

Contents

Preface xv

Part I Principles of Animal Virology

Chapter 1 Structure and Composition of Viruses

Viral Morphology 4

Chemical Composition of Virions 10

Preservation of Viral Infectivity 14

Further Reading 15

Chapter 2 Classification and Nomenclature of Viruses

Criteria for Viral Classification 16

Nomenclature 17

Families of DNA Viruses 17

Families of RNA Viruses 22

Other Viruses 27

Groupings Based on Epidemiologic/Pathogenic Criteria

28

Further Reading 29

Chapter 3 Viral Replication

The Viral Replication Cycle 31

Attachment 33

Uptake (Penetration) 35

Uncoating 36

Strategies of Replication 3

Transcription 42

v

Translation 45
Replication of Viral Nucleic Acid 48
Assembly and Release 49
Further Reading 52

Chapter 4 Viral Genetics and Evolution

Mutation 54

Genetic Recombination between Viruses 59
Interactions between Viral Gene Products 61
Mapping Viral Genomes 62
Recombinant DNA Technology 64
Evolution of Viruses 66
Further Reading 72

Chapter 5 Virus-Induced Changes in Cells

Types of Virus-Cell Interactions 74

Cytopathic Effects of Virus Infections 76

Mechanisms of Cell Damage 80

Noncytocidal Infections 81

Interferons 82

Further Reading 86

Chapter 6 Mechanisms of Infection and Spread of Viruses through the Body

Routes of Entry 87

Mechanisms of Spread in the Body 92

Virus Shedding 100

Further Reading 102

Chapter 7 Determinants of Viral Virulence and Host Resistance

Viral Virulence and Host Resistance 104
Genetic Determinants of Viral Virulence 105
Genetic Determinants of Host Resistance 111
Physiologic Factors Affecting Resistance 114
Further Reading 118

Chapter 8 Immune Response to Viral Infections

Components of the Immune System 120 Immune Responses to Viral Infection 129 Recovery from Viral Infection 131

vii Contents

	Immunity to Reinfection 133 Passive Immunity 134 Further Reading 135
Chapter 9	Mechanisms of Disease Production Viral Damage to Tissues and Organs 136 Immunopathology 140 Immunosuppression 144 Viral Infections in Immunocompromised Patients 145 Further Reading 146
Chapter 10	Persistent Infections Categories of Persistent Infections 148 Acute Infections with Rare Late Complications 149 Latent Infections 150 Chronic Infections 156 Slow Infections 158 Pathogenesis of Persistent Infections 164 Further Reading 169
Chapter 11	Mechanisms of Viral Oncogenesis Oncogenes and Tumor Suppressor Genes 171 Cell Transformation 172 Tumor Induction by Retroviruses 174 Human T-Cell Leukemia Viruses 181 Tumor Induction by DNA Viruses 182 Papillomaviruses 184 Hepadnaviruses 184 Herpesviruses 186 Multistep Oncogenesis 188 Further Reading 189
Chapter 12	Laboratory Diagnosis of Viral Diseases Rational Use of the Laboratory 191 Collection, Packaging, and Transport of Specimens 193 Direct Identification of Virus, Viral Antigen, or Viral Genome 195 Virus Isolation 205 Measurement of Serum Antibodies 210 Laboratory Safety 216

Further Reading

217

viii Contents

Chapter 13	Immunization against Viral Diseases
	Live-Virus Vaccines 219
	Inactivated Virus and Virus Subunit Vaccines 223
	Synthetic Vaccines 225
	DNA Vaccines 226
	Anti-Idiotypic Antibodies 226
	Methods for Enhancing Immunogenicity 226
	Comparison of Different Classes of Vaccines 227
	Further Reading 231
Chapter 14	Epidemiology of Viral Infections
	Computations and Data Used by Epidemiologists 233
	Types of Epidemiologic Investigations 238
	Virus Transmission 242
	Mechanisms of Survival of Viruses in Nature 244
	Further Reading 255
Chapter 15	Prevention, Control, and Eradication of Viral Diseases
	Quarantine 256
	Hygiene and Sanitation 257
	Vector Control 258
	Change of Lifestyle 259
	Immunization 259
	Eradication 263
	Further Reading 265
Chapter 16	Chemotherapy of Viral Diseases
	Strategy for Development of Antiviral Agents 267
	Clinical Application 269
	Interferons 271
	Inhibitors of Viral DNA Polymerase 272
	Inhibitors of Reverse Transcriptase 276
	Ion Channel Blockers 277
	Blocking Attachment or Uncoating of Virion 278
	Inhibitors of Viral Proteases 279
	Virus-Specific Oligonucleotides 279
	Inhibitors of Regulatory Proteins 280
	Further Reading 280

Contents

Part II Viruses of Humans

Chapter 17 Parvoviridae

Properties of Parvoviridae 285

Parvovirus B19 288

Enteric Parvoviruses 292

Dependoviruses 292

Further Reading 293

Chapter 18 Papovaviridae

Properties of Papovaviridae 294

Papillomaviruses 294

Polyomaviruses 302

Further Reading 304

Chapter 19 Adenoviridae

Properties of Adenoviridae 306

Pathogenesis and Immunity 309

Clinical Syndromes 310

Laboratory Diagnosis 312

Epidemiology 314

Control 314

Further Reading 315

Chapter 20 Herpesviridae

Properties of Herpesviridae 318

Herpes Simplex Viruses 323

Varicella-Zoster Virus 330

Cytomegalovirus 334

Human Herpesvirus 6 341

Epstein-Barr Virus 343

Herpes B Virus 346

Further Reading 346

Chapter 21 Poxviridae

Properties of Poxviridae 348

Pathogenesis and Immunity 352

Laboratory Diagnosis 352

Human Infections with Orthopoxviruses 353

Human Infections with Parapoxviruses 356

Molluscum Contagiosum 356 Yabapox and Tanapox 357 Further Reading 357

Chapter 22 Hepadnaviridae and Deltavirus

Properties of Hepadnaviridae 359
Clinical Features of Hepatitis B 362
Pathogenesis and Immunity 364
Laboratory Diagnosis 366
Epidemiology 369
Control 369
Deltavirus (Hepatitis D) 373

379

Chapter 23 Picornaviridae

Properties of *Picornaviridae* 382
Polioviruses 385
Other Enteroviruses 391
Rhinoviruses 398
Hepatitis A 400
Further Reading 405

Chapter 24 Caliciviridae and Astroviridae

Further Reading

Caliciviruses Associated with Gastroenteritis 407 Hepatitis E 411 Astroviruses 415 Further Reading 417

Chapter 25 Togaviridae

Properties of Togaviridae 418 **Pathogenesis** 421 Clinical Syndromes 421 Laboratory Diagnosis 423 Epidemiology 424 Control 426 427 Rubella Further Reading 432

Chapter 26 Flaviviridae

Properties of *Flaviviridae* 434
Pathogenesis and Clinical Features 436

Contents xi

Laboratory Diagnosis 437 **Epidemiology and Control** 438 Yellow Fever 438 Dengue 441 Flavivirus Encephalitides 443 Tick-Borne Flavivirus Hemorrhagic Fevers 445 Hepatitis C 445 Further Reading 449

Chapter 27 Coronaviridae

Properties of Coronaviridae 451
Pathogenesis and Immunity 454
Clinical Features 454
Laboratory Diagnosis 454
Epidemiology 455
Further Reading 455

Chapter 28 Paramyxoviridae

Properties of Paramyxoviridae 456
Measles 461
Mumps 465
Parainfluenza Viruses 467
Respiratory Syncytial Virus 469
Further Reading 474

Chapter 29 Rhabdoviridae

Properties of Rhabdoviridae 475
Rabies 478
Vesicular Stomatitis 482
Further Reading 482

Chapter 30 Filoviridae

Properties of Filoviridae 485
Pathogenesis 486
Clinical Features 486
Laboratory Diagnosis 487
Epidemiology 487
Prevention 487
Further Reading 488

Chapter 31 Orthomyxoviridae

Properties of Orthomyxoviridae 489

Pathogenesis and Immunity 493

Clinical Features of Influenza 494

495

Laboratory Diagnosis 494

Epidemiology

Control 496

Further Reading 499

Chapter 32 Arenaviridae

Properties of Arenaviridae 500

Laboratory Diagnosis 503

Epidemiology 504

Diseases Caused by Arenaviruses 504

Prevention and Treatment 507

Further Reading 508

Chapter 33 Bunyaviridae

Properties of Bunyaviridae 509

Pathogenesis 513

Laboratory Diagnosis 513

Rift Valley Fever 513

Sandfly Fever 515

California Encephalitis 515

Oropouche Fever 516

Crimean-Congo Hemorrhagic Fever 517

Hemorrhagic Fever with Renal Syndrome 518

Further Reading 520

Chapter 34 Reoviridae

Properties of Reoviridae 522

Rotaviruses 524

Coltiviruses and Orbiviruses 528

Orthoreoviruses 529

Further Reading 530

Chapter 35 Retroviridae

Properties of Retroviridae 532

Human T-Cell Leukemia (Lymphotropic) Viruses 535

Human Immunodeficiency Viruses 538

Human Spumaviruses 561 Further Reading 561

Chapter 36 Viral Syndromes

Viral Diseases of the Respiratory Tract 564

Viral Gastroenteritis 569

Viral Diseases of the Central Nervous System 571

Viral Skin Rashes 576

Viral Hemorrhagic Fevers 579

Viral Genitourinary Infections 580

Viral Diseases of the Eye 581

Viral Arthritis 583

Viral Carditis 583

Viral Hepatitis 584

Viral Pancreatitis and Diabetes 586

Chronic Fatigue Syndrome 586

Congenital and Perinatal Viral Infections 586

Viral Infections in Immunocompromised Patients 588

Further Reading 589

Index 591