Contents

Preface ix
Acknowledgements x
Contributors x

A contemporary approach to microbiology
Microbes and parasites 1

SECTION 1 THE ADVERSARIES: MICROBES

1. Microbes as parasites
The varieties of microbes 7
Living inside or outside cells 8
Systems of classification 9

2. The bacteria
Structure 11
Nutrition 13
Growth and division 13
Gene expression 14
Extrachromosomal elements 17
Mutation and gene transfer 19
Survival under adverse conditions 24
The genomics of medically important bacteria 24

3. The viruses
Infection of host cells 29
Replication 31
Outcome of viral infection 33
Major groups of viruses 35

4. The fungi
Major groups of disease-causing fungi 39

5. The protozoa 43

6. The helminths and arthropods
The helminths 47
The arthropods 49

7. Prions
‘Rogue protein’ pathogenesis 53
Development and transmission of prion diseases 54
Medical problems posed by prion disease 54

8. The host–parasite relationship
The normal flora 57
Symbiotic associations 60
The characteristics of parasitism 62
The evolution of parasitism 63

SECTION 2 THE ADVERSARIES: HOST DEFENSES

9. The innate defenses of the body
Defense against entry into the body 72
Defenses once the microorganism penetrates the body 72

10. Adaptive responses provide a ‘quantum leap’ in effective defense
The role of antibodies 87
The role of T lymphocytes 89
Extracellular attack on large infectious agents 93
Local defenses at mucosal surfaces 94

11. The cellular basis of adaptive immune responses
B and T cell receptors 100
Clonal expansion of lymphocytes 102
The role of memory cells 103
Stimulation of lymphocytes 104
Cytokines 104
Regulatory mechanisms 106
Tolerance mechanisms 106
12. Background to the infectious diseases
Host–parasite relationships 117
Causes of infectious diseases 118
The biologic response gradient 120

13. Entry, exit and transmission
Sites of entry 123
Exit and transmission 130
Types of transmission between humans 132
Transmission from animals 137

14. Immune defenses in action
Complement 143
Acute phase proteins and pattern recognition receptors 144
Fever 144
Natural killer cells 144
Phagocytosis 145
Cytokines 147
Antibody-mediated immunity 148
Cell-mediated immunity 151
Recovery from infection 154

15. Spread and replication
Features of surface and systemic infections 157
Mechanisms of spread through the body 159
Genetic determinants of spread and replication 162
Other factors affecting spread and replication 163

16. Parasite survival strategies and persistent infections
Parasite survival strategies 167
Concealment of antigens 169
Antigenic variation 172
Immunosuppression 173
Persistent infections 176

17. Pathologic consequences of infection
Pathology caused directly by the microorganism 184
Pathologic activation of natural immune mechanisms 187
Pathologic consequences of the immune response 189
Skin rashes 193
Viruses and cancer 194

18. Upper respiratory tract infections
The common cold 201
Pharyngitis and tonsillitis 202
Parotitis 210
Otitis and sinusitis 211
Acute epiglottitis 213
Oral cavity infections 213
Laryngitis and tracheitis 214
Diphtheria 214

19. Lower respiratory tract infections
Acute infections 217
Chronic infections 232
Parasitic infections 237

20. Urinary tract infections
Acquisition and etiology 241
Pathogenesis 242
Clinical features and complications 244
Laboratory diagnosis 245

21. Sexually transmitted diseases
STDs and sexual behavior 251
Syphilis 251
Gonorrhea 256
Chlamydial infection 258
Other causes of inguinal lymphadenopathy 261
Mycoplasmas and non-gonococcal urethritis 262
Other causes of vaginitis and urethritis 262
Genital herpes 263
Human papillomavirus infection 264
Human immunodeficiency virus 264
 Opportunistic STDs 273
Arthropod infestations 275

22. Gastrointestinal tract infections
Diarrheal diseases caused by bacterial or viral infection 277
Food poisoning 292
Helicobacter pylori and gastric ulcer disease 293

Introduction to Section 4: The Clinical Manifestations of Infection 199

Treatment 247
Prevention 248

Tuberculosis: Chapter 18 - The Clinical Manifestations of Infection by Body System
Medical microbiology, the large subset of microbiology that is applied to medicine, is a branch of medical science concerned with the prevention, diagnosis and treatment of infectious diseases. In addition, this field of science studies various clinical applications of microbes for the improvement of health. Microbiology is the study of microorganisms, those being unicellular, multicellular, or acellular. Microbiology encompasses numerous sub-disciplines including virology, parasitology, mycology and bacteriology. Molecular Medical Microbiology is the first book to synthesise the many new developments in both molecular and clinical research in a single comprehensive resource. This timely and authoritative three-volume work is an invaluable reference source of medical bacteriology. Comprising more than 100 chapters, organized into 17 major sections, the scope of this impressive work is wide-ranging. Medical microbiology, the large subset of microbiology that is applied to medicine, is a branch of medical science concerned with the prevention, diagnosis and treatment of infectious diseases. In addition, this field of science studies various clinical applications of microbes for the improvement of health. There are four kinds of microorganisms that cause infectious disease: bacteria, fungi, parasites and viruses, and one type of infectious protein called prion.