

Kenneth J. Ryan / C. George Ray

Champoux • Drew • Neidhardt • Plorde

Sherris
MEDICAL
MICROBIOLOGY

An Introduction to Infectious Diseases



Fourth Edition

4TH EDITION

SHERRIS
MEDICAL
MICROBIOLOGY

AN INTRODUCTION TO INFECTIOUS DISEASES

KENNETH J. RYAN, MD

C. GEORGE RAY, MD

EDITORS

GIFT OF THE ASIA FOUNDATION
NOT FOR RE-SALE
QUÀ TẶNG CỦA QUỸ CHÂU Á
KHÔNG ĐƯỢC BÁN LẠI

TRƯỜNG ĐẠI HỌC CÔNG NGHIỆP HÀ NỘI
TRUNG TÂM THÔNG TIN THƯ VIỆN
07 07
00041

McGraw-Hill

MEDICAL PUBLISHING DIVISION

New York Chicago San Francisco Lisbon London Madrid Mexico City Milan
New Delhi San Juan Seoul Singapore Sydney Toronto

Sherris MEDICAL MICROBIOLOGY, Fourth Edition

Copyright © 2004 by The McGraw-Hill Companies, Inc. All rights reserved. Printed in the United States of America. Except as permitted under the United States copyright Act of 1976, no part of this publication may be reproduced or distributed in any form or by any means, or stored in a data base or retrieval system, without the prior written permission of the publisher.

Copyright © 1994 by Appleton & Lange; copyright © 1990 by Elsevier Science Publishing as *Medical Microbiology: An Introduction to Infectious Diseases*, edited by John C. Sherris; copyright © 1984 by Elsevier Science Publishing as *Medical Microbiology: An Introduction to Infectious Diseases*, edited by John C. Sherris

34567890 DOW DOW 09876

ISBN 0-8385-8529-9

NOTICE

Medicine is an ever-changing science. As new research and clinical experience broaden our knowledge, changes in treatment and drug therapy are required. The authors and the publisher of this work have checked with sources believed to be reliable in their efforts to provide information that is complete and generally in accord with the standards accepted at the time of publication. However, in view of the possibility of human error or changes in medical sciences, neither the authors nor the publisher nor any other party who has been involved in the preparation or publication of this work warrants that the information contained herein is in every respect accurate or complete, and they disclaim all responsibility for any errors or omissions or for the results obtained from use of the information contained in this work. Readers are encouraged to confirm the information contained herein with other sources. For example and in particular, readers are advised to check the product information sheet included in the package of each drug they plan to administer to be certain that the information contained in this work is accurate and that changes have not been made in the recommended dose or in the contraindications for administration. This recommendation is of particular importance in connection with new or infrequently used drugs.

This book was set in Times Roman by Progressive Information Technologies. The editors were Janet Foltin and Karen Davis. The production supervisor was Richard Ruzicka. The text designer was Marsha Cohen. The cover designer was Aimée Nordin. The art coordinator was Becky Hainz-Baxter. The index was prepared by Editorial Services. RR Donnelley, Willard, was printer and binder.

This book is printed on acid-free paper.

Library of Congress Cataloging-in-Publication Data

Sherris medical microbiology : an introduction to infectious diseases/Kenneth J. Ryan, C. George Ray, editors.—4th ed.
p. ; cm
Includes bibliographical references and index.
ISBN 0-8385-8529-9 (alk. paper)
1. Medical microbiology. 2. Communicable diseases. I. Title: Medical microbiology. II. Ryan, Kenneth J. (Kenneth James), 1940- III. Ray, C. George, 1934- IV. Sherris, John C. [DNLM: 1. Communicable Diseases. 2. Microbiology. WC 100 S553 2003] QR46.M473 2003
616'.01—dc21

ISBN 0-07-121245-0 (International Edition)

2003054180

Exclusive rights by The McGraw-Hill Companies, Inc., for manufacture and export. This book cannot be re-exported from the country to which it is consigned by McGraw-Hill. The International Edition is not available in North America.

CONTENTS

Preface		xi		
Acknowledgments		xiii		
CHAPTER 1	Overview <i>Kenneth J. Ryan</i>	1		
PART I				
THE BACTERIAL CELL		9		
CHAPTER 2	Bacterial Structures <i>Frederick C. Neidhardt</i>	11		
CHAPTER 3	Bacterial Processes <i>Frederick C. Neidhardt</i>	27		
CHAPTER 4	Bacterial Genetics <i>Frederick C. Neidhardt</i>	53		
PART II				
BIOLOGY OF VIRUSES		77		
CHAPTER 5	Virus Structure <i>James J. Champoux</i>	79		
CHAPTER 6	Virus Multiplication <i>James J. Champoux</i>	87		
CHAPTER 7	Viral Genetics <i>James J. Champoux</i>	105		
PART III				
HOST-PARASITE INTERACTIONS		113		
CHAPTER 8	Immune Response to Infection <i>John J. Marchalonis</i>	115		
CHAPTER 9	Normal Microbial Flora <i>Kenneth J. Ryan</i>	141		
CHAPTER 10	Host-Parasite Relationships <i>Stanley Falkow</i>	149		
PART IV				
SPREAD AND CONTROL OF INFECTION		173		
CHAPTER 11	Sterilization and Disinfection <i>Kenneth J. Ryan</i>	175		
CHAPTER 12	Epidemiology of Infectious Diseases <i>W. Lawrence Drew</i>	185		
CHAPTER 13	Antibacterial and Antiviral Agents <i>Kenneth J. Ryan and W. Lawrence Drew</i>	193		
CHAPTER 14	Antimicrobial Resistance <i>Kenneth J. Ryan</i>	215		
CHAPTER 15	Principles of Laboratory Diagnosis of Infectious Diseases <i>Kenneth J. Ryan and C. George Ray</i>	229		
PART V				
PATHOGENIC BACTERIA		259		
CHAPTER 16	Staphylococci <i>Kenneth J. Ryan</i>	261		
CHAPTER 17	Streptococci and Enterococci <i>Kenneth J. Ryan</i>	273		
CHAPTER 18	Corynebacterium, Listeria, and Bacillus <i>Kenneth J. Ryan</i>	297		
CHAPTER 19	Clostridium, Peptostreptococcus, Bacteroides, and Other Anaerobes <i>Kenneth J. Ryan</i>	309		
CHAPTER 20	Neisseria <i>Kenneth J. Ryan</i>	327		

CHAPTER 21	Enterobacteriaceae <i>Kenneth J. Ryan</i>	343	CHAPTER 36	Enteroviruses <i>C. George Ray</i>	531
CHAPTER 22	<i>Vibrio</i>, <i>Campylobacter</i>, and <i>Helicobacter</i> <i>Kenneth J. Ryan</i>	373	CHAPTER 37	Hepatitis Viruses <i>W. Lawrence Drew</i>	541
CHAPTER 23	<i>Pseudomonas</i> and Other Opportunistic Gram-negative Bacilli <i>Kenneth J. Ryan</i>	385	CHAPTER 38	Herpesviruses <i>W. Lawrence Drew</i>	555
CHAPTER 24	<i>Haemophilus</i> and <i>Bordetella</i> <i>Kenneth J. Ryan</i>	395	CHAPTER 39	Viruses of Diarrhea <i>C. George Ray</i>	577
CHAPTER 25	<i>Mycoplasma</i> and <i>Ureaplasma</i> <i>W. Lawrence Drew</i>	409	CHAPTER 40	Arthropod-Borne and Other Zoonotic Viruses <i>C. George Ray</i>	585
CHAPTER 26	<i>Legionella</i> <i>Kenneth J. Ryan</i>	415	CHAPTER 41	Rabies <i>W. Lawrence Drew</i>	597
CHAPTER 27	Spirochetes <i>Kenneth J. Ryan</i>	421	CHAPTER 42	Retroviruses, Human Immunodeficiency Virus, and Acquired Immunodeficiency Syndrome <i>James J. Champoux and W. Lawrence Drew</i>	601
CHAPTER 28	Mycobacteria <i>James J. Plorde</i>	439	CHAPTER 43	Papovaviruses <i>W. Lawrence Drew</i>	617
CHAPTER 29	<i>Actinomyces</i> and <i>Nocardia</i> <i>Kenneth J. Ryan</i>	457	CHAPTER 44	Persistent Viral Infections of the Central Nervous System <i>W. Lawrence Drew</i>	623
CHAPTER 30	<i>Chlamydia</i> <i>W. Lawrence Drew</i>	463	<hr/>		
CHAPTER 31	<i>Rickettsia</i>, <i>Coxiella</i>, <i>Ehrlichia</i>, and <i>Bartonella</i> <i>W. Lawrence Drew</i>	471	PART VII		
CHAPTER 32	Plague and Other Bacterial Zoonotic Diseases <i>Kenneth J. Ryan</i>	481	<i>PATHOGENIC FUNGI</i> 629		
<hr/>			CHAPTER 45	Characteristics of Fungi <i>Kenneth J. Ryan</i>	631
PART VI			CHAPTER 46	Pathogenesis, Immunity, and Chemotherapy of Fungal Infections <i>Kenneth J. Ryan</i>	639
<i>PATHOGENIC VIRUSES</i> 493			CHAPTER 47	Dermatophytes, <i>Sporothrix</i>, and Other Superficial and Subcutaneous Fungi <i>Kenneth J. Ryan</i>	649
CHAPTER 33	Influenza, Respiratory Syncytial Virus, Adenovirus, and Other Respiratory Viruses <i>C. George Ray</i>	495	CHAPTER 48	<i>Candida</i>, <i>Aspergillus</i>, and Other Opportunistic Fungi <i>Kenneth J. Ryan</i>	659
CHAPTER 34	Mumps Virus, Measles, Rubella, and Other Childhood Exanthems <i>C. George Ray</i>	513	CHAPTER 49	<i>Cryptococcus</i>, <i>Histoplasma</i>, <i>Coccidioides</i>, and Other Systemic Fungal Pathogens <i>Kenneth J. Ryan</i>	669
CHAPTER 35	Poxviruses <i>C. George Ray</i>	525			

CHAPTER 50 *Pneumocystis carinii* 685
Kenneth J. Ryan

PART VIII

PARASITES 691

CHAPTER 51 Introduction to Pathogenic Parasites: Pathogenesis and Chemotherapy of Parasitic Diseases 693
James J. Plorde

CHAPTER 52 Sporozoa 711
James J. Plorde

CHAPTER 53 Rhizopods 733
James J. Plorde

CHAPTER 54 Flagellates 741
James J. Plorde

CHAPTER 55 Intestinal Nematodes 763
James J. Plorde

CHAPTER 56 Tissue Nematodes 779
James J. Plorde

CHAPTER 57 Cestodes 791
James J. Plorde

CHAPTER 58 Trematodes 803
James J. Plorde

PART IX

LOCAL AND SYSTEMIC INFECTIONS 815

CHAPTER 59 Skin and Wound Infections 817
Kenneth J. Ryan

CHAPTER 60 Bone and Joint Infections 823
C. George Ray

CHAPTER 61 Eye, Ear, and Sinus Infections 827
C. George Ray

CHAPTER 62 Dental and Periodontal Infections 835
Murray R. Robinovitch

CHAPTER 63 Upper Respiratory Tract Infections and Stomatitis 845
C. George Ray

CHAPTER 64 Middle and Lower Respiratory Tract Infections 849
C. George Ray and Kenneth J. Ryan

CHAPTER 65 Enteric Infections and Food Poisoning 857
Kenneth J. Ryan

CHAPTER 66 Urinary Tract Infections 867
Kenneth J. Ryan

CHAPTER 67 Central Nervous System Infections 873
C. George Ray

CHAPTER 68 Intravascular Infections, Bacteremia, and Endotoxemia 881
C. George Ray and Kenneth J. Ryan

CHAPTER 69 Infections of the Fetus and Newborn 893
C. George Ray

CHAPTER 70 Sexually Transmitted Diseases 901
W. Lawrence Drew

CHAPTER 71 Infections in the Immunocompromised Patient 907
W. Lawrence Drew

CHAPTER 72 Nosocomial Infections and Infection Control 915
Kenneth J. Ryan




Glossary 923

Index 939

PREFACE

With this fourth edition, *Sherris Medical Microbiology*, which began almost two decades ago as *Medical Microbiology* (1984), retains the same team as the third edition with some redistribution in assignments. The most significant of these is the decision of George Ray to join Ken Ryan as editor. John Sherris continues to act as an advisor to all of us.

The goal of *Sherris Medical Microbiology* remains unchanged from that of the first edition. This book is intended to be the primary text for students of medicine and medical science who are encountering microbiology and infectious diseases for the first time. The organization is the same as the third edition with basic topics followed by chapters on the major bacterial, viral, fungal, and parasitic pathogens. We have tried to strengthen the pathogen presentation style introduced in the third edition. For each virus, bacterium, fungus, or parasite, the most important features of the organism (structure, metabolism, genetics), the disease (epidemiology, pathogenesis, immunity), and the clinical aspects (manifestations, diagnosis, treatment, prevention) are placed in distinct sections and in the same order. The opening to each of these sections is now marked by an icon for the

organism , disease , or clinical aspects . At the juncture between

the organism and disease sections, a new feature, the Clinical Capsule, has been introduced. This brief snapshot of the disease is intended to orient the first-time reader before they dive into discussions of pathogenic mechanisms. Fourteen brief chapters at the end summarize the relevant clinical, diagnostic, and therapeutic information into the most common clinical infectious syndromes without the addition of new material. It is hoped that these chapters will be of particular value when the student prepares for case discussions or sees patients.

In *Sherris Medical Microbiology*, the emphasis is on the text narrative, which is designed to be read comprehensively, not as a reference work. In this regard all the pathogenic microorganisms we feel are important are included at a level of detail relevant for medical students. Any added detail in tables and figures is for example or explanation and not intended to be learned. Marginal notations throughout the text have been revised to capsule major points as an aid for the student during review. A student scanning the red marginal notes will encounter all the major points in a chapter. If a note looks unfamiliar, the relevant text is immediately adjacent.

An overview chapter on the immune response to infection is included for continuity, but it is assumed this subject will be covered by one of the many excellent immunology