### Contents

- Preface ix
- Acknowledgements xi

**A contemporary approach to microbiology**
- Microbes and parasites 1
- The context for contemporary medical microbiology 1
- Microbiology past, present and future 2
- The approach adopted in this book 4

**SECTION 1 THE ADVERSARIES – MICROBES**

1. Microbes as parasites
   - The varieties of microbes 9
   - Living inside or outside cells 10
   - Systems of classification 11

2. The bacteria
   - Structure 15
   - Nutrition 17
   - Growth and division 18
   - Gene expression 20
   - Extrachromosomal elements 24
   - Mutation and gene transfer 26
   - Survival under adverse conditions 32
   - The genomics of medically important bacteria 32

3. The viruses
   - Infection of host cells 37
   - Replication 39
   - Outcome of viral infection 42
   - Major groups of viruses 46

4. The fungi
   - Major groups of disease-causing fungi 47

5. The protozoa 51

6. The helminths and arthropods
   - The helminths 53
   - The arthropods 56

7. Prions
   - "Rogue protein" pathogenesis 59
   - Development and transmission of prion diseases 60
   - Medical problems posed by prion diseases 61

8. The host-parasite relationship
   - The normal flora 63
   - Symbiotic associations 66
   - The characteristics of parasitism 68
   - The evolution of parasitism 69

**SECTION 2 THE ADVERSARIES – HOST DISEASES**

9. The innate defenses of the body
   - Defense against entry into the body 77
   - Defenses once the microorganism penetrates the body 77

10. Adaptive responses provide a "quantum leap" in effective defense
    - The role of antibodies 93
    - The role of T lymphocytes 96
    - Extracellular attack on large infectious agents 99
    - Local defenses at mucosal surfaces 100

11. The cellular basis of adaptive immune responses
    - B- and T-cell receptors 105
    - Clonal expansion of lymphocytes 105
    - The role of memory cells 107
    - Stimulation of lymphocytes 109
    - Cytokines 111
    - Regulatory mechanisms 115
    - Tolerance mechanisms 115

**SECTION 3 THE CONFLICTS**

12. Background to the infectious diseases
    - Host-parasite relationships 121
    - Causes of infectious diseases 125
    - The biologic response gradient 127

13. Entry, exit and transmission
    - Sites of entry 129
    - Exit and transmission 136
    - Types of transmission between humans 138
    - Transmission from animals 143

14. Immune defenses in action
    - Complement 149
    - Acute phase proteins and pattern recognition receptors 149
    - Fever 150
    - Natural killer cells 150
    - Phagocytosis 151
    - Cytokines 154
    - Antibody-mediated immunity 156
    - Cell-mediated immunity 158
    - Recovery from infection 163

15. Spread and replication
    - Features of surface and systemic infections 165
    - Mechanisms of spread through the body 167
    - Genetic determinants of spread and replication 170
    - Other factors affecting spread and replication 173

16. Parasite survival strategies and persistent infections
    - Parasite survival strategies 176
    - Antigenic variation 181
    - Immunosuppression 182
    - Persistent infections 185

17. Pathologic consequences of infection
    - Pathology caused directly by microorganism 191
    - Diarrhea 195
Marburg and Ebola hemorrhagic fevers 410
Crimean-Congo hemorrhagic fever, a tick-borne virus 412
Q fever 412
Anthrax 412
Plague 413
Yersinia enterocolitica infection 414
Tularemia 414
Pasteurella multocida infection 416
Leptospirosis 416
Rat bite fever 417
Brucellosis 417
Helminth infections 418

29. Fever of unknown origin
Definitions of fever of unknown origin 421
Causes of FUO 421
Investigation of classical FUO 422
Treatment of FUO 425
FUO in specific patient groups 426
Infective endocarditis 426

30. Infections in the compromised host
The compromised host 429
Infections of the host with deficient innate immunity due to physical factors 432
Infections associated with secondary adaptive immunodeficiency 435
Other important opportunistic pathogens 436

31. Strategies for control
Epidemiologic considerations 445
Detection and diagnosis 450
Epidemiologic aspects of vaccinations 450
Factors influencing the success of vaccination 453
More immunogenic vaccines provide better protection, but may be less safe 454
Control by chemotherapy versus vaccination 455
Control versus eradication 457

32. Diagnosis of infection and assessment of host defense mechanisms
Aims of the clinical microbiology laboratory 459
Specimen processing 459
Non-cultural techniques for the laboratory diagnosis of infection 461
Cultivation (culture) of microorganisms 468
Identification of microorganisms grown in culture 469
Antibody detection methods for the diagnosis of infection 471
Assessment of host defense systems 472

33. Attacking the enemy: antimicrobial agents and chemotherapy
Selective toxicity 479
Discovery and design of antimicrobial agents 479
Classification of antibacterial agents 479
Resistance to antibacterial agents 481
Classes of antibacterial agents 484
Inhibitors of cell wall synthesis 484
Inhibitors of protein synthesis 490
Inhibitors of nucleic acid synthesis 498
Antimetabolites affecting nucleic acid synthesis 500
Other agents that affect DNA 502
Inhibitors of cytoplasmic membrane function 502
Urinary tract antiseptics 503
Antituberculous agents 503
Antibacterial agents in practice 504
Antibiotic assays 506
Antiviral therapy 507
Antifungal agents 513
Antiparasitic agents 515
Use and misuse of antimicrobial agents 515

34. Protection the host: vaccination
Aims of vaccination 519
Requirements of a good vaccine 519
Types of vaccine 521
Special considerations 526
Current vaccine practice 530
New and experimental vaccines 538

35. Passive and non-specific immunotherapy
Passive immunization with antibody 543
Non-specific cellular immunostimulation 546
Correction of host immunodeficiency 548
Probiotics 548

36. Hospital infection, sterilization and disinfection
Common hospital infections 551
Important causes of hospital infection 551
Sources and routes of spread of hospital infection 553
Host factors and hospital infection 554
Consequences of hospital infection 557
Prevention of hospital infection 558
Investigating hospital infection 561
Sterilization and disinfection 568

Appendix – Pathogen parade 573
Bibliography 625
Index 635