Archives
of
Virology

Supplement 10

F. A. Murphy, C. M. Fauquet, D. H. L. Bishop,
S. A. Ghabrial, A. W. Jarvis, G. P. Martelli, M. A. Mayo,
M. D. Summers (eds.)

Virus Taxonomy

Classification and Nomenclature of Viruses

Sixth Report
of the International Committee
on Taxonomy of Viruses

Virology Division
International Union of Microbiological Societies

Springer-Verlag Wien GmbH

Dr. Frederick A. Murphy
School of Veterinary Science, University of California, Davis, CA, U.S.A.

Dr. Claude M. Fauquet
ORSTOM/The Scripps Research Institute, La Jolla, CA, U.S.A.

Dr. David H. L. Bishop
Natural Environment Research School, Institute of Virology, Oxford, U.K.

Dr. Said A. Ghabrial
Department of Plant Pathology, University of Kentucky, Lexington, KY, U.S.A.

Dr. Audrey W. Jarvis
New Zealand Dairy Research Institute, Palmerston North, New Zealand

Dr. Giovanni P. Martelli
Istituto di Patologia Vegetale, Bari, Italy

Dr. Mike A. Mayo
Scottish Crop Research Institute, Dundee, U.K.

Dr. Max D. Summers
Department of Entomology, Texas A&M University, College Station, TX, U.S.A.

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically those of translation, reprinting, re-use of illustrations, broadcasting, reproduction by photocopying machines or similar means, and storage in data banks.

© 1995 Springer-Verlag Wien
Originally published by Springer-Verlag/Wien in 1995

Typesetting: Camera-ready by editors

Printed on acid-free and chlorine-free bleached paper

With 185 Figures

Cover illustration: The three-dimensional surface-shaded map of rotavirus by cryoelectron microscopy and image processing (diameter $\sim 1,000\text{\AA}$). The surface is characterized by 60 VP4 haemagglutinin spikes that bind to cell surface receptors and mediate infection (front cover). Three protein shells encapsidate the dsRNA genome, which has been removed for clarity: an outer capsid shell formed by 780 VP7 molecules; an inner capsid shell formed by 260, pillar-shaped, VP6 trimers; and a core shell formed primarily by VP2 as well as VP1 and VP3 (back cover) (with permission of Dr. M. Yeager, The Scripps Research Institute, La Jolla, California). From: The EMBO Journal, Volume 13, Number 7 (1 April 1994), front cover, by permission of Oxford University Press.

ISSN 0939-1983
ISBN 978-3-211-82594-5 ISBN 978-3-7091-6607-9 (eBook)
DOI 10.1007/978-3-7091-6607-9

PREFACE AND ACKNOWLEDGMENTS

Virus taxonomy is a polarizing subject when it comes up in hallway conversations. Some virologists tune out immediately, others tune in. In the end, after the skeptics walk off, down the hallway, the intensity of the conversation usually increases, because if there is one truism about virus taxonomy it is that it brings out among virologists “strongly held opinions” (a euphemism for “polite arguments”). The point is that virus taxonomy is based upon opinion rather than data, or better, it is based upon the opinionated usage of data. Since one opinion is usually as valid as the next, chaos can reign, but starting in 1966, chaos started to give way to order as the International Committee on Nomenclature of Viruses, later changed to the International Committee on Taxonomy of Viruses (ICTV), set out to provide a single universal system for the classification and nomenclature of all viruses. The system has been based upon true international consensus building, and true pragmatism — and it has been successful. The work of the Committee has been published in a series of reports, the *Reports of the International Committee on Taxonomy of Viruses*, *The Classification and Nomenclature of Viruses*. These Reports have become part of the history and infrastructure of modern virology:

ICTV Report	Editors	Reporting ICTV Proceedings at the International Congresses of Virology held in
The First Report, 1971	P. Wildy	Helsinki, 1968
The Second Report, 1976	F. Fenner	Budapest, 1971 and Madrid, 1975
The Third Report, 1979	R. E. F. Mathews	The Hague, 1978
The Fourth Report, 1982	R. E. F. Mathews	Strasbourg, 1981
The Fifth Report, 1991	R. I. B. Francki, C. M. Fauquet, D. L. Knudson, F. Brown	Sendai, 1984, Edmonton, 1987 and Berlin, 1990

This Report, the Sixth Report of the ICTV, adds to the accumulated taxonomic construction “in progress” since 1966. It records the proceedings of the Committee since 1990 and includes decisions reached at mid-term meetings in 1991 and 1992 and at the Ninth International Congress of Virology held in Glasgow in August of 1993.

The work of the Committee is far from complete — in fact, it would seem that as virus research continues to grow in breadth and depth and discoveries of the nature and diversity of the viruses become more and more amazing, the naïve goal of a “complete” taxonomy recedes into the distance. Virus taxonomy is a dynamic enterprise — to remain useful, it must continue to draw upon the wisdom and efforts of many virologists around the world, virologists representing all of the specialty disciplines that make up virology, overall. In this regard, this Report represents the work of about 400 virologists, the members of the Study Groups, Subcommittees and the Executive Committee of the ICTV for the term 1990-1993. The compilers of the Report wish to express their gratitude to all these virologists. We also wish to acknowledge, belatedly, the financial contribution of the Mayne Bequest Fund, the University of Queensland.

We also wish to express our gratitude to Ella Blanc, dedicated secretary to Dr. Claude M. Fauquet, and especially to Usha Padidam, responsible for the typing, formatting and layout of the VIth ICTV Report.

for the Committee

Frederick A. Murphy
President of the International Committee on Taxonomy of Viruses

VIRUS TAXONOMY

Sixth Report of the International Committee on Taxonomy of Viruses

Editors

F.A. Murphy

School of Veterinary Medicine
University of California, Davis
Davis, CA 95616
USA

C.M. Fauquet

ORSTOM/The Scripps Research Institute
Division of Plant Biology-MRC7
10666 North Torrey Pines Rd.
La Jolla, CA 92037 USA

D.H.L. Bishop

Natural Environment Research
School
Institute of Virology
Mansfield Road
Oxford OX1 3SR, UK

S.A. Ghabrial

University of Kentucky
Dept. of Plant Pathology
S-305 Ag. Sc. Bldg. N
Lexington, KY 40546
USA

A.W. Jarvis

New Zealand Dairy Research
Institute
Private Bag
Palmerston North
New Zealand

G.P. Martelli

Instituto di Patologia Vegetale
Via Giovanni Amendola 165A
70126 Bari
Italy

M.A. Mayo

Scottish Crop Research Institute
Invergowrie
Dundee DD2 5DA
UK

M.D. Summers

Texas A & M University
Dept. of Entomology
College Station, TX 77843-2475
USA

Contributors

Ackermann, H.-W.

Adam, G.

Adrian, T.

Alexander, D.J.

Atabekov, J.G.

Baldwin, M.

Bamford, D.H.

Barbanti-Brodano, G.

Barnett, O.W.

Bartha, A.

Baxby, D.

Beaty, B.J.

Beckage, N.E.

Bergoin, M.

Berns, K.I.

Berthiaume, L.

Billeter, M.A.

Bishop, D.H.L.

Black, D.N.

Blissard, G.W.

Bloom, M.

Boccardo, G.

Bozarth, R.

Bradley, D.

Brain, D.A.

Bridgdon, R.W.

Brinton, M.A.

Brown, F.

Bruenn, J.

Brunt, A.A.

Buchmeier, M.J.

Buck, K.W.

Burrell, C.J.

Calisher, C.H.

Candresse, T.

Carter, M.J.

Cavanagh, D.

Chiba, S.

Clegg, J.C.S.

Coffin, J.M.

Collett, M.

Collinge, J.

Collins, P.L.

Dalrymple, J.M.

Ghabrial, S.

Gibbs, M.J.

Gingery, R.E.

Ginsberg, H.

Goldbach, R.

Goorha, R.

Graf, T.M.

Granados, R.R.

Gust, I.D.

Hamilton, R.I.

Hammond, J.

Hanzlik, T.

Heinz, F.X.

Hendry, D.

Herrmann, J.E.

Hierholzer, J.C.

Hill, J.H.

Hillman, B.I.

Hinuma, Y.

Hoey, E.

Holmes, K.V.

Horzinek, M.C.

Hoshino, Y.

Howard, C.

Howley, P.M.

Hull, R.

Hunter, E.

Incardona, N.L.

Jackson, A.O.

Jaenisch, R.

Jahrling, P.B.

Johnson, J.

Joklik, W.K.

Jordan, R.

- Kaper, J.M.
Karabatsos, N.
Kashiwazaki, S.
Keddie, B.A.
Keese, P.
Lee, H.W.
Meshi, T.
Milne, R.G.
Minor, P.D.
Minson, A.C.
Monroe, S.S.
Morales, F.
Moss, B.
Moyer, R.W.
Muller, H.
Murant, A.F.
Muzyczka, N.
Nagai, Y.
Nakamura, K.
Namba, S.
Nasz, I.
Neurath, A.R.
Newbold, J.
Nichol, S.T.
Nicholson, B.L.
Noordaa, J.V.
Nuss, D.L.
Nusse, R.
Nuttall, P.A.
Ohki, S.T.
Olszewski, N.E.
Oroszlan, S.
Orth, G.
Örvell, C.
Palese, P.
Palmenberg, A.
Patterson, J.
Payment, P.
Peters, C.J.
Peters, D.
Petterson, R.F.
Pickup, D.J.
Plagemann, P.G.W.
Possee, R.
Pringle, C.R.
Prusiner, S.B.
Purcifull, D.
Randles, J.W.
Rathjen, J.P.
Reavy, B.
Rice, C.M.
Rima, B.
Robinson, A.J.
Robinson, D.J.
Robinson, W.
Rock, D.
Roizman, B.
Romaine, C.P.
Rott, R.
Rueckert, R.
Russell, W.C.
Russo, M.
Rybicki, E.P.
Saif, L.
Samal, K.S.K.
Sanchez, A.
Schaffer, F.
Schaller, H.
Schleper, C.
Schlesinger, R.W.
Schmaljohn, C.S.
Scotti, P.D.
Shah, K.V.
Shikata, E.
Shope, R.E.
Shukla, D.D.
Siddell, S.G.
Siegl, G.
Smith, A.
Smith, J.S.
Southern, P.J.
Spaan, W.J.M.
Stanway, G.
Stoltz, D.B.
Strauss, J.H.
Stuart, K.
Studdert, M.J.
Summers, M.D.
Svoboda, J.
Swanepoel, R.
Taguchi, F.
Tal, J.
Talbot, P.J.
Tateishi, J.
Tattersall, P.
Taylor, J.M.
Teich, N.
ter Meulen, V.
Theilmann, D.A.
Thiel, H.J.
Tiollais, P.
Tischer, I.
Tomaru, K.
Toriyama, S.
Toyoshima, K.
Tripathy, D.N.
Turnbull-Ross, A.D.
Uyeda, I.
Van Alfen, N.K.
Van Duin, J.
Van Etten, J.L.
Van Regenmortel, M.H.V.
Varmus, H.
Vinuela, E.
Volkman, L.E.
Wadell, G.
Walker, P.J.
Wang, A.
Wang, C.
Webb, B.A.
Weissmann, C.
Wen, Y-M.
Wengler, G.
Wickner, R.
Will, H.
Wimmer, E.
Winton, J.R.
Wunner, W.H.
Yamashita, S.
Yin-Murphy, M.
Zillig, W.
zur Hausen, H.

CONTENTS

PART I: INTRODUCTION TO THE UNIVERSAL SYSTEM OF VIRUS TAXONOMY	1
The History of Virus Taxonomy	1
The International Committee on Taxonomy of Viruses (ICTV)	1
The Universal System of Virus Taxonomy	2
Virus Nomenclature	3
Structural, Genomic, Physicochemical and Replicative Properties of Viruses Used in Taxonomy	4
Some Properties of Viruses Used in Taxonomy	5
Taxonomy and Unambiguous Virus Identification	7
Taxonomy and the Adequate Description of New Viruses	7
Taxonomy in Diagnostic Virology	8
The Future of Virus Taxonomy	8
 PART II: THE VIRUSES	 15
Glossary of Abbreviations and Virological Terms	16
Virus Diagrams	18
Taxa Listed Alphabetically	24
Taxa Listed by Host	26
Taxa Listed by Nucleic Acid	28
Key to the Placement of Viruses in Taxa	30
The Order of Presentation of the Viruses	39
Descriptions of Taxa	49
 PART III: THE INTERNATIONAL COMMITTEE ON TAXONOMY OF VIRUSES	 509
Officers and Members of the ICTV, 1990-1993	510
The Statutes of the ICTV, 1993	522
The Rules of Virus Classification and Nomenclature, 1993	526
The Format for Submission of New Taxonomic Proposals	528
 PART IV: INDEXES	 531
Author Index	533
Virus Index	551
Taxonomic Index	585