Contents

Section 1 General Topics

1. Normal and Abnormal Bacterial Flora of the Gut 3
Chetana Vaishnavi

- Colonization of the Gut 4
- Normal Flora of the GI Tract 4
- Factors Affecting the Gut Flora 6
- Host Immune Defenses 7
- Beneficial Effects of Gut Flora 8
- Abnormal Flora 9
- Harmful Effects of the Normal Flora 9

2. Etiology and Prevention of Food-borne Bacterial Gastroenteritis 12
Mohammad Aminul Islam, Mohammad Asadulghani

- Mechanism of Food-borne Gastroenteritis 13
- Gastroenteritis by Gram-negative Bacteria 13
- Gastroenteritis by Gram-positive Bacteria 25

3. Imaging of Gastrointestinal Infections 32
Rajagopal KV, Smiti Sripathi

- Imaging of Specific Infections 32
- Imaging of Nonspecific Infections 42

4. Antimicrobial Therapy for Infectious Diarrhea 50
Ranganathan N Iyer

- Noninflammatory Diarrheal Disease 51
- Inflammatory Diarrheas 55
- Enteric Fever and Allied Conditions 57
- Diarrhea in HIV-infected Patients 60
- Traveler's Diarrhea 60
- CMV Infection of GIT 60

5. Probiotics and Prebiotics in Gastrointestinal Health and Disease 62
Asit Ranjan Ghosh, Vinay Dubey, Chetana Vaishnavi

- History 63
- Probiotics 63
- Prebiotics 65
- Synbiotics 66
- Mechanisms of Action on GI Mucosal Surface 66
- Probiotics Marketed by Indian Firms 67
- Role in GI Infections and GI Disorders 67
- Other GI Disorders 72

6. **Dietary and Nutritional Management in Gastrointestinal Infections** 76
BN Behera, Mridula Wattas

- Enteric Fever 77
- Intestinal Tuberculosis 77
- Diarrhea 79
- Constipation 81
- Esophagitis and Gastroesophageal Reflux Disease 81
- Gastritis 82
- Peptic Ulcer 82
- Viral Hepatitis 83

SECTION 2 SPECIAL BACTERIAL DISEASES

7. ***Clostridium difficile* Associated Disease** 87
Chetana Vaishnavi

- Historical Background 88
- Modes of Transmission 89
- Clinical Manifestations 89
- Pathogenesis of CDAD 92
- Factors Precipitating CDAD 95
- Epidemiology 98
- Diagnostic Modalities 100
- Therapy and Management 104
- Prevention and Infection Control measures 107

8. **Typhoid and Paratyphoid Fever** 109
Gopal Nath, Pradyot Prakash, Anil K Gulati

- History 110
- Etiologic Agent 110
- Transmission 110
- Epidemiology 110
- Economic Burden 112
- Clinical Manifestations 113
- Chronic Carriers 113
- Pathogenesis 115
- Diagnosis 115
- Treatment and Drug Resistance 118
- Drug Resistance 119
- Vaccines 121
- Prevention and Control 122

SECTION 3 GASTROINTESTINAL TUBERCULOSIS

9. **Clinical Presentation of Gastrointestinal Tuberculosis** 127
Rajoo Singh Chhina, Deepinder Kaur Chhina, Nitin Behl

- Etiology 128
- Clinical Manifestations 128
- Pathogenesis and Pathology 129
- Site of Involvement 129

10. Diagnostic Methods for Gastrointestinal Tuberculosis 133
Prabha Desikan, Rajoo Singh Chhina, Deepinder Kaur Chhina

- Gastrointestinal Tuberculosis 134
- Diagnostic Aids 134
- Perspective on Currently Available and Newer Diagnostics 145
- Differentiating Features between Intestinal Tuberculosis and Crohn's Disease 145

11. Management of Gastrointestinal Tuberculosis 148
Rajoo Singh Chhina

- Management 148
- Antituberculous Treatment (ATT)-induced Hepatotoxicity 151

SECTION 4 *HELICOBACTER PYLORI*

12. Clinical Spectrum and Epidemiology of *Helicobacter pylori* 157
Gourdas Choudhuri, Amit Jain

- Clinical Spectrum of *H. pylori* Infection 158
- Potential Benefits of *H. pylori* 161
- Epidemiology of *H. pylori* Infection 161

13. Pathology and Pathogenesis of *Helicobacter pylori* Infection 164
Kaushal Kishor Prasad

- Pathology of *H. pylori*-associated Diseases 165
- GI Tract Associations of *H. pylori* Infection 165
- Non-GI Tract Associations of *H. pylori* infection 178
- Pathogenesis of *H. pylori* Infection 180
- Role of *H. pylori* virulence-Associated Factors 181
- Virulence Genes of *H. pylori* 182
- Lipopolysaccharides 185
- Nitrogen Metabolizing and Other Secretory Enzymes 185
- Urease and Arginase 185
- Amidases 185
- Mucinase, Protease, Lipase and Phospholipase 185
- Other Virulence Factors 186
- Host Factors and *H. pylori* 186
- Immune Response to *H. pylori* 186

14. Laboratory Diagnosis of *Helicobacter pylori* Infection 191
Kashi N Prasad, Sanket K Shukla

- Invasive Tests 192
- Noninvasive Tests 196

15. Medical Management of Peptic Ulcer Disease 200
Prabha Sawant, Ajay Choksey

- Ulcers Associated with *Helicobacter pylori* Infection 201
- Ulcers not Associated with *Helicobacter pylori* Infection 201
- *Helicobacter pylori* Infection with NSAID Use 201
- Drugs Available for Treatment 201
- Treatment of Regimens 203

Section 5 Specific Bacterial Gastroenteritis

16. *Shigella* and Shigellosis 209
RD Kulkarni, Chetana Vaishnavi

- History 210
- Etiologic Agent 210
- Group and Type Identification 210
- Distribution of Serogroups and Serotypes 211
- Transmission 212
- Epidemiology 213
- Clinical Manifestations 214
- Pathogenesis 216
- Laboratory Diagnosis 217
- Treatment 220
- Drug Resistance 221
- Prevention and Control 222
- Vaccines 222

17. Nontyphoidal *Salmonellae* 224
Beena Antony, M Srinath Baliga

- History and Nomenclature 224
- Etiologic Agent 225
- Transmission 226
- Epidemiology 227
- Clinical Manifestations 230
- Pathogenesis and Virulence Factors 231
- Laboratory Diagnosis 232
- Treatment and Antimicrobial Resistance 232

18. *Escherichia coli* Diarrheas 235
Chetana Vaishnavi

- History 236
- Etiologic Agent 236
- Enterohemorrhagic Pathotype 237
- Enterotoxigenic Pathotype 243
- Enteropathogenic Pathotype 245
- Enteroinvasive Pathotype 247
- Enteroaggregative Pathotype 248
- Common Laboratory Diagnostic Methods 249
- Antibiotic Resistance in *E. coli* 250

19. *Yersinia enterocolitica* and Gastrointestinal Disease 253
BS Ramakrishna

- History 254
- Etiologic Agent 254
- Transmission 254
- Clinical Manifestations 254
- Pathogenesis 256
- Laboratory Diagnosis 257
- Differential Diagnosis 259
- Treatment 260
- Vaccines 260
- Epidemiology 260

20. Clinical Manifestations of *Campylobacter* Infection 263
Chetana Vaishnavi

- Historical Background 264
- Etiologic Agent 264
- Transmission 265
- Pathogenesis 266
- Clinical Manifestations 269
- Guillain Barré Syndrome 273
- Epidemiology 276
- Treatment of Campylobacteriosis 280
- Vaccines 282
- Prevention and Control 282

21. Epidemic-prone *Vibrio cholera* 284
Varsha Gupta, Ritu Garg

- History 285
- Classification 285
- Etiologic Agent 285
- Epidemiology 286
- Transmission 287
- Clinical Manifestations 288
- Pathogenesis 288
- Laboratory Diagnosis 290
- Treatment 293
- Prevention and Control 294
- Vaccines 294

22. Noncholera *Vibrios* in Human Gastroenteritis 297
Indrani Karunasagar, B Krishna Kumar, Anusha Rohit

- *Vibrio parahaemolyticus* 298
- *Vibrio vulnificus* 300
- *Vibrio alginolyticus* 302
- *Vibrio fluvialis* 302
- *Vibrio hollisae* 302
- *Vibrio furnissii* 302
- *Vibrio metschnikovii* 302
- *Vibrio mimicus* 303
- Non-O1 and non-O139 *V. cholerae* 303
- Laboratory Diagnosis 303
- Treatment 306
- Prevention 306

23. Current Perspectives on Pathogenesis of *Aeromonas* 307
Prasanta K Bag

- History 308
- Etiologic Agent 308
- Transmission 308
- Epidemiology 309
- Clinical Manifestations 309
- Pathogenicity and Virulence Factors 310
- Virulence Factors 312
- Laboratory Diagnosis 313
- Treatment and Drug Resistance 317

Section 6 Viral Diarrhea

24. Rotavirus Diarrhea 321
Chetana Vaishnavi

- History 322
- Etiologic Agent 322
- Classification 323
- Transmission 323
- Clinical Manifestations 323
- Pathogenesis and Immunity 324
- Laboratory Diagnosis 325
- Treatment 326
- Prevention and Control 326
- Epidemiology 328

25. Non-rotavirus Viral Diarrhea 330
Baijayantimala Mishra

- Classification 331
- Caliciviruses 331
- Adenoviruses 336
- Astroviruses 336
- Coronaviruses 337
- Parechoviruses 338

Section 7 Parasitic Diseases

26. Intestinal and Extraintestinal Amebiasis 341
Prabha Sawant, Arvind Kumar

- Etiologic agent 342
- Epidemiology 342
- Clinical Manifestations 343
- Pathogenesis 347
- Pathology 347
- Host Immunity 348
- Diagnostic Modalities 348
- Differential Diagnosis 351
- Treatment 351
- Prognostic Factors 352
- Prevention and Vaccine Development 352

27. *Balantidium coli* Infection in Humans 354
Chetana Vaishnavi

- History 354
- Etiologic Agent 354
- Transmission 355
- Life Cycle 356
- Clinical Manifestations 356
- Diagnosis 357
- Treatment 357
- Prevention 357

28. Recent Insights into *Giardia lamblia* Infection 358
Kaushal Kishor Prasad

- Epidemiology 359
- Structure and Biology 360
- Genomics and Proteomics 363
- Life Cycle 363
- Sites of Colonization 364
- Host-Parasite Interactions 365
- Reproduction 366
- Nutrition and Metabolism 366
- Clinical Features 368
- Immunocompromised Host and *Giardia* 369
- Association with *Helicobacter pylori* 369
- Pathogenesis 369
- Antigenic Variations 370
- Diagnosis 371
- Treatment 372
- Prevention 374

29. Intestinal Protozoan Infections in Immunocompromised Persons 377
Ajay Wanchu, Susheel Kumar

- Cryptosporidiosis 378
- Microsporidiosis 382
- Isosporiasis 383
- Cyclosporiasis 385

30. Intestinal Nematodes 386
Showkat Ali Zargar, Jaswinder Singh Sodhi

- *Ascaris lumbricoides* 387
- *Ancyclostoma duodenale* and *Necator americanus* 392
- *Enterobius vermicularis* 395
- *Strongyloides stercoralis* 397
- *Trichostrongylus* 399
- *Trichuris trichiura* 400
- *Trichinella spiralis* 402
- *Paracapillaria philippinensis* 404
- *Anisakis simplex* 405

31. Human Intestinal Cestodes 408
Sumeeta Khurana, Kapil Goyal

- Human Intestinal Cestodes 408
- Treatment 414

32. Hydatid Disease in Humans 417
Showkat Ali Zargar, Jaswinder Singh Sodhi

- Etiologic Agent 417
- Life Cycle of *Echinococcus* 418
- Epidemiology 418
- Pathophysiology 418
- Clinical Manifestations 419
- Complications of Hydatid Cysts 420
- Diagnosis 420
- Treatment and Management 423
- Prevention 424

33. Trematode Infections of Gastrointestinal System 426
Veena Tandon, Bishnupada Roy, Sudeep Ghatani

- General Organization of Flukes 426
- Life Cycle in General 427

Section 8 Fungal Infections

34. Fungal Infections of Gastrointestinal Tract 453
Shivaprakash M Rudramurthy, Abhishek Mewara

- Localized Infections 453
- Fungal Infections as a Part of Disseminated Disease 456
- Fungal Infections of the Peritoneum 461
- Antibiotic Associated Diarrhea 462

Section 9 Infections of Gastrointestinal Allied Organs

35. Bacterial Hepatitis 465
Deepinder Kaur Chhina, Rajoo Singh Chhina, Omesh Goyal

- Septic Hepatitis 466
- Direct Bacterial Involvement of the Liver 467

36. Viral Hepatitis 475
Ajit Sood, Vandana Midha

- Hepatitis A virus 476
- Hepatitis B virus 478
- Hepatitis C virus 484
- Hepatitis D virus 489
- Hepatitis E Virus 491

37. Putative Hepatitis Viruses 496
Chetana Vaishnavi

- Hepatitis G Virus 497
- Transfusion-Transmitted Virus 502
- SEN Virus 506

38. Acute Cholangitis 510
Ragesh Babu Thandassery, Rakesh Kochhar

- Pathogenesis 511
- Bacteria Involved in Cholangitis 511
- Etiological Conditions 512
- Clinical Context of Etiological Conditions 512
- Diagnosis 517
- Treatment 518
- Prognosis and Mortality 521

39. Infections of the Pancreas 522
Atul Sachdev, Nikhil Nadkarni

- Infected Pancreatic Necrosis 522
- Emphysematous Pancreatitis 526

- Pancreatic Abscess 527
- Pancreatitis and Fungal Infections 528
- Nutritional Support for Severe Acute Pancreatitis 529

40. Spontaneous Bacterial Peritonitis 532
Shoket M Chowdry, Chetana Vaishnavi

- Bacteriology of SBP 533
- Predisposing Factors for SBP 533
- Previous Episodes of SBP 533
- Clinical Manifestations 533
- Pathogenesis of SBP 535
- Diagnosis 537
- Treatment of SBP 538
- Prophylaxis of SBP 539
- Factors Affecting Outcome of SBP 540
- Epidemiology of SBP 540

SECTION 10 GASTROINTESTINAL MANIFESTATIONS OF OTHER INFECTIONS

41. Gastrointestinal Anthrax 545
Rajan R Patil

- History 546
- Etiologic Agent 546
- Transmission 547
- Risk for Exposure 547
- Clinical Manifestations 548
- Pathology 549
- Pathogenesis 550
- Host Immune Interaction 550
- Diagnosis 551
- Differential Diagnosis 551
- Treatment 552
- Prevention and Control 553
- Bioterrorism 556
- Epidemiology 557

42. Gastrointestinal Manifestations of Leptospirosis 559
K Natarajaseenivasan, V Raja

- History 560
- Etiologic Agent 560
- Classification 560
- Metabolic Characteristics 562
- Epidemiology 562
- Infection Cycle 563
- Risk Factors 563
- Genetics of Leptospira 564
- Types of Clinical Syndromes 564
- Clinical Manifestations 565
- Pathophysiology and Pathogenesis 569
- Laboratory Diagnosis 570
- Differential Diagnosis 572

- Treatment 572
- Vaccines 572

43. Human Brucellosis **574**
Shashank Purwar

- Etiologic Agent 575
- Risk Factors and Transmission 576
- Pathogenesis 577
- Host Immune Response 578
- Clinical Manifestations 578
- Complications of Brucellosis 579
- Diagnostic Modalities 581
- Treatment 583
- Vaccine 584
- Preventive Measures 584

44. Cytomegalovirus and Gastrointestinal Tract **586**
Ganesh Bhat

- Virus Structure and Genome Organization 587
- Clinical Manifestations of CMV 587
- Clinical Impact on Solid Organ Transplant 591
- Prevention of CMV Disease in SOT Recipients 592
- Pathogenesis and Pathology 592
- Diagnosis of CMV Infection of GI Tract 593
- Treatment of CMV Disease 595
- Prevention of CMV Infection and Disease 597

45. Gastrointestinal and Hepatic Manifestations of Dengue Infection **599**
Rajoo Singh Chhina, Omesh Goyal, Deepinder Kaur Chhina

- Etiologic Agent 599
- Transmission 600
- Pathogenesis 600
- Clinical Manifestations 600
- Manifestations of Gastrointestinal System 601
- Diagnosis 604
- Treatment 605
- Prevention 605
- Epidemiology 605

46. Malaria and the Liver **607**
Pankaj Puri, Anil C Anand

- History 608
- The Liver in the Life Cycle of *Plasmodium* 608
- Incidence of Jaundice and Liver Dysfunction in Malaria 608
- Etiopathogenesis 609
- Clinical Features and Diagnosis 610
- Laboratory Findings 610
- Histopathology 610
- Differential Diagnosis 611
- Management 611
- Prognosis 611

Index *613*