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医学生复习指南丛书

英文影印版

细胞生物学与组织学基本要点

BASIC CONCEPTS
IN

CELL BIOLOGY AND HISTOLOGY

A STUDENT'S SURVIVAL GUIDE

James C. McKenzie
Robert M. Klein



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北京大学医学出版社



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BASIC CONCEPTS

IN

Cell Biology and Histology

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北京大学医学出版社

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Basic Concepts in Cell Biology and Histology: a student's survival guide

ISBN 0 - 07 - 036930 - 5

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图书在版编目(CIP)数据

细胞生物学与组织学基本要点 = Basic Concepts in
Biology and Histology/(美)麦肯济等主编. —北京:
北京大学医学出版社,2002.10

(医学生复习指南丛书)

ISBN 7 - 81071 - 386 - 8

I. 细… II. 麦… III. ①人体细胞学 -
医学院校 - 教学参考资料 - 英文 IV. R329

中国版本图书馆 CIP 数据核字(2002)第 076128 号

北京大学医学出版社出版

(北京海淀区学院路 38 号北京大学医学部院内 100083)

莱芜市圣龙印务书刊有限责任公司印刷 新华书店经销

* * *

开本:787mm×1092mm 1/16 印张:28.5 字数:599 千字

2003 年 1 月第 1 版 2003 年 1 月山东第 1 次印刷

印数:1 - 3000 册 定价:28.50 元

影印出版说明

“医学生复习指南丛书”是美国医学生所用的基础医学阅读参考书系列之一，也是参加“美国医生执照考试”（United States Medical Licensing Examination, USMLE）考前复习的主要参考书。由《生理学基本要点》、《生物化学基本要点》、《免疫学基本要点》、《药理学基本要点》、《病理学基本要点》、《医学遗传学基本要点》、《细胞生物学与组织学基本要点》、《胚胎学基本要点》、《神经科学基本要点》等组成。

本丛书内容主要为基础医学各核心课程中的基本概念及重点内容，涵盖了“美国医生执照考试”（USMLE）的主要考点内容，并用容易理解与掌握的方式对各个学科的难点内容进行了讲解。在编写方式上，作者用简明易懂的文字和大量的图表进行解释，便于学生掌握学科的重点内容，可使学生用最少的时间对学科的内容有一个完整的概念与基本了解。在取材上经过作者的精心取舍，注重知识的系统性和相关知识的联系，加强了临床应用必需的内容，因而在内容的深度和广度上比较适合医学本科教育的需要，也符合医学基础服务于临床的宗旨。例如：“细胞生物学与组织学基础教程”中不仅讲述了从细胞膜至细胞核的基本知识，还介绍了各种组织和各个器官的结构和功能；“医学遗传学基础教程”从遗传学的基础概念联系到大量的临床遗传性疾病；“胚胎学基础教程”讲述了许多先天性畸形的发生机制和危险因子……这样的编排不仅使医学基础知识紧扣临床实际，还会增强学生运用知识的能力。当然，在相互联系中更能巩固所学知识的记忆。

本丛书写作文字流畅，可读性强；条理清晰，方便查阅。对于中国的医学生来说，使用本丛书不仅能使他们掌握各学科的专业基础知识和基本概念，同时，在学习过程中，还能学到更加地道的英语表达方式，提高其专业外语水平。本丛书可作为医学基础课双语教学的英语教学参考书，也是参加美国“医生执照考试”（USMLE）的中国医学生和医生考前复习的必备参考书。

• P R E F A C E •

This Basic Concepts text organizes and integrates the immense fields of cell biology and histology. *Basic Concepts in Cell Biology and Histology* is not intended to be a comprehensive textbook, but a systematic compendium of key concepts about the relationship between cells, tissues, and organ systems and the way in which these histological entities function. The first part of the book develops the basic concepts of how cells are organized internally to carry out both generalized and specific functions. The second part of the book focuses on the arrangement of cells to form tissues and organs which work together to carry out organ system functions. Furthermore, the cell biology concepts developed in the first ten chapters are applied to the tissues and organs described in the remaining chapters. The last two chapters of this book serve as a road map to the identification of tissues and organs and a review of the basic techniques used in cell biology and histology. Also included is a guide to the orientation and interpretation of electron micrographs.

Each chapter contains primary topics (bold headings) which are organized into a series of basic concepts (within boxes) proceeding from the most basic to the more specific. To be successful in the study of cell biology and histology it is essential to master these basic concepts. In turn, each basic concepts box is followed by a short paragraph of explanation. Within these paragraphs, important terms are italicized. These are terms that are deemed essential to understanding and discussion of the chapter topic. The arrangement of basic concepts boxes and the highlighting of key terms which comprise the vocabulary of cell biology and histology are intended to facilitate student learning.

The flowcharts provided in the Strategies chapter are a unique portion of the book. They have been developed through the combined experience of the authors: fifty years of teaching over 7000 medical, dental, and graduate students in our respective educational institutions. These flowcharts facilitate the efforts of the beginning student to circumnavigate the obstacle that all tissues and organs appear indiscriminately pink and purple while learning the tried and true methods for their diagnostic identification. The flowcharts are organized to allow histological identification of any organ with an average of only four or five specific decisions, such as “Is this a solid organ or does it have a lumen?” or “What type of epithelium is present?”

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• A C K N O W L E D G M E N T •

The authors gratefully acknowledge their students and colleagues at Howard University College of Medicine and The University of Kansas Medical Center for their insightful comments and cogent criticisms of the manuscript. The following faculty from Howard University are acknowledged for their input and contributions: James H. Baker, William Ball, Robert J. Cowie, Raziel Hakim, and John K. Young. The following faculty from the University of Kansas are acknowledged for their input and contributions: George C. Enders, Lisa K. Felzien, and Vincent H. Gattone, II. In addition, the immunologic expertise of Gary W. Wood at Wayne State University School of Medicine and proofreading of John Clancy, Jr., of Loyola University—Stritch School of Medicine are appreciated. The authors thank David Cormack of the University of Toronto for providing the long bone development figure for Chapter 14. The authors thank the artists who painstakingly converted their ideas and sketches into exquisite drawings. In alphabetical order, the artists involved in completion of the artwork for this book were: John Berman, Andre Branning, Karen Chinn, Larry Howell, and Bill Paige. The authors acknowledge their present and past students who have challenged them to develop new teaching methodologies and whose comments and criticisms have improved the content of this text. Our students have provided our *raison d'être* for writing *Basic Concepts in Cell Biology and Histology* and have kept us excited about this endeavor. We anticipate that our future students will find this text to be beneficial to their studies of cell biology and histology.

• C O N T E N T S •

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BASIC CELL BIOLOGY

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• C H A P T E R • 1 •

MEMBRANES

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- **Membrane Lipids**
 - **Membrane Proteins**
-
- • • • • • • • • •
-

As Allan Sherman once sang

You gotta have skin.
All you really need is skin.
'Cause skin is the thing
that keeps your insides in.

Indeed, cell membranes do, to a large extent, keep the insides of a cell in and the outside of the cell out. Membranes also form boundaries of cytoplasmic organelles such as the nucleus, mitochondria, lysosomes, endoplasmic reticulum, Golgi apparatus, and transport and secretory vesicles. However, membranes play a much greater role than merely acting as barriers. First, their composition allows them to be more selective than the bouncer at the local hot nightclub, allowing passage to only the “beautiful” molecules and keeping out the “riff-raff.” The beautiful molecules tend to be (1) those which are lipid soluble and can diffuse easily through the membrane and (2) those for which special doors (channels and transporters) exist. Second, membranes also serve as sites for communication with the external milieu via *receptors and recognition molecules* embedded in or connected to their superstructure. Third, membranes are also the location of macromolecules by which cells *anchor* themselves to each other or the extracellular “gunk” (matrix). In addition, they provide attachment sites for contractile or cytoskeletal proteins which alter or maintain cell shape. Finally, membranes are dynamic. Their basic components can change rapidly to meet the demands of life in the fast lane, or their basic morphology can be altered to allow the passage of big packages of “stuff” in or out of the cell. The key to understanding the structure and function of cell membranes is *compartmentalization*.