

Contents

Chapter 1

Bunyaviridae

David H. L. Bishop and Robert E. Shope

1. Introduction	1
1.1. Characteristics of the Bunyaviridae	3
1.2. Isolation and Relationships of Members and Possible Members of the Bunyaviridae Family ..	5
2. Structural Components and Their Functions	68
2.1. Virus Particle Morphology and Morphogenesis ..	68
2.2. Composition and Properties of Bunyavirus Particles	78
2.3. Diagrammatic Representation of Bunyavirus Virions	105
3. Replication of Bunyaviruses	106
3.1. Adsorption and Penetration	106
3.2. Primary Transcription: Early Viral Messenger RNA Synthesis	107
3.3. Viral Protein Synthesis	108
3.4. Virus RNA Replication	110
3.5. Secondary Transcription: Amplified Messenger RNA Synthesis	111
3.6. Virus Assembly and Budding	113
4. Genetics	114
4.1. Isolation and Characterization of Temperature- Sensitive, Conditional Lethal Bunyavirus Mutants	114
4.2. High-Frequency Homologous Virus Genetic Recombination	119

4.3. Complementation Analyses	123
4.4. Group I/II Double Mutants	125
4.5. High-Frequency Heterologous Recombination between Certain Bunyaviruses	125
4.6. Summary of the Bunyavirus Genetics Studies	130
5. Defective Interfering Virus	131
6. Conclusions	131
7. References	132

Chapter 2

Arenaviruses

William E. Rawls and Wai-Choi Leung

1. Introduction	157
2. Historical Considerations	158
3. Pathobiology	160
4. Morphologic and Physical Properties	164
5. Proteins	168
5.1. Polypeptides	168
5.2. Antigens	170
6. Nucleic Acids	172
7. Internal Components of the Virus	175
7.1. Virus-Associated Ribosomes	175
7.2. Ribonucleoprotein Core	176
7.3. Virus-Associated Enzymes	177
8. Replication in Cultured Cells	178
9. Interference and Defective Interfering Particles	182
10. Concluding Remarks	184
11. References	185

Chapter 3

Coronaviridae

James A. Robb and Clifford W. Bond

1. Introduction	193
1.1. Summary	193
1.2. Definition and Members of the Coronavirus Family	194

2.	Virions	195
2.1.	Morphology	195
2.2.	Composition	197
2.3.	Fine Structure and Arrangement of Virion Components	201
3.	Growth Properties in Cell and Organ Culture	204
3.1.	Infectivity Assays	204
3.2.	Growth Curves and Multiplication Kinetics	205
3.3.	Modification of Infectivity	207
4.	Multiplication of Virus	207
4.1.	Adsorption	207
4.2.	Penetration and Uncoating	208
4.3.	Biosynthesis of Viral Macromolecules	209
4.4.	Assembly	215
4.5.	General Comments	215
5.	Alteration in Host Cell Metabolism	216
6.	Defective Virus and Viral Interference	217
6.1.	Defective Virus	217
6.2.	Interference by Defective Virus	217
6.3.	Other Forms of Interference	218
7.	Pathogenesis of Coronavirus Disease	218
7.1.	Spectrum of Disease	218
7.2.	Route of Infection	219
7.3.	Animal Response to Infection	225
7.4.	Summary of Pathogenesis	230
8.	Persistent Infections	231
9.	Genetics	236
10.	Conclusion	237
11.	References	237

Chapter 4

Caliciviruses

Frederick L. Schaffer

1.	Introduction and Classification	249
2.	Natural History and Disease Aspects	250
2.1.	Vesicular Exanthema of Swine Virus (VESV)	250
2.2.	San Miguel Sea Lion Virus (SMSV)	250

2.3.	Relationship between VESV and SMSV	251
2.4.	Feline Calicivirus (FCV).....	252
2.5.	Human Calicivirus	252
3.	Antigenic Aspects	253
3.1.	VESV and SMSV	253
3.2.	FCV	254
3.3.	Relation between FCV and VESV/SMSV.....	255
4.	Caliciviruses in Cultured Cells	255
4.1.	Growth and Host Range.....	256
4.2.	Cytopathology	257
4.3.	Genetics	259
4.4.	Viral RNA	259
4.5.	Viral Protein	261
5.	The Virion	264
5.1.	Purification	264
5.2.	Morphology and Structure.....	264
5.3.	Sedimentation	266
5.4.	Buoyant Density	267
5.5.	Inactivation and Stability	268
5.6.	Virion RNA	269
5.7.	Virion Protein	272
5.8.	Virion Mass	274
6.	Defective Interfering Virus	275
7.	Concluding Remarks	275
8.	Addendum	276
9.	References	278

Chapter 5

Orbiviruses

D. W. Verwoerd, H. Huismans, and B. J. Erasmus

1.	Introduction	285
2.	Propagation and Assay Systems	286
2.1.	Primary Isolation	286
2.2.	Cultivation	288
2.3.	Cytopathology	289
2.4.	Assay Systems	290

3.	The Virion	290
3.1.	Morphology	290
3.2.	Physicochemical Properties	294
3.3.	The Viral Genome	298
3.4.	The Viral Capsid	303
3.5.	Viral Enzymes	307
4.	Replication	309
4.1.	Adsorption and Penetration	309
4.2.	Site of Replication	309
4.3.	Synthesis of Viral Nucleic Acids	310
4.4.	Synthesis of Viral Proteins	312
4.5.	Mutants and Defective Particles	316
4.6.	Effect of Viral Infection on Cellular Functions ...	317
5.	Antigenic Properties	318
5.1.	Serological Reactions	318
5.2.	Serological Classification	322
5.3.	Antigens Involved in Antigenic Variation	323
5.4.	Immunity	324
6.	Epizootiology	325
6.1.	Host Range	325
6.2.	Transmission	327
6.3.	Ecological Factors	329
6.4.	Pathogenesis	329
7.	Concluding Remarks	331
8.	References	332

Chapter 6

Icosahedral Cytoplasmic Deoxyriboviruses

Rakesh Goorha and Allan Granoff

1.	Introduction	347
2.	Classification and General Biological Properties of Icosahedral Cytoplasmic Deoxyriboviruses	348
3.	Size, Morphology, and Structure	349
3.1.	Size	349
3.2.	Morphology and Structure	353
4.	Physical Properties	356

5. Chemical Composition	356
5.1. DNA	356
5.2. Proteins and Enzyme Activities	358
5.3. Lipids	360
6. Replication	361
6.1. Replication of Frog Virus 3	364
6.2. Nuclear Requirement for ICDV Replication	385
7. Conclusions and Prospects for the Future	390
8. References	392

Chapter 7

Fish Viruses and Viral Infections

Philip E. McAllister

1. Introduction	401
2. Fish Herpesviridae	401
2.1. Biology of the Diseases	402
2.2. Biology of the Viruses	404
3. Fish Iridoviridae	409
3.1. Biology of the Diseases	409
3.2. Biology of the Viruses	410
4. Fish Reoviridae	414
4.1. Biology of the Diseases	415
4.2. Biology of the Viruses	417
5. Fish Rhabdoviridae	426
5.1. Biology of the Diseases	426
5.2. Biology of the Viruses	430
6. Fish Retroviridae	440
6.1. Biology of the Diseases	441
6.2. Evidence of Putative Virus	444
7. Unclassified and Putative Fish Viruses Associated with Neoplasia	446
7.1. Stomatopapilloma of Eel-Associated Viruses	446
7.2. Brown Bullhead Papilloma-Associated Virus	447
7.3. Atlantic Salmon Papilloma-Associated Virus	448
7.4. Pleuronectid Epidermal Papilloma-Associated Virus	449
8. Unclassified and Putative Fish Viruses	451
8.1. Bluegill Virus	451
8.2. Grunt Fin Agent	452

8.3. Ulcerative Dermal Necrosis-Associated Virus . . .	454
8.4. Gill Necrosis of Carp-Associated Virus	454
9. References	455

Chapter 8

Viruses of Human Hepatitis A and B

William S. Robinson

1. Introduction: Recognition of Hepatitis Viruses	471
2. Hepatitis B Virus (HBV)	473
2.1. Infectious HBV	473
2.2. Hepatitis B Surface Antigen	474
2.3. Hepatitis B Virion and Its DNA	477
2.4. Incomplete Hepatitis B Viral Forms	484
2.5. Hepatitis B Core Antigen (HB _c Ag)	485
2.6. Hepatitis B _e Antigen (HB _e Ag)	486
2.7. Synthesis of HBV Antigens in Infected Liver	487
2.8. Current Estimate of the Number of HBV Genes and the Total Virus-Specified Polypeptide	488
3. Course of HBV Infection	489
3.1. Self-Limited HBV Infection	489
3.2. Persistent HBV Infection	491
4. Disease Associated with HBV Infection	492
4.1. Acute and Chronic Hepatitis B	492
4.2. Hepatocellular Carcinoma	493
4.3. Other Disease Syndromes Associated with HBV Infection	493
5. Epidemiology of HBV	494
5.1. Total Viral Hepatitis in the United States	494
5.2. HBV Infections in the United States	495
5.3. HBV Infections in Other Parts of the World	495
5.4. Persistent HBV Infection	495
5.5. HBV Transmission	498
6. Hepatitis A Virus (HAV)	500
6.1. Infectious HAV	500
6.2. Hepatitis A Antigen (HAAg) Forms in Feces, Liver, and Bile	502
6.3. Viral Antigen Synthesis in Infected Liver	504
7. Course of HAV Infection	505

8.	Immunity to HAV	507
9.	Disease Associated with HAV Infection	507
10.	Epidemiology of HAV Infections	507
10.1.	Incidence of HAV Infection	508
10.2.	Routes of HAV Transmission	509
11.	References	512
Index		527