Archives of Virology (2023) 168:220
https://doi.org/10.1007/s00705-023-05834-2

VIROLOGY DIVISION NEWS

Renaming of genera *Ebolavirus* and *Marburgvirus* to *Orthoebolavirus* and *Orthomarburgvirus*, respectively, and introduction of binomial species names within family *Filoviridae*

Nadine Biedenkopf[1] · Alexander Bukreyev[2] · Kartik Chandran[3] · Nicholas Di Paola[4] · Pierre B. H. Formenty[5] · Anthony Griffiths[6] · Adam J. Hume[6] · Elke Mühlberger[6] · Sergey V. Netesov (Нетёсов Сергей Викторович)[7] · Gustavo Palacios[8] · Janusz T. Pawęska[9] · Sophie Smither[10] · Ayato Takada (高田礼人)[11] · Victoria Wahl[12] · Jens H. Kuhn[13]

Published online: 3 August 2023

Abstract

The International Committee on Taxonomy of Viruses (ICTV) *Filoviridae* Study Group continues to prospectively refine the established nomenclature for taxa included in family *Filoviridae* in an effort to decrease confusion of genus, species, and virus names and to adhere to amended stipulations of the International Code of Virus Classification and Nomenclature (ICVCN). Recently, the genus names *Ebolavirus* and *Marburgvirus* were changed to *Orthoebolavirus* and *Orthomarburgvirus*, respectively. Additionally, all established species names in family *Filoviridae* now adhere to the ICTV-mandated binomial format. Virus names remain unchanged and valid. Here, we outline the revised taxonomy of family *Filoviridae* as approved by the ICTV in April 2023.

Introduction

Family *Filoviridae* currently encompasses eight genera and 15 species for 16 viruses [2]. In recent years, nomenclatural confusion became apparent regarding two of these genera,

Handling Editor: Sead Sabanadzovic.

The authors are the members of the 2020–2023 International Committee on Taxonomy of Viruses *Filoviridae* Study Group.

✉ Jens H. Kuhn
kuhnjens@mail.nih.gov

1 Institute of Virology, Philipps-University Marburg, Marburg, Germany

2 The University of Texas Medical Branch at Galveston, Galveston, TX, USA

3 Department of Microbiology and Immunology, Albert Einstein College of Medicine, Bronx, NY, USA

4 United States Army Medical Research Institute of Infectious Diseases, Fort Detrick, Frederick, MD, USA

5 World Health Organization, Geneva, Switzerland

6 Department of Virology, Immunology and Microbiology, Chobanian and Avedisian School of Medicine, National Emerging Infectious Diseases Laboratories, Boston University, Boston, MA, USA

7 Novosibirsk State University, Novosibirsk, Novosibirsk Oblast, Russia

8 Department of Microbiology, Icahn School of Medicine at Mount Sinai, New York, NY, USA

9 Center for Emerging Zoonotic and Parasitic Diseases, National Institute for Communicable Diseases of the National Health Laboratory Service, Sandringham-Johannesburg, Gauteng, South Africa

10 CBR Division, Dstl, Porton Down, Salisbury, Wiltshire, UK

11 Division of Global Epidemiology, International Institute for Zoonosis Control, Hokkaido University, Sapporo, Japan

12 National Biodefense Analysis and Countermeasures Center, Fort Detrick, Frederick, MD, USA

13 Integrated Research Facility at Fort Detrick (IRF-Frederick), Division of Clinical Research (DCR), National Institute of Allergy and Infectious Diseases (NIAID), National Institutes of Health (NIH), B-8200 Research Plaza, Fort Detrick, Frederick, MD 21702, USA

Table 1 Taxonomy of family *Filoviridae* as of April 2023

Genus name[¶]	Previous species name (if applicable)	New species name[¶]	Virus name (abbreviation)[&]
Cuevavirus	Lloviu cuevavirus	*Cuevavirus lloviuense*	Lloviu virus (LLOV)
Dianlovirus	Mengla dianlovirus	*Dianlovirus menglaense*	Měnglà virus (MLAV)
"Loebvirus"[1]	/	*"Loebvirus percae"*[1]	Lötschberg virus (LTBV)
Oblavirus	/	*Oblavirus percae*	Oberland virus (OBLV)
Orthoebolavirus	Bombali ebolavirus	*Orthoebolavirus bombaliense*	Bombali virus (BOMV)
	Bundibugyo ebolavirus	*Orthoebolavirus bundibugyoense*	Bundibugyo virus (BDBV)
	Reston ebolavirus	*Orthoebolavirus restonense*	Reston virus (RESTV)
	Sudan ebolavirus	*Orthoebolavirus sudanense*	Sudan virus (SUDV)
	Tai Forest ebolavirus	*Orthoebolavirus taiense*	Taï Forest virus (TAFV)
	Zaire ebolavirus	*Orthoebolavirus zairense*	Ebola virus (EBOV)
Orthomarburgvirus	Marburg marburgvirus	*Orthomarburgvirus marburgense*	Marburg virus (MARV)
			Ravn virus (RAVV)
Striavirus	Xilang striavirus	*Striavirus antennarii*	Xīlǎng virus (XILV)
Tapjovirus	/	*Tapjovirus bothropis*	Tapajós virus (TAPV)
Thamnovirus	/	*Thamnovirus kanderense*	Kander virus (KNDV)
	/	*Thamnovirus percae*	Fiwi virus (FIWIV)
	Huangjiao thamnovirus	*Thamnovirus thamnaconi*	Huángjiāo virus (HUJV)

[1]These taxa were proposed in July 2023 and still need to be evaluated by the ICTV

[¶]Taxon names are always italicized and always begin with a capital letter

[&]Virus names are not italicized and are not capitalized, except if the name or a name component is a proper noun [16]

Ebolavirus and *Marburgvirus*. The vernacular terms "ebolaviral", "ebolavirus", and "ebolaviruses" (referring to the collective members of genus *Ebolavirus*) were frequently confused with the name of a particular member of that genus, i.e., Ebola virus. Similarly, the terms "marburgviral", "marburgvirus", and "marburgviruses" were frequently confused with the name of a particular member of genus *Marburgvirus*, i.e., Marburg virus.

Changes to virus taxonomy

In 2022, a taxonomic proposal (TaxoProp 2022.009M.A. Filoviridae_2genrenamed) was submitted to the International Committee on Taxonomy of Viruses (ICTV) [13] to remove the ambiguity associated with the vernacular terms by renaming genera *Ebolavirus* and *Marburgvirus* to *Orthoebolavirus* and *Orthomarburgvirus*, respectively. This proposal was approved by the ICTV Executive Committee in late 2022 and ratified by the ICTV in April 2023 [3, 11, 17]. Consequently, the terms "orthoebolaviral", "orthoebolavirus", and "orthoebolaviruses" and "orthomarburgviral", "orthomarburgvirus", and "orthomarburgviruses" now refer to the collective viruses assigned to genera *Orthoebolavirus* and *Orthomarburgvirus*, respectively. Bombali virus, Bundibugyo virus, Ebola virus, Reston virus, Sudan virus, and Taï Forest virus are orthoebolaviruses; likewise, Marburg virus and Ravn virus are orthomarburgviruses. Differentiation of these terms provides clarity; for example, the currently licensed vaccines to prevent Ebola virus disease are only efficacious against Ebola virus, not against other orthoebolaviruses [14].

In March 2021, the ICTV ratified TaxoProp 2018.001G.R.binomial_species, which requires all species names to follow a new codified rule:

> "A species name shall consist of only two distinct word components separated by a space. The first word component shall begin with a capital letter and be identical in spelling to the name of the genus to which the species belongs. The second word component shall not contain any suffixes specific for taxa of higher ranks. The entire species name (both word components) shall be italicized" [4, 15].

The purpose of this rule was to differentiate more clearly the name of a virus from the name of the species to which it is assigned, using the familiar genus + species epithet format found elsewhere in biological taxonomy nomenclature [16]. This rule required most of the then-established filoviral species names to be changed, providing an opportunity to bring an end to another confusion in the literature (i.e., the incorrect use of a now-outdated

Table 2 Identification of potential nomenclature problems in manuscripts (modified and updated from reference [9])

Manuscript check	Action
Search for the newly assigned species names listed in Table 1, column 3 (as applicable).	Species are not objects/viruses but categories/taxa [6, 16]. Virologists work with objects/viruses. Hence, species names should only appear very rarely in a manuscript. Typically, these terms ought to be listed only once in the methods and, potentially, the introduction sections and there be linked to their member viruses. Therefore, replace species names throughout with the appropriate virus names and/or their abbreviations as listed in Table 1, column 4.
Search for the terms "Bombali ebolavirus", "Bundibugyo ebolavirus", "Huangjiao thamnovirus", "Lloviu cuevavirus", "Marburg marburgvirus", "Mengla dianlovirus", "Reston ebolavirus", "Sudan ebolavirus", "Taï Forest ebolavirus", "Xilang striavirus", and "Zaire ebolavirus".	These terms are outdated species names if italicized (Table 1, column 2), outdated virus names [1], or species names that were wrongly applied as virus names. Replace with newly assigned species names (Table 1, column 3) if appropriate (see row above) or with virus names and/or their abbreviations as listed in Table 1, column 4.
Search for the terms "Lake Victoria marburgvirus", "Cote d'Ivoire ebolavirus", "Côte d'Ivoire ebolavirus", and "Ivory Coast ebolavirus" (as applicable).	These species names (if italicized) and virus names (if not italicized) are outdated [1]. Replace with newly assigned species names (Table 1, column 3) if appropriate or with virus names and/or their abbreviations as listed in Table 1, column 4.
Search (as applicable) for the terms "BEBOV", "CIEBOV", "ICEBOV", "MBGV", "REBOV", "SEBOV", "UEBOV", and "ZEBOV" (as applicable).	These terms are outdated [1]. Replace with current abbreviations as listed in Table 1, column 4, except if part of proprietary names (for instance, vaccine or commercial assay names).
Search for the abbreviation "EBOV" (if applicable).	Are you referring to a single virus, namely "Ebola virus" (which belongs to species *Orthoebolavirus zairense*)? In that case, the abbreviation is correctly applied [5]. Are you referring to several viruses of the genus *Orthoebolavirus*? If this is the case, replace with "orthoebolavirus(es)/ebolaviral", because the collective members of higher taxa (ranked above species) are not to be abbreviated. Note that the genus name "*Orthoebolavirus*" is capitalized and italicized, but the name of the collective viruses assigned to the genus, i.e., "orthoebolaviruses", is written in lower case and is not italicized (this applies to all genera).
Search for the abbreviation "MARV" (if applicable).	Are you referring to a single virus, namely "Marburg virus" (which belongs to species *Orthomarburgvirus marburgense*)? In this case, the abbreviation is correctly applied [5]. Are you referring to several viruses of the genus *Orthomarburgvirus*? If this is the case, replace with "orthomarburgvirus(es)/orthomarburgviral", because the collective members of higher taxa are not to be abbreviated. Note that the genus name "*Orthomarburgvirus*" is capitalized and italicized, but the name of the collective viruses assigned to the genus, i.e., "orthomarburgviruses", is written in lower case and is not italicized (this applies to all genera).
Search for the terms "*Ebolavirus*" and "*Marburgvirus*" (as applicable).	These genus names are outdated. Replace with "*Orthoebolavirus*" and "*Orthomarburgvirus*", respectively. Note that the genus names "*Orthoebolavirus*" and "*Orthomarburgvirus*" are capitalized and italicized, but the names of their collective members, i.e., "orthoebolaviruses" and "orthomarburgviruses", respectively, are written in lower case and are not italicized [this applies to all genera]. *Orthoebolavirus* and *Orthomarburgvirus* are genera and hence categories/taxa, whereas orthoebolaviruses and orthomarburgviruses are objects/viruses.
Search for the terms "ebolavirus", "ebolaviruses", "ebolaviral", "marburgvirus", "marburgviruses", and "marburgviral" (as applicable).	Replace with "orthoebolavirus", "orthoebolaviruses", "orthoebolaviral", "orthomarburgvirus", "orthomarburgviruses", and "orthomarburgviral", respectively. Note that the genus names "*Orthoebolavirus*" and "*Orthomarburgvirus*" are capitalized and italicized, but the names of their collective members, i.e., "orthoebolaviruses" and "orthomarburgviruses", respectively, are written in lower case and are not italicized [this applies to all genera]. *Orthoebolavirus* and *Orthomarburgvirus* are genera and hence categories/taxa, whereas orthoebolaviruses and orthomarburgviruses are objects/viruses.

Table 2 (continued)

Manuscript check	Action
Search for the term "*Filoviridae*" (if applicable).	*Filoviridae* is a family and hence a category/taxon. Virologists work with objects/viruses. Families cannot be "used" in any way; thus replace, where appropriate, with the term referring to the collective members of this family: "filoviruses" (or, preferable, "filovirids) or their adjectives ("filovirus", "filovirid", "filoviral").
Search for the term "species".	Species are not objects/viruses but categories/taxa [6, 16]. Virologists work with objects/viruses. Species cannot be "used" in any way or "do" things. Rephrase your sentences accordingly, for instance: a) Replace "rhesus monkeys infected with the *Orthoebolavirus zairense* species" with "rhesus monkeys infected with Ebola virus"; b) Replace "*Orthoebolavirus zairense* is hypothesized to infect fruit bats" with "Ebola virus is hypothesized to infect fruit bats"; c) Replace "Five new orthoebolavirus species have been discovered" with "Five new orthoebolaviruses have been discovered" or "Five new orthoebolavirus species have been established".
Search for the term "strain".	Use the word "strain" only if you refer to a laboratory mouse- or guinea pig-adapted virus that causes disease in those rodents. Otherwise, replace with "variant" or "isolate" (e.g., "Kikwit", "Makona", and "Yambuku" are EBOV variants; "Kikwit-9510621", "Makona-C05", and "Yambuku-Mayinga" are examples for isolates of each of these variants [7, 8]).

species name, *Zaire ebolavirus*, as a virus name [instead of the correct Ebola virus] and the incorrect use of "ZEBOV" as the virus abbreviation [instead of the correct EBOV]. New species names were proposed according to guidance outlined by Postler et al. [12] in a taxonomic proposal submitted by the ICTV *Filoviridae* Study Group to the ICTV in 2021 (TaxoProp 2021.012M.A.Filoviridae_sprenamed.docx). This proposal was approved by the ICTV Executive Committee in late 2022 and accepted/ratified by the ICTV in April 2023 [3, 11, 17]. Table 1 lists the current taxonomy of family *Filoviridae* with the outdated species names as a reference; Table 2 provides practical guidance on how to apply the updated nomenclature in manuscripts.

Conclusion

As with renaming proposals elsewhere in virus taxonomy, it should be stressed that changes to the names of species have no influence on the names of their viruses, which remain unchanged.

We hope this description of the modifications and replacements of genus and species names is of value with respect to the reasons for the nomenclature changes and that it may serve a useful reference guide for those working in the field. The ICTV Report chapter *Filoviridae* has been updated with the new genus and species names along with other recent taxonomic changes in the family [10].

Acknowledgments We thank Anya Crane (NIH NIAID DCR IRF-Frederick) for critically editing the manuscript.

Funding This work was supported in part through Laulima Government Solutions, LLC, prime Contract No. HHSN272201800013C with the U.S. National Institute of Allergy and Infectious Diseases (NIAID). J.H.K. performed this work as an employee of Tunnell Government Services (TGS), a subcontractor of Laulima Government Solutions, LLC, under Contract No. HHSN272201800013C. This work was also funded in part by Contract No. HSHQDC-15-C-00064, awarded by the U.S. Department of Homeland Security (DHS) Science and Technology Directorate (S&T) for the management and operation of The National Biodefense Analysis and Countermeasures Center, a federally funded research and development center operated by the Battelle National Biodefense Institute (V.W.). The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. Department of the Army, the U.S. Department of Defense, the U.S. Department of Health and Human Services, the U.S. Department of Homeland Security (DHS) Science and Technology Directorate (S&T), or of the institutions and companies affiliated with the authors. In no event shall any of these entities have any responsibility or liability for any use, misuse, inability to use, or reliance upon the information contained herein. The U.S. departments do not endorse any products or commercial services mentioned in this publication. The U.S. Government retains and the publisher, by accepting the article for publication, acknowledges that the U.S. Government retains a non-exclusive, paid up, irrevocable, world-wide license to publish or reproduce the published form of this manuscript, or allow others to do so, for U.S. Government purposes.

Declarations

Conflict of interest The authors declare no conflicts of interest.

Ethical approval This article does not contain any studies with human participants or animals performed by any of the authors.

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