



# BURTON'S MICROBIOLOGY

FOR THE HEALTH SCIENCES

EIGHTH EDITION

Paul G. Engelkirk  
Gwendolyn R. W. Burton

 Lippincott Williams & Wilkins  
a Wolters Kluwer business

thePoint 

## SECTION I INTRODUCTION TO MICROBIOLOGY

<b>1</b>	<b>Microbiology—The Science</b> .....	1
	Introduction .....	1
	What Is Microbiology? .....	1
	Why Study Microbiology? .....	2
	First Microorganisms on Earth .....	7
	Earliest Known Infectious Diseases .....	7
	Pioneers in the Science of Microbiology .....	7
	Careers in Microbiology .....	12
<b>2</b>	<b>Microscopy</b> .....	15
	Introduction .....	15
	Using the Metric System to Express the Sizes of Microorganisms .....	15
	Microscopes .....	16

## SECTION II INTRODUCTION TO MICROORGANISMS

<b>3</b>	<b>Cell Structure and Taxonomy</b> .....	27
	Introduction .....	27
	Eucaryotic Cell Structure .....	29
	Procaryotic Cell Structure .....	31
	Recap of Structural Differences Between Procaryotic and Eucaryotic Cells .....	38
	Reproduction of Organisms and Their Cells .....	38
	Taxonomy .....	39
	Determining Relatedness Among Organisms .....	40
<b>4</b>	<b>Diversity of Microorganisms, Part 1</b>	
	Acellular and Procaryotic Microbes .....	45
	Introduction .....	45
	Acellular Infectious Agents .....	46
	The Domain <i>Bacteria</i> .....	54
	The Domain <i>Archaea</i> .....	69
<b>5</b>	<b>Diversity of Microorganisms, Part 2</b>	
	Eucaryotic Microbes .....	73
	Introduction .....	73
	Algae .....	73
	Protozoa .....	76
	Fungi .....	79
	Lichens .....	85
	Slime Molds .....	85

## **SECTION III CHEMICAL AND GENETIC ASPECTS OF MICROORGANISMS**

<b>6</b>	<b>Biochemistry: The Chemistry of Life</b> .....	89
	Introduction .....	89
	Organic Chemistry .....	90
	Biochemistry .....	91
<b>7</b>	<b>Microbial Physiology and Genetics</b> .....	107
	Microbial Physiology .....	107
	Metabolic Enzymes .....	109
	Metabolism .....	111
	Bacterial Genetics .....	116
	Genetic Engineering .....	120
	Gene Therapy .....	121

## **SECTION IV CONTROLLING THE GROWTH OF MICROORGANISMS**

<b>8</b>	<b>Controlling Microbial Growth In Vitro</b> .....	125
	Introduction .....	126
	Factors That Affect Microbial Growth .....	126
	Encouraging the Growth of Microorganisms In Vitro ..	129
	Inhibiting the Growth of Microorganisms In Vitro .....	135
<b>9</b>	<b>Using Antimicrobial Agents to Control Microbial Growth In Vivo</b> .....	145
	Introduction .....	145
	Ideal Qualities of an Antimicrobial Agent .....	147
	How Antimicrobial Agents Work .....	147
	Antibacterial Agents .....	148
	Antifungal Agents .....	149
	Antiprotozoal Agents .....	150
	Antiviral Agents .....	150
	Drug Resistance .....	150
	What Clinicians and Patients Can Do To Help in the War Against Drug Resistance .....	154
	Empiric Therapy .....	155
	Undesirable Effects of Antimicrobial Agents .....	156
	Concluding Remarks .....	157

## SECTION V ENVIRONMENTAL MICROBIOLOGY

<b>10 Microbial Ecology</b> .....	161
Introduction .....	161
Symbiotic Relationships Involving Microorganisms ...	162
Indigenous Microflora of Humans .....	163
Beneficial and Harmful Roles of Indigenous Microflora .	167
Microbial Communities .....	168
Agricultural Microbiology .....	169
Biotechnology .....	171
Bioremediation .....	172
<b>11 Epidemiology and Public Health</b> .....	175
Epidemiology .....	175
Interactions Among Pathogens, Hosts, and the Environment .....	180
Chain of Infection .....	181
Reservoirs of Infection .....	181
Modes of Transmission .....	185
Public Health Agencies .....	187
Bioterrorism and Biological Warfare Agents .....	191
Water Supplies and Sewage Disposal .....	193

## SECTION VI MICROBIOLOGY IN HEALTHCARE FACILITIES

<b>12 Healthcare Epidemiology: Nosocomial Infections and Infection Control</b> .....	197
Introduction .....	197
Nosocomial Infections .....	198
Infection Control .....	202
Concluding Remarks .....	215
<b>13 Diagnosing Infectious Diseases</b> .....	219
Introduction .....	219
Clinical Specimens .....	220
The Pathology Department (“the Lab”) .....	226
The Clinical Microbiology Laboratory .....	227

## **SECTION VII PATHOGENICITY AND HOST DEFENSE MECHANISMS**

<b>14 Pathogenesis of Infectious Diseases</b> .....	235
Introduction .....	235
Infection Versus Infectious Disease .....	236
Why Infection Does Not Always Occur .....	236
Four Periods or Phases in the Course of an Infectious Disease .....	236
Localized Versus Systemic Infections .....	237
Acute, Subacute, and Chronic Diseases .....	237
Symptoms of a Disease Versus Signs of a Disease .....	237
Latent Infections .....	237
Primary Versus Secondary Infections .....	238
Steps in the Pathogenesis of Infectious Diseases .....	238
Virulence .....	238
Virulence Factors (Attributes That Enable Pathogens to Attach, Escape Destruction, and Cause Disease) .....	239
<b>15 Nonspecific Host Defense Mechanisms</b> .....	247
Introduction .....	247
Nonspecific Host Defense Mechanisms .....	248
First Line of Defense .....	249
Second Line of Defense .....	250
<b>16 Specific Host Defense Mechanisms:     An Introduction to Immunology</b> .....	263
Introduction .....	264
Immunity .....	265
Humoral Immunity .....	270
Cell-Mediated Immunity .....	276
Hypersensitivity and Hypersensitivity Reactions .....	277
Immunosuppression .....	281
The Immunology Laboratory .....	282

## **SECTION VIII INFECTIOUS DISEASES**

<b>17 Major Viral, Bacterial, and Fungal Diseases     of Humans</b> .....	289
Introduction .....	290
Infectious Diseases of the Skin .....	290
Infectious Diseases of the Ears .....	296

Infectious Diseases of the Eyes .....	298
Infectious Diseases of the Respiratory System .....	300
Infectious Diseases of the Oral Region .....	301
Infectious Diseases of the Gastrointestinal (GI) Tract ..	311
Infectious Diseases of the Genitourinary (GU) System ..	317
Infectious Diseases of the Circulatory System .....	319
Infectious Diseases of the Central Nervous System (CNS) .....	325
Appropriate Therapy for Viral, Bacterial, and Fungal Infections .....	331
<b>18 Major Parasitic Diseases of Humans: An Introduction to Medical Parasitology .....</b>	<b>337</b>
Introduction .....	337
Parasitic Protozoa .....	338
Protozoal Infections of Humans .....	338
Helminths .....	341
Helminth Infections of Humans .....	346
Appropriate Therapy for Parasitic Diseases .....	346
Arthropods .....	346
<b>Appendix A Answers to Self-Assessment Exercises .</b>	<b>351</b>
<b>Appendix B Compendium of Important Bacterial Pathogens of Humans .....</b>	<b>353</b>
<b>Appendix C Useful Conversions .....</b>	<b>357</b>
<b>Additional Resources .....</b>	<b>359</b>
<b>Glossary .....</b>	<b>361</b>
<b>Index .....</b>	<b>383</b>