

Comparative Diagnosis of Viral Diseases

Volume II

HUMAN AND RELATED VIRUSES, Part B

Edited by

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Preface

In view of the possibility of an epidemic, the swine influenza virus recently preoccupied public health departments to a great extent and mobilized uncommon efforts for its diagnosis and prevention. This single example of a virus that can infect animals and man at the same time confirms the importance of comparative virology, not only from the point of view of basic research but from that of the diagnosis, control, and prevention of viral diseases.

Although treatises on fundamental comparative virology are available, one will note that among several books devoted to the diagnosis and control of viral infections none is based on the comparative approach essential for several groups of viruses infecting animals and man. This four-volume treatise was conceived to fill this gap. It is even more necessary because it is difficult to diagnose specifically and rapidly numerous viral diseases without considering the comparative biological, serologic, and physico-chemical properties of the viruses involved. Thus, it is devoted to the diagnosis of viral diseases, and is based on the new comparative unifying concept of the viral world. The work demonstrates that the comparison of and the discrimination among viruses, according to the criteria of classification of the International Committee on Taxonomy of Viruses and to the diseases caused by these viruses irrespective of the species involved, are essential for their diagnosis and prevention.

For reasons of classification and cataloguing, the first two volumes of this treatise deal with classified human and related viruses (Volume I) and unclassified human and related viruses (Volume II). In Volume II, one can also find the latest data on the possible implications of viruses in certain cancers and slowly evolving diseases. An important portion of this volume is devoted to the modern approach to the diagnosis of viral diseases and to their control by vaccination and chemotherapy, as well as to the system of Virus Information of the World Health Organization. Volumes III and IV (in preparation) will complete the treatise and will

be devoted to animal and related viruses (Volume III) and to invertebrate and plant viruses (Volume IV).

The treatise was conceived to cover in separate chapters the diseases caused by each virus family. However, in some cases in which a particular interest is manifested for a virus or for the disease(s) it induces, a whole chapter is devoted to the subject. This is the case for the Epstein-Barr virus, cytomegalovirus, rotavirus, rubella virus, and the Marburg virus which has elicited great interest in the last few years.

This treatise, which is based on a new concept, gives a comparative description of the principal physicochemical, molecular, structural, genetic, immunological, and biological characteristics of viruses implicated in various diseases. With a view to a comparative diagnosis, the symptoms and the evolution of the diseases are described in detail, as well as the modern methodology for their rapid and specific diagnosis and for their control and prevention. In this respect, Volumes I and II will interest all clinical virologists and immunologists and veterinarians and research workers. The first two volumes are addressed particularly to the professionals of public health and veterinary sciences who work in the area of diagnosis and control of viral diseases and to those who are interested in the problem of the relation between viruses and cancer.

Each of the contributors to this treatise is well known for his expertise in his field; each has prepared a thoughtful and well-documented treatment of his subject. Personal interpretations and conclusions of the authors, as well as the numerous illustrations and unpublished material, provide a large body of information which brings into sharp focus current findings and new directions in the comparative diagnosis and prevention of viral diseases.

It is our hope that the first two volumes of this treatise will provide a useful tool for all concerned with viral diseases, particularly in hospitals, schools of medical and veterinary sciences, and in diagnostic and control centers of infectious diseases.

We wish to express our sincere gratitude to the contributors for the effort and care with which they have prepared their chapters; to the members of the International Advisory Board of the treatise for their advice; to Professor Maurice L'Abbé, Vice-Rector for Research of the Université de Montréal, and to Doctor Pierre Bois, Dean of the Faculty of Medicine of the Université de Montréal, for their support, permitting the completion of the book; and last, but not least, to the staff of Academic Press for their part in the editing, indexing, proofreading, and other aspects of production of this treatise.

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CHRISTINE KURSTAK

Contents of Volume I

HUMAN AND RELATED VIRUSES, Part A

Classification of Human and Related Viruses

EDOUARD KURSTAK

Part I DNA Viruses

Parvoviruses. Possible Implications in Human Infections

E. KURSTAK AND P. TIJSSEN

Implication of Papovaviruses in Human Diseases

SILVIA D. GARDNER

Adenoviruses: Diagnosis of Infections

PATRICIA E. TAYLOR

Diagnosis of Herpes Simplex, Varicella, and Zoster Infections

ARIEL C. HOLLINSHEAD AND JOHN J. DOCHERTY

Comparative Diagnosis of Epstein-Barr Virus-Related Diseases: Infectious Mononucleosis, Burkitt's Lymphoma, and Nasopharyngeal Carcinoma

GUY DE THÉ AND GILBERT LENOIR

Comparative Diagnosis of Cytomegaloviruses: New Approach

ENG-SHANG HUANG AND JOSEPH S. PAGANO

Comparative Diagnosis of Poxvirus Diseases

JAMES H. NAKANO

Part II RNA Viruses

Comparative Diagnosis of Picornavirus (Enterovirus and Rhinovirus) Infections

R. GORDON DOUGLAS, JR.

Diagnosis of Reovirus Infections: Comparative Aspects

NEVILLE F. STANLEY

Rotaviruses: Clinical Observations and Diagnosis of Gastroenteritis

PETER J. MIDDLETON

Orthomyxovirus—Influenza: Comparative Diagnosis Unifying Concept

W. R. DOWDLE, G. R. NOBLE, AND A. P. KENDAL

Paramyxoviruses: Comparative Diagnosis of Parainfluenza, Mumps, Measles, and Respiratory Syncytial Virus Infections

ANDREW E. KELEN AND D. ANGUS MCLEOD

Coronaviruses as Causes of Diseases: Clinical Observation and Diagnosis

KENNETH MCINTOSH

Comparative Diagnosis of Togavirus and Bunyavirus Infections

TELFORD H. WORK AND MARTINE JOZAN

Rubella Virus Infection Diagnosis: Present Status

A. J. RHODES, N. R. PAUL, AND S. IWAKATA

Arenaviruses: Diagnosis of Lymphocytic Choriomeningitis, Lassa, and Other Arenaviral Infections

FREDERICK A. MURPHY

Rhabdoviruses: Rabies and Rabies-Related Viruses

T. J. WIKTOR AND M. A. W. HATTWICK

Contents

List of Contributors	xi
Preface	xiii
Contents of Volume I	xv

Part I UNCLASSIFIED VIRUSES

***Chapter 1* Marburg Virus Disease**

HERTA WULFF AND J. LYLE CONRAD

I. Introduction	3
II. Description of Virus	4
III. Comparative Biology	9
IV. Immunity	19
V. Epidemiology	21
VI. Comparative Diagnosis	23
VII. Prevention and Control	29
References	31

***Chapter 2* Diagnosis of Hepatitis Viral Infections**

ARIE J. ZUCKERMAN AND COLIN R. HOWARD

I. Introduction	36
II. The Pathology of Viral Hepatitis	37
III. Hepatitis B	38
IV. Hepatitis A	70
V. Immunization against Hepatitis	75
References	80

Chapter 3 Slow Virus Infections: Comparative Aspects and Diagnosis

RICHARD F. MARSH

I. Introduction	87
II. Progressive Multifocal Leukoencephalopathy	89
III. Subacute Sclerosing Panencephalitis	94
IV. Creutzfeldt-Jakob Disease	99
V. Concluding Remarks	105
References	105

Part II CANCER VIRUSES

Chapter 4 Human Proliferative Diseases and Viruses

GABRIEL SEMAN AND LEON DMOCHOWSKI

I. Introduction	112
II. Viruses Associated with Neoplasia of Animals	115
III. Biochemical and Molecular Methods in Studies of Viral Involvement in Animal and Human Neoplasia	137
IV. Search for Human Tumor Viruses	145
V. Molecular and Biochemical Studies in Human Neoplasia	152
VI. Immunological Approaches to the Study of Viruses in Human Neoplasia	162
VII. Herpesviruses and Human Neoplasia	166
VIII. Concluding Remarks	183
References	187

Part III CONTROL OF VIRAL DISEASES: VACCINES AND CHEMOTHERAPY

Chapter 5 Control of Viral Diseases by Vaccines

J. FURESZ, D. W. BOUCHER, AND G. CONTRERAS

I. Introduction	210
II. Vaccines in Current Use	213
III. Combined and Simultaneous Administration of Viral Vaccines	232
IV. Immunization Practices against Viral Diseases in the United States and Canada	233
V. Immunization Recommendations for Travelers	238
VI. Prospects for New Viral Vaccines	239
References	243

Chapter 6 Chemotherapy of Viral Diseases: Present Status and Future Prospects

GEORGE J. GALASSO AND FRED J. PAYNE

I. Introduction	250
II. General Considerations	250
III. Nucleoside Analogs	252
IV. The Interferons	268
V. Miscellaneous Antivirals	275
VI. Immune Potentiators	284
VII. Antiviral Perspectives	286
References	289

Part IV VIRUS INFORMATION SYSTEM

Chapter 7 The World Health Organization Virus Information System

FAKHRY ASSAAD AND PAUL BRÉS

I. Introduction	300
II. Development of the Reporting System	300
III. Objectives	302
IV. Data Input from Laboratories	303
V. Limitations to the Input	307
VI. Data Processing	308
VII. Output	310
VIII. Limitations of the Output	327
IX. Noncomputerized Information	330
X. Information System for Influenza Surveillance	330
XI. Use of Excess Mortality from Respiratory Diseases in the Study of Influenza	333
XII. Arboviruses, Rickettsiae, and Chlamydiae	333
XIII. Future of the WHO Virus Reporting System	334
XIV. World Health Organization [Collaborating Centres (Virus Diseases)]	335
References	343

Part V DIAGNOSTIC REAGENTS AND NEWER METHODS

Chapter 8 Viral Diagnostic Reagents

JOHN R. POLLEY

I. Introduction	348
II. Historical Background	354
III. Inactivation	361

IV. Adenoviruses	365
V. <i>Herpesvirus hominis</i> (Simplex)	369
VI. Varicella-Zoster Virus	372
VII. Cytomegaloviruses	373
VIII. Poxviruses	376
IX. Orthomyxoviruses (Influenza)	379
X. Paramyxoviruses (Parainfluenza)	383
XI. Mumps	386
XII. Measles	388
XIII. Respiratory Syncytial Virus	391
XIV. Arboviruses	392
XV. Rubella	396
XVI. Rotaviruses (Infantile Gastroenteritis Virus)	399
References	400

Chapter 9 Immunoperoxidase Technique in Diagnostic Virology and Research: Principles and Applications

E. KURSTAK, P. TIJSEN, AND C. KURSTAK

I. Introduction	404
II. Reagents	406
III. Methods of Conjugation	415
IV. Procedures for Detection of Viral Antigens in Cells	425
V. Applications and Perspectives in Diagnosis and Research	436
VI. Conclusions	442
References	443

Chapter 10 Enzyme Immunoassays and Their Potential in Diagnostic Virology

A. VOLLER AND D. E. BIDWELL

I. Introduction	449
II. Materials and Methods	451
III. Results	453
IV. Conclusions	457
References	457

Chapter 11 Radioimmunoassay in Viral Diagnosis

HARRY DAUGHARTY AND DONALD W. ZIEGLER

I. Introduction	459
II. Methods and Reagents	461
III. Applications	475
References	484

Chapter 12 Cytohybridization Techniques in Virology

P. TIJSSEN AND E. KURSTAK

I. Introduction	489
II. Basic Principles of Hybridization	490
III. Requirements in Cytohybridization	491
IV. Preparation of the Radioactive Probes	492
V. Procedures for <i>in Situ</i> Hybridization	495
VI. Applications in Research and Diagnosis	501
VII. Conclusions and Prospects	502
VIII. Glossary	502
References	503

Chapter 13 Electron and Immunoelectron Microscopic Procedures for Diagnosis of Viral Infections

FRANCES W. DOANE AND NAN ANDERSON

I. Introduction	506
II. Establishing an EM Unit for Virology	507
III. Direct Examination of Clinical Specimens by Negative Staining	509
IV. Direct Examination of Clinical Specimens by Thin Sectioning	517
V. Identification of Viruses Isolated in Tissue Cultures, Eggs, and Animals	519
VI. Screening Cell Cultures and Virus Pools for Adventitious Agents	525
VII. Immunoelectron Microscopy	530
VIII. Safety Precautions	535
References	537

Index	541
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Part I

UNCLASSIFIED VIRUSES

Chapter 1

Marburg Virus Disease

HERTA WULFF AND J. LYLE CONRAD

I. Introduction	3
II. Description of Virus	4
A. Morphology	4
B. Physiochemical Properties and Resistance to Treatment	8
C. Antigenic Properties	9
III. Comparative Biology	9
A. Clinical and Laboratory Features of Human Disease	9
B. Experimental Hosts	11
C. Pathology	13
IV. Immunity	19
V. Epidemiology	21
VI. Comparative Diagnosis	23
A. Differential Diagnosis of Human Disease	23
B. Virus Isolation Procedures	25
C. Serological Procedures	27
VII. Prevention and Control	29
References	31

I. INTRODUCTION

In an early publication concerning an unusual outbreak of a hitherto unknown hemorrhagic disease in an industrial laboratory setting, the name “Marburg virus” was chosen for the etiological viral agent by Siegert and his colleagues (1967, 1968a) because it was first isolated from patients in Marburg, Germany. This name has prevailed.

So far, only two outbreaks and 34 cases of Marburg virus disease have

come to the attention of the medical profession. The outbreaks occurred in entirely different environments. In the first, which occurred in August 1967, all primary cases were in laboratory workers who had close contact with blood and organs of African green or vervet monkeys (*Cercopithecus aethiops*). The monkeys had been imported by air from Uganda with a short intermediate stop in London. Hemorrhagic illness later occurred in Marburg and Frankfurt, Germany, and in Belgrade, Yugoslavia. A total of 31 persons became ill; seven patients died.

The second outbreak occurred in February 1975 in Johannesburg, South Africa. Of the three persons affected, there was one fatality (Center for Disease Control, 1975). The first patient had traveled in Rhodesia for 2 weeks before the onset of his illness. The patient had no known direct contact with monkeys. The natural reservoir for Marburg virus is still unknown.

In this chapter, current knowledge of Marburg virus disease is summarized, and the causative agent and its properties are described.

II. DESCRIPTION OF VIRUS

A. Morphology

The structure of the Marburg virus particle has been investigated in detail by the negative contrast technique; it was identical to that also observed in thin section preparations.

Electron microscopy of infected tissue cultures, guinea pig or monkey plasma, and human or animal organs shows cylindrical particles with a diameter of 65 to 90 nm. The length of each particle varies between 130 and more than 2600 nm, with a modal of 665 nm (Siegert *et al.*, 1967, 1968a; Kissling *et al.*, 1968; Peters and Mueller, 1968; Zlotnik *et al.*, 1968; May *et al.*, 1968). The particles consist of a helical wound core and an envelope with surface projections; they have one rounded end and are often coiled at the other. Terminal blebs are formed from a distention of the membrane envelope around the convoluted internal structure of one end of the particle. The membranous material or "envelope" is about 20 nm thick. The inner cylindrical structure, which has a diameter of 45 nm, is considered the "nucleocapsid." It has transverse striations occurring at 5-nm intervals. Surface projections have a diameter of 10 nm (Figs. 1-3).

Further details of the structure of the virion are discussed by Peters and colleagues (1971), who describe different layers of the "envelope" with striation patterns of different periodicity, and by Almeida and colleagues