. From the lower invertebrate to mammalian animal, the heart morphology is obviously different among Drosophila (one chamber), Zebrafish (two chambers), Xenopus (three chambers), and rodent (four chambers), but the genetic and molecular mechanisms in cardiovascular development are surprisingly conserved. Indeed, the knowledge we get from the invertebrate and vertebrate model organisms can help us understand and explore new strategy for the treatment of human cardiovascular disease.

The study of cardiovascular development has acquired new momentum in last 20 years due to the advancement of modern molecular biology and new available equipments and techniques, and we begin to understand the molecular pathways and cellular interaction in the process of heart induction, rightward looping, chamber formation, and maturation. Heart and vascular developments are sophisticated processes and new information expanded very quickly. It is not difficult to find a text book or review articles to summarize the new advancements in the field of cardiovascular development; however, it is not easy to find a book to describe the comprehensive step-by-step protocols for cardiovascular development research. Owing to the page limitation, the current research articles cannot describe the very detail of the experimental material and methods. The major goal of this book is to provide the step-by-step protocols for both beginner and experience scientist in the field of cardiovascular development research.

Cardiovascular development: methods and protocols cover many new state-of-the-art techniques in the field of cardiovascular development research including in vivo imaging and Bioinformatics. We also described many of the classical methods which are high frequently used in the cardiovascular development research, such as fate mapping and immunohistochemistry staining. This book is divided into three parts. In part I, we summarized using different organisms for cardiovascular developmental research. Part II focused on using cell and molecular biology methods to study cardiovascular development. Part III summarized the new available techniques for cardiovascular development research, such as in vivo imaging and bioinformatics. Our primary audience of this book is for molecular biologists and cell biologists who are working on the cardiovascular development research. It is also a useful reference for clinician, genetic biologist, biochemists, biophysicists, or other field scientists who are interested in cardiovascular development.

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