

Preface

The size and volume of our knowledge are replenished very quickly in the modern era of biology. Every week, new facts are published, new genomes are sequenced, and new proteins are discovered. Unlike any time before now, a detailed understanding of the behavior of biomolecules, changes in gene expression, the regulation of hormone synthesis, or enzymatic reactions are available for the diagnosis and pharmacological manipulation of diseases.

This book is designed to fill a void in the literature of illustrated reviews of the well-documented and understood mechanisms of human disease at the cellular and molecular levels. The core of the book is based on the Elsevier Disease Pathway Collection (signaling pathways of 250 diseases), which was compiled by the team of authors throughout 2012–18 (<http://www.pathwaystudio.com>).

Pathways and networks are becoming indispensable tools in many areas of molecular biology, pharmacology, and medicine. Our knowledge about protein-protein interactions accumulated in the form of pathway models allows us to interpret the results of molecular screenings and identify targets for drug design. A unique aspect of this book is the images of disease pathways, which are a registered trademark of Elsevier, and this is the first time they are being published outside of Elsevier's commercial software. A link to the repository where the described pathway models can be freely browsed or downloaded is also provided.

The most difficult part of assembling this book was deciding which diseases to include. There are so many diseases that were covered by the team of authors and so few available pages to fill. We have included 42 the most common widespread diseases in the human population and other well-studied ones that can together illustrate the interactions between molecular causes and disease symptoms.

We have not covered oncological diseases because we believe that the oncology domain must be described separately as an intensively studied and important part of human disease. We also have not included syndromes (with rare exception) or mental disorders in this book, but we hope we can publish them in the future.

Objectives

This atlas has a dual intent: to provide readers with detailed information about the basic concepts of disease signaling pathways on a high scientific level while simultaneously keeping the presentation simple and clearly understandable for a general biologist.

To meet these objectives, we shaped disease descriptions as an atlas, a richly illustrated book with a short narrative. We listed definitions and all terms that facilitate understanding disease mechanisms before the description of molecular signaling pathways for each disease. At the same time, we attempted to motivate readers to find more information about each disease by providing specialized web links and references.

The authors are not responsible for any conclusions or consequences arising from the use of the information presented in this book such as drug names and another disease treatment-related information. Any drugs or products mentioned in this publication should be used in accordance with the prescribing information prepared by relevant specialists or the drug's respective manufacturers.

Assembly

This book is divided into three parts:

The first part gives introductory information about pathways as described in the guide and legend. Chapter 1 in the first part provides an introduction to cell biology, molecular signaling biochemistry, and a systems biology approach to the study disease mechanisms.

The second part (Chapters 2–13) focuses on an overview of the molecular mechanisms underlying 42 diseases and covers 12 areas of human disease. Diseases are grouped into 12 areas following the International Statistical Classification of Diseases and Related Health Problems, <https://icd.who.int>. Each disease description includes a summary, a short glossary, and images of disease signaling pathways along with a descriptive narration. The mechanisms of molecular signaling are discussed briefly but thoroughly.

Chapter 14, located in the third part, discusses the application of signaling pathways and networks in the analysis of big data for personalized and precision medicine. The third part also includes a glossary and the links to other resources.

Intended audience

The book is intended for general biologists, bioinformaticists, medical workers, and students. Readers who require information about the cellular and molecular mechanisms of human diseases may also find it useful.