Archives of Virology (2018) 163:2295–2310
https://doi.org/10.1007/s00705-018-3843-5

VIROLOGY DIVISION NEWS

Taxonomy of the family *Arenaviridae* and the order *Bunyavirales*: update 2018

Piet Maes[1] · Sergey V. Alkhovsky[2] · Yīmíng Bào[3] · Martin Beer[4] · Monica Birkhead[5] · Thomas Briese[6] · Michael J. Buchmeier[7] · Charles H. Calisher[8] · Rémi N. Charrel[9] · Il Ryong Choi[10] · Christopher S. Clegg[11] · Juan Carlos de la Torre[12] · Eric Delwart[13,14] · Joseph L. DeRisi[15] · Patrick L. Di Bello[16] · Francesco Di Serio[17] · Michele Digiaro[18] · Valerian V. Dolja[19] · Christian Drosten[20,21,22] · Tobiasz Z. Druciarek[16] · Jiang Du[23] · Hideki Ebihara[24] · Toufic Elbeaino[18] · Rose C. Gergerich[16] · Amethyst N. Gillis[25] · Jean-Paul J. Gonzalez[26] · Anne-Lise Haenni[27] · Jussi Hepojoki[28,29] · Udo Hetzel[29,30] · Thiện Hồ[16] · Ní Hóng[31] · Rakesh K. Jain[32] · Petrus Jansen van Vuren[5,33] · Qi Jin[34,35] · Miranda Gilda Jonson[36] · Sandra Junglen[20,22] · Karen E. Keller[37] · Alan Kemp[5] · Anja Kipar[29,30] · Nikola O. Kondov[13] · Eugene V. Koonin[38] · Richard Kormelink[39] · Yegor Korzyukov[28] · Mart Krupovic[40] · Amy J. Lambert[41] · Alma G. Laney[42] · Matthew LeBreton[43] · Igor S. Lukashevich[44] · Marco Marklewitz[20,22] · Wanda Markotter[5,33] · Giovanni P. Martelli[45] · Robert R. Martin[37] · Nicole Mielke-Ehret[46] · Hans-Peter Mühlbach[46] · Beatriz Navarro[17] · Terry Fei Fan Ng[14] · Márcio Roberto Teixeira Nunes[47,48] · Gustavo Palacios[49] · Janusz T. Pawęska[5,33] · Clarence J. Peters[50] · Alexander Plyusnin[28] · Sheli R. Radoshitzky[49] · Víctor Romanowski[51] · Pertteli Salmenperä[28,52] · Maria S. Salvato[53] · Hélène Sanfaçon[54] · Takahide Sasaya[55] · Connie Schmaljohn[49] · Bradley S. Schneider[25] · Yukio Shirako[56] · Stuart Siddell[57] · Tarja A. Sironen[28] · Mark D. Stenglein[58] · Nadia Storm[5] · Harikishan Sudini[59] · Robert B. Tesh[48] · Ioannis E. Tzanetakis[16] · Mangala Uppala[59] · Olli Vapalahti[28,30,60] · Nikos Vasilakis[48] · Peter J. Walker[61] · Guópíng Wáng[31] · Lìpíng Wáng[31] · Yànxiǎng Wáng[31] · Tàiyún Wèi[62] · Michael R. Wiley[49,63] · Yuri I. Wolf[38] · Nathan D. Wolfe[25,64] · Zhìqiáng Wú[23] · Wénxìng Xú[31,65,66,67] · Li Yang[68] · Zuòkūn Yāng[31] · Shyi-Dong Yeh[69] · Yǒng-Zhèn Zhāng[70] · Yàzhōu Zhèng[31] · Xueping Zhou[71] · Chénxī Zhū[31] · Florian Zirkel[21] · Jens H. Kuhn[72]

Received: 16 March 2018 / Accepted: 2 April 2018 / Published online: 21 April 2018

Handling Editor: Sead Sabanadzovic.

Michael J. Buchmeier, Rémi N. Charrel, Christopher S. Clegg, Juan Carlos de la Torre, Joseph L. DeRisi, Jean-Paul J. Gonzalez, S. Lukashevich, Clarence J. Peters, Sheli R. Radoshitzky, Víctor Romanowski, Maria S. Salvato and Jens H. Kuhn were the members of the 2014–2017 International Committee on Taxonomy of Viruses (ICTV) *Arenaviridae* Study Group.

Piet Maes, Sergey V. Alkhovsky, Martin Beer, Thomas Briese, Charles H. Calisher, Rémi N. Charrel, Hideki Ebihara, Rakesh K. Jain, Amy J. Lambert, Márcio Roberto Teixeira Nunes, Alexander Plyusnin, Connie Schmaljohn, Robert B. Tesh, Shyi-Dong Yeh and Jens H. Kuhn were the members of the 2014–2017 ICTV *Bunyaviridae* Study Group.

Michele Digiaro, Toufic Elbeaino, Giovanni P. Martelli, Nicole Mielke-Ehret and Hans-Peter Mühlbach were the members of the 2014–2017 ICTV *Emaravirus* Study Group.

Il Ryong Choi, Anne-Lise Haenni, Miranda Gilda Jonson, Takahide Sasaya, Yukio Shirako, Tàiyún Wèi and Xueping Zhou were the members of the 2014–2017 ICTV *Tenuivirus* Study Group.

Stuart Siddell was the Chair of the 2014–2017 ICTV Animal dsRNA and ssRNA-Viruses Subcommittee.

Hélène Sanfaçon was the Chair of the 2014–2017 ICTV Plant Viruses Subcommittee.

Extended author information available on the last page of the article

Abstract
In 2018, the family *Arenaviridae* was expanded by inclusion of 1 new genus and 5 novel species. At the same time, the recently established order *Bunyavirales* was expanded by 3 species. This article presents the updated taxonomy of the family *Arenaviridae* and the order *Bunyavirales* as now accepted by the International Committee on Taxonomy of Viruses (ICTV) and summarizes additional taxonomic proposals that may affect the order in the near future.

Introduction

The family *Arenaviridae* was established in 1976 to accommodate predominantly murid viruses with bisegmented, ambisense single-stranded RNA genomes that form enveloped particles with a "sandy" appearance [7]. Until recently, the family was monogeneric, including the single genus *Arenavirus*, with a steadily increasing number of species. The taxonomy of the family was substantially amended and emended [22] following the discovery of several distinct arenaviruses in alethinophidian snakes [4, 10, 24]. In particular, the genus *Arenavirus* was renamed *Mammarenavirus*, and a second genus, *Reptarenavirus*, was established in 2014 for several of the newly discovered snake viruses. A non-Linnean binomial species nomenclature was adopted for the entire family *Arenaviridae* [22] (ICTV TaxoProps [taxonomic proposals] 2014.011a-dV and 2014.012aV). Since then, the genus *Mammarenavirus* has been extended by 8 species for novel murid viruses discovered in Africa and Asia [3, 8, 11, 15, 21, 25] (TaxoProps 2014.013aV.A.v3. Mammarenavirus_2sp, 2015.001aM, 2016.014aM and 2016.019aM.A.v2.Mammarenavirus_sp).

The order *Bunyavirales* was established in 2017 to accommodate related viruses with segmented, linear, single-stranded, negative-sense or ambisense RNA genomes distributed among nine families (TaxoProp 2016.030a-vM). In particular, the then existing family *Bunyaviridae* was elevated to the rank of order. The three established bunyaviral genera *Hantavirus*, *Nairovirus*, and *Tospovirus* were renamed *Orthohantavirus*, *Orthonairovirus*, and *Orthotospovirus* and included in the newly established families *Hantaviridae*, *Nairoviridae*, and *Tospoviridae*, respectively (TaxoProp 2016.030a-vM). The genus *Orthonairovirus* was expanded by five species [13] (TaxoProp 2016.026a,bM). The family *Peribunyaviridae* was created to include the established bunyaviral genus *Orthobunyavirus* and a new genus, *Herbevirus*, for bunyaviruses discovered in invertebrates [14, 17] (TaxoProps 2016.024a-dM and 2016.030a-vM). The family *Phenuiviridae* was created to accommodate the established bunyaviral genus *Phlebovirus*, the previously "free-floating" plant virus genus *Tenuivirus*, and two new genera, *Goukovirus* and *Phasivirus*, for novel invertebrate bunyaviruses [16] (TaxoProps 2016.022a-dM and 2016.027a-dM). Three new families, *Feraviridae*, *Jonviridae*, and *Phasmaviridae*, were established for newly discovered invertebrate bunyaviruses [2, 14, 18] (TaxoProps 2016.021a-dM, 2016.025a-dM and 2016.028a-dM). In addition, the family *Fimoviridae* was created to accommodate the previously "free-floating" plant virus genus *Emaravirus*, which was expanded by three species for newly discovered plant viruses [5, 6, 26] (TaxoProps 2016.016aP, 2016.017aP, 2016.018aP, and 2016.030a-vM). Finally, a non-Linnean binomial species nomenclature was adopted for the entire family (TaxoProps 2016.020aM, 2016.023a-cM, 2016.026a,bM, 2016.029aM.A.v2.Tenuivirus_spren, and 2016.030a-vM).

After the establishment of the order *Bunyavirales*, the ICTV Study Groups responsible for the taxonomy of *Arenaviridae* and *Bunyavirales* assigned unclassified viruses to existing or novel taxa and continued streamlining order nomenclature in collaboration with other virus experts. Here we present the changes to both taxa that were proposed via official TaxoProps at http://www.ictvonline.org/ in 2017 and that were accepted by the ICTV Executive Committee. These changes are official ICTV taxonomy as of March 2018.

Family *Arenaviridae*

Taxonomic changes at the family rank

In 2018, the family was extended by addition of a novel genus, *Hartmanivirus*, for Haartman Institute snake virus (HISV) isolated from a captive boa constrictor in Finland [9, 10] (TaxoProp 2017.001M.A.v1.Hartmanivirus.zip). The genus *Mammarenavirus* was extended by addition of two novel species for Ryukyo virus (RYKV) and souris virus (SOUV) discovered in mice in China and Cameroon, respectively (TaxoProps 2017.002M.A.v2.Mammarenavirus_sp and 2017.003M.A.v1.Mammarenavirus_sp). Five mammarenavirus species were renamed due to the ICTV decision to disallow diacritic marks in taxon names (TaxoProp 2017.001G.A.v2.43spren): *Amaparí mammarenavirus*, *Junín mammarenavirus*, *Paraná mammarenavirus*, *Pichindé mammarenavirus*, and *Sabiá mammarenavirus* were renamed *Serra do Navio mammarenavirus*, *Argentinian mammarenavirus*, *Paraguayan mammarenavirus*, *Cali mammarenavirus*, and *Brazilian mammarenavirus*, respectively, whereas the member virus names remained unchanged (TaxoProp 2017.001G.A.v2.43spren). Finally, the three reptarenavirus species names *Alethinophid 1 reptarenavirus*, *Alethinophid 2 reptarenavirus*, and *Alethinophid 3 reptarenavirus* were renamed *Golden reptarenavirus*, *California reptarenavirus*, and *Rotterdam reptarenavirus*. Two new

reptarenavirus species were created for tavallinen suomalainen mies virus 2 (TSMV-2) and University of Giessen viruses 1–3 (UGV-1–3) discovered in captive boa constrictors; several newly sequenced reptarenaviruses were assigned to existing species [9] (TaxoProp 2017.015M.A.v1. Reptarenavirus_2sp3ren).

Order *Bunyavirales*

Taxonomic changes at the order rank

In 2018, no changes were made at the order rank.

Taxonomic changes at the family rank

Feraviridae

In 2018, no changes were made at the family rank.

Fimoviridae

In 2018, no changes were made at the family rank.

Hantaviridae

In 2018, no changes were made at the family rank.

Jonviridae

In 2018, no changes were made at the family rank.

Nairoviridae

The family *Nairoviridae* was expanded in 2018 by addition of two new species for the long-known but previously unsequenced Artashat virus (ARTSV) and Chim virus (CHIMV), both originally isolated from ticks. In addition, the species *Burana orthonairovirus* was renamed *Tamdy orthonairovirus* to better reflect the discovery history of species members, and several newly sequenced nairoviruses were classified into existing species [1] (TaxoProp 2017.008M.A.v1.Orthonairovirus_2sp1ren).

Peribunyaviridae

The family *Peribunyaviridae* was expanded in 2018 by addition of a novel species for Wolkberg virus (WBV) discovered in wingless bat flies (*Eucampsipoda africana*) in South Africa [12] (TaxoProp 2017.007M.A.v1. Orthobunyavirus_sp).

Phasmaviridae

In 2018, no changes were made at the family rank.

Phenuiviridae

In 2018, no changes were made at the family rank.

Tospoviridae

In 2018, no changes were made at the family rank.

Outlook

The taxonomy of viruses of the family *Arenaviridae* and the order *Mononegavirales* remains in flux, and additional important changes are likely forthcoming. Indeed, in 2017, two additional taxonomic proposals that would affect the family *Arenaviridae* and the order *Mononegavirales* were debated during the most recent ICTV EC meeting in Singapore. TaxoProp 2017.006M.U.v2.Negarnaviricota proposes the

- establishment of a phylum for negative-sense RNA viruses that is subdivided into two subphyla; and
- establishment of a class including the order *Bunyavirales*, to be assigned to one of the subphyla.

TaxoProp 2017.012M.U.v2.Bunyavirales_rev proposes

- dissolution of the families *Feraviridae*, *Jonviridae*, and *Tospoviridae* and absorption of their genera into remaining families;
- the creation of three new bunyaviral families for novel invertebrate viruses [19, 20, 23];
- the inclusion of the family *Arenaviridae* in the order; and
- the creation of 19 new bunyaviral genera. These genera are planned to accommodate novel, mostly invertebrate, viruses [14, 23], but some of them are deemed necessary for reclassification of certain hantaviruses and phleboviruses.

These two proposals failed to find unanimous approval at a final ICTV EC vote in fall of 2017 and were deferred to the 2018 ICTV EC meeting, at which a simple majority vote would suffice for approval of the original proposals.

Summary

Summaries of the current, ICTV-accepted taxonomies of the family *Arenaviridae* and the order *Bunyavirales* are presented in Tables 1 and 2, respectively. These tables also

Table 1 ICTV-accepted taxonomy of the family *Arenaviridae* as of 2018. Listed are all arenaviruses that have been classified into species

Genus	Species[a]	Virus (abbreviation)[a]
Hartmanivirus	*Haartman hartmanivirus*	Haartman Institute snake virus (HISV)
Mammarenavirus	*Allpahuayo mammarenavirus*	Allpahuayo virus (ALLV)
	Argentinian mammarenavirus	Junín virus (JUNV)
	Bear Canyon mammarenavirus	Bear Canyon virus (BCNV)
	Brazilian mammarenavirus	Sabiá virus (SBAV)
	Chapare mammarenavirus	Chapare virus (CHAPV)
	Cupixi mammarenavirus	Cupixi virus (CUPXV)
	Flexal mammarenavirus	Flexal virus (FLEV)
	Gairo mammarenavirus	Gairo virus (GAIV)
	Guanarito mammarenavirus	Guanarito virus (GTOV)
	Ippy mammarenavirus	Ippy virus (IPPYV)
	Lassa mammarenavirus	Lassa virus (LASV)
	Latino mammarenavirus	Latino virus (LATV)
	Loei River mammarenavirus	Loei River virus (LORV)
	Lujo mammarenavirus	Lujo virus (LUJV)
	Luna mammarenavirus	Luna virus (LUAV)
		Luli virus (LULV)
	Lunk mammarenavirus	Lunk virus (LNKV)
	Lymphocytic choriomeningitis mammarenavirus[b]	lymphocytic choriomeningitis virus (LCMV)
	Machupo mammarenavirus	Machupo virus (MACV
	Mariental mammarenavirus	Mariental virus (MRLV)
	Merino Walk mammarenavirus	Merino Walk virus (MRWV)
	Mobala mammarenavirus	mobala virus (MOBV)
	Mopeia mammarenavirus	Mopeia virus (MPOV)
		Morogoro virus (MORV)
	Okahandja mammarenavirus	Okahandja virus (OKAV)
	Oliveros mammarenavirus	Oliveros virus (OLVV)
	Paraguayan mammarenavirus	Paraná virus (PRAV)
	Cali mammarenavirus	Pichindé virus (PICHV)
	Pirital mammarenavirus	Pirital virus (PIRV)
	Ryukyu mammarenavirus	Ryukyu virus (RYKV)
	Serra do Navio mammarenavirus	Amaparí virus (AMAV)
	Solwezi mammarenavirus	Solwezi virus (SOLV)
	Souris mammarenavirus	souris virus (SOUV)
	Tacaribe mammarenavirus	Tacaribe virus (TCRV)
	Tamiami mammarenavirus	Tamiami virus (TMMV)
	Wenzhou mammarenavirus	Wēnzhōu virus (WENV)
	Whitewater Arroyo mammarenavirus	Big Brushy Tank virus (BBRTV)
		Catarina virus (CTNV)
		Skinner Tank virus (SKTV)
		Tonto Creek virus (TTCV)
		Whitewater Arroyo virus (WWAV)
Reptarenavirus	*California reptarenavirus*	CAS virus (CASV)
	Giessen reptarenavirus	University of Giessen virus 1 (UGV-1)
		University of Giessen virus 2 (UGV-2)
		University of Giessen virus 3 (UGV-3)
	Golden reptarenavirus[b]	Golden Gate virus (GOGV)
	Ordinary reptarenavirus	tavallinen suomalainen mies virus 2 (TSMV-2)
	Rotterdam reptarenavirus	ROUT virus (ROUTV)
		University of Helsinki virus 1 (UHV-1)

[a]Please note that viruses are real objects that are assigned to concepts that are called taxa. Species, genera, families, and orders are taxa. Taxon names are always italicized and always begin with a capital letter. Virus names, on the other hand, are not italicized and are not capitalized, except if the name or a name component is a proper noun. This column lists the virus names with their correct (lack of) capitalization

[b]Type species

Table 2 ICTV-accepted taxonomy of the order *Bunyavirales* as of 2018. Listed are all bunyaviruses that have been classified into species

Genus	Species[a]	Virus (abbreviation)[a]
Family *Feraviridae*		
Orthoferavirus	*Ferak orthoferavirus*[b]	ferak virus (FERV)
Family *Fimoviridae*		
Emaravirus	*Actinidia chlorotic ringspot-associated emaravirus*	Actinidia chlorotic ringspot-associated virus (AcCRaV)
	European mountain ash ringspot-associated emaravirus[b]	European mountain ash ringspot-associated virus (EMARaV)
	Fig mosaic emaravirus	fig mosaic virus (FMV)
	High Plains wheat mosaic emaravirus	High Plains wheat mosaic virus (HPWMoV)
	Pigeonpea sterility mosaic emaravirus 1	pigeonpea sterility mosaic virus (PPSMV)
	Pigeonpea sterility mosaic emaravirus 2	pigeonpea sterility mosaic virus 2 (PPSMV-2)
	Raspberry leaf blotch emaravirus	raspberry leaf blotch virus (RLBV)
	Redbud yellow ringspot-associated emaravirus	redbud yellow ringspot-associated virus (RYRaV)
	Rose rosette emaravirus	rose rosette virus (RRV)
Family *Hantaviridae*		
Orthohantavirus	*Amga orthohantavirus*	Amga virus (MGAV)[c]
	Andes orthohantavirus	Andes virus (ANDV)
		Castelo dos Sonhos virus (CASV)
		Lechiguanas virus (LECV = LECHV)
		Orán virus (ORNV)
	Asama orthohantavirus	Asama virus (ASAV)
	Asikkala orthohantavirus	Asikkala virus (ASIV)
	Bayou orthohantavirus	bayou virus (BAYV)
		Catacamas virus (CATV)
	Black Creek Canal orthohantavirus	Black Creek Canal virus (BCCV)
	Bowe orthohantavirus	Bowé virus (BOWV)
	Bruges orthohantavirus	Bruges virus (BRGV)
	Cano Delgadito orthohantavirus	Caño Delgadito virus (CADV)
	Cao Bang orthohantavirus	Cao Bằng virus (CBNV)
		Liánghé virus (LHEV)
	Choclo orthohantavirus	Choclo virus (CHOV)
	Dabieshan orthohantavirus	Dàbiéshān virus (DBSV)
	Dobrava-Belgrade orthohantavirus	Dobrava virus (DOBV)
		Kurkino virus (KURV)
		Saaremaa virus (SAAV)
		Sochi virus
	El Moro Canyon orthohantavirus	Carrizal virus (CARV)
		El Moro Canyon virus (ELMCV)
		Huitzilac virus (HUIV)
	Fugong orthohantavirus	Fúgòng virus (FUGV)
	Fusong orthohantavirus	Fŭsōng virus (FUSV)
	Hantaan orthohantavirus[b]	Amur virus (AMRV)
		Hantaan virus (HTNV)
		Soochong virus (SOOV)
	Imjin orthohantavirus	Imjin virus (MJNV)
	Jeju orthohantavirus	Jeju virus (JJUV)
	Kenkeme orthohantavirus	Kenkeme virus (KKMV)
	Khabarovsk orthohantavirus	Khabarovsk virus (KHAV)
		Topografov virus (TOPV)

Table 2 (continued)

Genus	Species[a]	Virus (abbreviation)[a]
	Laguna Negra orthohantavirus	Laguna Negra virus (LANV)
		Maripa virus (MARV)
		Río Mamoré virus (RIOMV)
	Laibin orthohantavirus	Láibīn virus (LBV)
	Longquan orthohantavirus	Lóngquán virus (LQUV)
	Luxi orthohantavirus	Lúxī virus (LUXV)
	Maporal orthohantavirus	Maporal virus (MAPV)
	Montano orthohantavirus	Montaño virus (MTNV)
	Necocli orthohantavirus	Necoclí virus (NECV)
	Nova orthohantavirus	Nova virus (NVAV)
	Oxbow orthohantavirus	Oxbow virus (OXBV)
	Prospect Hill orthohantavirus	Prospect Hill virus (PHV)
	Puumala orthohantavirus	Hokkaido virus (HOKV)
		Muju virus (MUJV)
		Puumala virus (PUUV)
	Quezon orthohantavirus	Quezon virus (QZNV)
	Rockport orthohantavirus	Rockport virus (RKPV)
	Sangassou orthohantavirus	Sangassou virus (SANGV)
	Seoul orthohantavirus	gōu virus (GOUV)
		Seoul virus (SEOV)
	Sin Nombre orthohantavirus	New York virus (NYV)[d]
		sin nombre virus (SNV)
	Thailand orthohantavirus	Anjozorobe virus
		Serang virus (SERV)[e]
		Thailand virus (THAIV)
	Thottapalayam orthohantavirus	Thottapalayam virus (TPMV)
	Tula orthohantavirus	Adler virus (ADLV)
		Tula virus (TULV)
	Yakeshi orthohantavirus	Yákèshí virus (YKSV)
Family *Jonviridae*		
Orthojonvirus	*Jonchet orthojonvirus*[b]	jonchet virus (JONV)
Family *Nairoviridae*		
Orthonairovirus	*Artashat orthonairovirus*	Artashat virus (ARTSV)
	Chim orthonairovirus	Chim virus (CHIMV)
	Crimean-Congo hemorrhagic fever orthonairovirus	Crimean-Congo hemorrhagic fever virus (CCHFV)
	Dera Ghazi Khan orthonairovirus	Abu Hammad virus (AHV)[f]
		Abu Mina virus (AMV)
		Dera Ghazi Khan virus (DGKV)
		Sapphire II virus (SAPV)
	Dugbe orthonairovirus[b]	Dugbe virus (DUGV)
		kupe virus (KUPEV)
	Hazara orthonairovirus	Hazara virus (HAZV)
		Tofla virus (TFLV)
	Hughes orthonairovirus	Caspiy virus (CASV)
		Farallon virus (FARV)
		Great Saltee virus (GRSV)
		Hughes virus (HUGV)
		Punta Salinas virus (PSV)

Table 2 (continued)

Genus	Species[a]	Virus (abbreviation)[a]
		Raza virus (RAZAV)
		Soldado virus (SOLV)
		Zirqa virus (ZIRV)
	Kasokero orthonairovirus	Kasokero virus (KASV = KASOV)
		Leopards Hill virus (LPHV)
		Yogue virus (YOGV)
	Keterah orthonairovirus	Gossas virus (GOSV)
		Issyk-kul virus (ISKV)
		Keterah virus (KTRV)[g]
		Uzun-Agach virus (UZAV)
	Nairobi sheep disease orthonairovirus	Nairobi sheep disease virus (NSDV)[h]
	Qalyub orthonairovirus	Bandia virus (BDAV)
		Geran virus (GERV)
		Qalyub virus (QYBV)
	Sakhalin orthonairovirus	Avalon virus (AVAV)
		Clo Mor virus (CMV = CLMV)
		Sakhalin virus (SAKV)
		Taggert virus (TAGV)
		Tillamook virus (TILLV)
	Tamdy orthonairovirus	Burana virus (BURV)
		Huángpí tick virus 1 (HpTV-1)
		Tamdy virus (TAMV)
		Tǎchéng tick virus 1 (TcTV-1)
		Wēnzhōu tick virus (WzTV)
	Thiafora orthonairovirus	Erve virus (ERVEV)
		Thiafora virus (TFAV)
Family *Peribunyaviridae*		
Herbevirus	*Herbert herbevirus*[b]	Herbert virus (HEBV)
	Kibale herbevirus	Kibale virus (KIBV)
	Shuangao insect herbevirus 1	Shuāngào insect virus 1 (SgIV-1)
	Tai herbevirus	Taï virus (TAIV)
Orthobunyavirus	*Acara orthobunyavirus*	Acará virus (ACAV)
		Moriche virus (MORV)
	Akabane orthobunyavirus	Akabane virus (AKAV)
		Sabo virus (SABOV)
		Tinaroo virus (TINV)
		Yaba-7 virus (Y7V)
	Alajuela orthobunyavirus	Alajuela virus (ALJV)
		Brus Laguna virus
		San Juan virus (SJV)
	Anopheles A orthobunyavirus	Anopheles A virus (ANAV)
		Arumateua virus (ARTV)
		Caraipé virus (CPEV)
		Las Maloyas virus (LMV)
		Lukuni virus (LUKV)
		Trombetas virus (TRMV)
		Tucuruí virus (TUCV)

Table 2 (continued)

Genus	Species[a]	Virus (abbreviation)[a]
	Anopheles B orthobunyavirus	Anopheles B virus (ANBV)
		Boracéia virus (BORV)
	Bakau orthobunyavirus	Bakau virus (BAKV)
		Ketapang virus (KETV)
		Nola virus (NOLAV)
		Tanjong Rabok virus (TRV)
		Telok Forest virus (TFV)
	Batama orthobunyavirus	Batama virus (BMAV)
	Benevides orthobunyavirus	Benevides virus (BVSV)
	Bertioga orthobunyavirus	Bertioga virus (BERV)
		Cananéia virus (CNAV)
		Guaratuba virus (GTBV)
		Itimirim virus (ITIV)
		Mirim virus (MIRV)
	Bimiti orthobunyavirus	bimiti virus (BIMV)
	Botambi orthobunyavirus	Botambi virus (BOTV)
	Bunyamwera orthobunyavirus[b]	Anadyr virus (ANADV)
		Batai virus (BATV)[i]
		Birao virus (BIRV)
		Bozo virus (BOZOV)
		Bunyamwera virus (BUNV)
		Cache Valley virus (CVV)
		Fort Sherman virus (FSV)
		Germiston virus (GERV)
		Ilesha virus (ILEV)
		Lokern virus (LOKV)
		Maguari virus (MAGV)
		Mboké virus (MBOV)
		Ngari virus (NRIV)[j]
		Northway virus (NORV)
		Playas virus (PLAV)
		Potosi virus (POTV)
		Santa Rosa virus (SARV)
		Shokwe virus (SHOV)
		Stanfield virus (STAV)
		Tensaw virus (TENV)
		Tlacotalpan virus (TLAV)
		Xingu virus (XINV)
	Bushbush orthobunyavirus	Benfica virus (BENV)
		Bushbush virus (BSBV)
		Juan Díaz virus (JDV)
	Bwamba orthobunyavirus	Bwamba virus (BWAV)
		Pongola virus (PGAV)
	California encephalitis orthobunyavirus	Achiote virus (ACHOV)
		California encephalitis virus (CEV)
		infirmatus virus (INFV)
		Inkoo virus (INKV)
		Jamestown Canyon virus (JCV)

Table 2 (continued)

Genus	Species[a]	Virus (abbreviation)[a]
		Jerry Slough virus (JSV)
		Keystone virus (KEYV)
		Khatanga virus (KHATV)[k]
		La Crosse virus (LACV)
		Lumbo virus (LUMV)
		Melao virus (MELV)
		Morro Bay virus (MBV)
		San Angelo virus (SAV)
		Serra do Navio virus (SDNV)
		snowshoe hare virus (SSHV)
		South River virus (SORV)
		Ťahyňa virus (TAHV)
		trivittatus virus (TVTV)
	Capim orthobunyavirus	Capim virus (CAPV)
	Caraparu orthobunyavirus	Apeú virus (APEUV)
		Bruconha virus (BRUV)
		Caraparú virus (CARV)
		El Huayo virus
		Itaya virus (ITYV)
		Ossa virus (OSSAV)
		Vinces virus (VINV)
	Catu orthobunyavirus	Catú virus (CATUV)
	Estero Real orthobunyavirus	Estero Real virus (ERV)
	Gamboa orthobunyavirus	Calchaquí virus (CQIV)
		Gamboa virus (GAMV)
		Pueblo Viejo virus (PVV)
		Soberanía virus
	Guajara orthobunyavirus	Guajará virus (GJAV)
	Guama orthobunyavirus	Ananindeua virus (ANUV)
		Guamá virus (GMAV)
		Mahogany Hammock virus (MHV)
		Moju virus (MOJUV)
	Guaroa orthobunyavirus	Guaroa virus (GROV)
	Kaeng Khoi orthobunyavirus	Kaeng Khoi virus (KKV)
	Kairi orthobunyavirus	Kairi virus (KRIV)
	Koongol orthobunyavirus	koongol virus (KOOV)
		wongal virus (WONV)
	Madrid orthobunyavirus	Madrid virus (MADV)
	Main Drain orthobunyavirus	Main Drain virus (MDV)
	Manzanilla orthobunyavirus	Buttonwillow virus (BUTV)
		Cát Quế virus (CQV)
		Ingwavuma virus (INGV)
		Inini virus (ININV)
		Manzanilla virus (MANV)
		Mermet virus (MERV)
	Marituba orthobunyavirus	Gumbo Limbo virus (GLV)
		Marituba virus (MTBV)
		Murutucú virus (MURV)
		Nepuyo virus (NEPV)

Table 2 (continued)

Genus	Species[a]	Virus (abbreviation)[a]
		Restan virus (RESV)
		Zungarococha virus (ZUNV)
	Minatitlan orthobunyavirus	Minatitlán virus (MNTV)
		Palestina virus (PLSV)
	MPoko orthobunyavirus	M'Poko virus (MPOV)
		Yaba-1 virus (Y1V)
	Nyando orthobunyavirus	Nyando virus (NDV)
		Eretmapodites virus (ERETV)
	Olifantsvlei orthobunyavirus	Bobia virus (BIAV)
		Dabakala virus (DABV)
		Olifantsvlei virus (OLIV)
		Oubi virus (OUBIV)
	Oriboca orthobunyavirus	Itaquí virus (ITQV)
		Oriboca virus (ORIV)
	Oropouche orthobunyavirus	Facey's paddock virus (FPV)
		Iquitos virus (IQTV)[d]
		Madre de Dios virus (MDDV)
		Oropouche virus (OROV)
		Perdões virus (PDEV)
		Pintupo virus (PINTV)
		Utinga virus (UTIV)
		Utivé virus (UVV = UTVEV)
	Patois orthobunyavirus	Abras virus (ABRV)
		Babahoya virus (BABV)
		Pahayokee virus (PAHV)
		Patois virus (PATV)
		Shark River virus (SRV)
	Sathuperi orthobunyavirus	Douglas virus (DOUV)
		Sathuperi virus (SATV)
	Shamonda orthobunyavirus	Peaton virus (PEAV)
		Sango virus (SANV)
		Shamonda virus (SHAV)
	Shuni orthobunyavirus	Aino virus (AINOV)
		Kaikalur virus (KAIV)
		Shuni virus (SHUV)
	Simbu orthobunyavirus	Simbu virus (SIMV)
		Oya virus (OYAV)
	Tacaiuma orthobunyavirus	Tacaiuma virus (TCMV)
		CoAr 1071 virus (CA1071V)
		CoAr 3627 virus (CA3626V)
		Virgin River virus (VRV)
	Tete orthobunyavirus	Bahig virus (BAHV)
		Matruh virus (MTRV)
		Tete virus (TETEV)
		Tsuruse virus (TSUV)
		Weldona virus (WELV)
	Thimiri orthobunyavirus	Thimiri virus (THIV)
	Timboteua orthobunyavirus	Timboteua virus (TBTV)

Table 2 (continued)

Genus	Species[a]	Virus (abbreviation)[a]
	Turlock orthobunyavirus	Lednice virus (LEDV)
		Turlock virus (TURV)
		Umbre virus (UMBV)
	Wolkberg orthobunyavirus	Wolkberg virus (WBV)
	Wyeomyia orthobunyavirus	Anhembi virus (AMBV)
		BeAr 328208 virus (BAV)
		Cachoeira Porteira virus (CPOV)
		Iaco virus (IACOV)
		Macauã virus (MCAV)
		Rio Pracupi virus
		Sororoca virus (SORV)
		Taiassui virus (TAIAV)
		Tucunduba virus (TUCV)
		Wyeomyia virus (WYOV)
	Zegla orthobunyavirus	Zegla virus (ZEGV)
Family *Phasmaviridae*		
Orthophasmavirus	*Kigluaik phantom orthophasmavirus*[b]	Kigluaik phantom virus (KIGV)
	Nome phantom orthophasmavirus	Nome phantom virus (NOMV)
	Shuangao insect orthophasmavirus 2	Shuāngào insect virus 2 (SgIV-2)
	Wuchang cockroach orthophasmavirus 1	Wǔchāng cockroach virus 1 (WcCV-1)
	Wuhan mosquito orthophasmavirus 1	Wǔhàn mosquito virus 1 (WhMV-1)
	Wuhan mosquito orthophasmavirus 2	Wǔhàn mosquito virus 2 (WhMV-2)
Family *Phenuiviridae*		
Goukovirus	*Cumuto goukovirus*	Cumuto virus (CUMV)
	Gouleako goukovirus[b]	Gouléako virus (GOLV)
	Yichang insect goukovirus	Yíchāng insect virus (YcIV)
Phasivirus	*Badu phasivirus*[b]	Badu virus (BADUV)
	Phasi Charoen-like phasivirus	Phasi Chaeron-like virus (PCLV)
	Wuhan fly phasivirus	Wǔhàn fly virus 1 (WhFV-1)
	Wutai mosquito phasivirus	Wǔtái mosquito virus (WtMV)
Phlebovirus	*Bujaru phlebovirus*	Bujaru virus (BUJV)
		Munguba virus (MUNV)
	Candiru phlebovirus	Alenquer virus (ALEV)
		Ariquemes virus (ARQV)
		Candiru virus (CDUV)
		Itaituba virus (ITAV)
		Jacundá virus (JCNV)
		Maldonado virus (MLOV)
		Morumbi virus (MR(M)BV)
		Mucura virus (MCRV/MRAV)
		Nique virus (NIQV)
		Oriximiná virus (ORXV)
		Serra Norte virus (SRNV)
		Turuna virus (TUAV)
	Chilibre phlebovirus	Cacao virus (CACV)
		Chilibre virus (CHIV)
	Frijoles phlebovirus	Frijoles virus (FRIV)
		Joá virus (JOAV)
	Punta Toro phlebovirus	Buenaventura virus (BUEV)
		Campana virus (CMAV)

Table 2 (continued)

Genus	Species[a]	Virus (abbreviation)[a]
		Capira virus (CAPIV)
		Coclé virus (CCLV)
		Leticia virus (LTCV)
		Punta Toro virus (PTV)
	Rift Valley fever phlebovirus[b]	Rift Valley fever virus (RVFV)
	Salehabad phlebovirus	Adana virus (ADAV)
		Adria virus (ADRV)
		Alcube virus
		Arbia virus (ARBV)
		Arumowot virus (AMTV)
		Medjerda Valley virus
		Odrénisrou virus (ODRV)
		Olbia virus (OLBV)
		Salehabad virus (SALV)
		Bregalaka virus (BREV)
		Zaba virus (ZABAV)
	Sandfly fever Naples phlebovirus	Arrábida virus (ARRV)
		Balkan virus (BALKV)
		Fermo virus (FERV)
		Gordil virus (GORV)
		Granada virus (GRV = GRAV)
		Massilia virus (MASV)
		Punique virus (PUNV)
		Saddaguia virus (SADV)
		Saint-Floris virus (SAFV)
		sandfly fever Naples virus (SFNV)
		Tehran virus (THEV)
		Toscana virus (TOSV)
		Zerdali virus (ZERV)
	SFTS phlebovirus	severe fever with thrombocytopenia syndrome virus (SFTSV)
	Uukuniemi phlebovirus	Chizé virus (CHZV)
		EgAN 1825-61 virus (EGAV)
		Fin V 707 virus (FINV)
		Oceanside virus (OCV = OCEV)
		Pontevès virus (PTVV)
		St. Abbs Head virus (SAHV)
		Uukuniemi virus (UUKV)
		Zaliv Terpenyia virus (ZTV)
Tenuivirus	*Echinochloa hoja blanca tenuivirus*	Echinochloa hoja blanca virus (EHBV)
	Iranian wheat stripe tenuivirus	Iranian wheat stripe virus (IWSV)
	Maize stripe tenuivirus	maize stripe virus (MStV = MSpV)
	Rice grassy stunt tenuivirus	rice grassy stunt virus (RGSV)
	Rice hoja blanca tenuivirus	rice hoja blanca virus (RHBV)
	Rice stripe tenuivirus[b]	rice stripe virus (RSV = RStV)
	Urochloa hoja blanca tenuivirus	Urochloa hoja blanca virus (UHBV)
Family *Tospoviridae*		
Orthotospovirus	*Groundnut bud necrosis orthotospovirus*	groundnut bud necrosis virus (GBNV)[l]

Table 2 (continued)

Genus	Species[a]	Virus (abbreviation)[a]
	Groundnut ringspot orthotospovirus	groundnut ringspot virus (GRSV)
	Groundnut yellow spot orthotospovirus	groundnut yellow spot virus (GYSV)[m]
	Impatiens necrotic spot orthotospovirus	impatiens necrotic spot virus (INSV)
	Iris yellow spot orthotospovirus	iris yellow spot virus (IYSV)
	Polygonum ringspot orthotospovirus	Polygonum ringspot virus (PolRSV)
	Tomato chlorotic spot orthotospovirus	tomato chlorotic spot virus (TCSV)
	Tomato spotted wilt orthotospovirus[b]	tomato spotted wilt virus (TSWV)
	Watermelon bud necrosis orthotospovirus	watermelon bud necrosis virus (WBNV)
	Watermelon silver mottle orthotospovirus	watermelon silver mottle virus (WSMoV)
	Zucchini lethal chlorosis orthotospovirus	zucchini lethal chlorosis virus (ZLCV)

[a]Please note that viruses are real objects that are assigned to concepts that are called taxa. Species, genera, families, and orders are taxa. Taxon names are always italicized and always begin with a capital letter. Virus names, on the other hand, are not italicized and are not capitalized, except if the name or a name component is a proper noun. This column lists the virus names with their correct (lack of) capitalization. Lists of viruses within a given species are provisional at this point and will likely be amended in the near future

[b]Type species

[c]Synonym: Artybash virus (ARTV)

[d]Synonym: New York 1 virus (NY-1V)

[e]Synonym: Jurong virus

[f]Includes the strain previously referred to as Tunis virus (TUNV)

[g]Includes the strain previously referred to as soft tick bunyavirus (STBV)

[h]Includes the strain previously referred to as Ganjam virus (GANV)

[i]Synonyms: Čalovo virus (CVOV), Chittoor virus (CHITV), Olkya virus, Olyka virus, UgMP-6830 virus

[j]Includes the strain previously referred to as Garissa virus

[k]Also mistakenly referred to in the literature as Chantanga virus (CHATV) and Chatanga virus (CHATV)

[l]Synonym: peanut bud necrosis virus (PDNV)

[m]Synonym: peanut yellow spot virus (PYSV)

include corrections and updates in virus name or abbreviation spelling.

Acknowledgments We thank Laura Bollinger (NIH/NIAID Integrated Research Facility at Fort Detrick, Frederick, MD, USA) and F. Murilo Zerbini (BIOAGRO, Universidade Federal de Viçosa, Viçosa, Brazil) for critically editing the manuscript.

Funding This work was supported in part through Battelle Memorial Institute's prime contract with the US National Institute of Allergy and Infectious Diseases (NIAID) under Contract No. HHSN272200700016I (J.H.K.). This work was also funded in part by National Institutes of Health (NIH) contract HHSN272201000040I/HHSN27200004/D04 and Grant R24AI120942 (N.V., R.B.T.), intramural funds of the US Department of Health and Human Services to the US National Library of Medicine (E.V.K. and Y.I.W.), and the 100-Talent Program of the Chinese Academy of Sciences, the National Key R&D Program of China (2016YFE0206600) and the International Union of Biological Sciences (Y.B.).

Compliance with ethical standards

Ethical approval 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 US Department of the Army, the US Department of Defense, the US Department of Health and Human Services, 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 US departments do not endorse any products or commercial services mentioned in this publication.

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.

References

1. Alkhovsky SV, Lvov DK, Shchetinin AM, Deriabin PG, Shchelkanov MY, Aristova VA, Morozova TN, Gitelman AK, Palacios GF, Kuhn JH (2017) Complete genome coding sequences of Artashat, Burana, Caspiy, Chim, Geran, Tamdy, and Uzun-Agach viruses (*Bunyavirales*: *Nairoviridae*: *Orthonairovirus*). Genome Announc 5:e01098-01017
2. Ballinger MJ, Bruenn JA, Hay J, Czechowski D, Taylor DJ (2014) Discovery and evolution of bunyavirids in arctic

phantom midges and ancient bunyavirid-like sequences in insect genomes. J Virol 88:8783–8794
3. Blasdell KR, Duong V, Eloit M, Chretien F, Ly S, Hul V, Deubel V, Morand S, Buchy P (2016) Evidence of human infection by a new mammarena virus endemic to Southeastern Asia. Elife 5:e13135
4. Bodewes R, Kik MJL, Raj VS, Schapendonk CME, Haagmans BL, Smits SL, Osterhaus ADME (2013) Detection of novel divergent arenaviruses in boid snakes with inclusion body disease in The Netherlands. J Gen Virol 94:1206–1210
5. Di Bello PL, Laney AG, Druciarek T, Ho T, Gergerich RC, Keller KE, Martin RR, Tzanetakis IE (2016) A novel emaravirus is associated with redbud yellow ringspot disease. Virus Res 222:41–47
6. Elbeaino T, Digiaro M, Uppala M, Sudini H (2015) Deep sequencing of dsRNAs recovered from mosaic-diseased pigeonpea reveals the presence of a novel emaravirus: pigeonpea sterility mosaic virus 2. Arch Virol 160:2019–2029
7. Fenner F (1976) Classification and nomenclature of viruses. Second report of the International Committee on Taxonomy of Viruses. Intervirology 7:1–115
8. Gryseels S, Rieger T, Oestereich L, Cuypers B, Borremans B, Makundi R, Leirs H, Günther S, Goüy de Bellocq J (2015) Gairo virus, a novel arenavirus of the widespread *Mastomys natalensis*: genetically divergent, but ecologically similar to Lassa and Morogoro viruses. Virology 476:249–256
9. Hepojoki J, Salmenperä P, Sironen T, Hetzel U, Korzyukov Y, Kipar A, Vapalahti O (2015) Arenavirus coinfections are common in snakes with boid inclusion body disease. J Virol 89:8657–8660
10. Hetzel U, Sironen T, Laurinmäki P, Liljeroos L, Patjas A, Henttonen H, Vaheri A, Artelt A, Kipar A, Butcher SJ, Vapalahti O, Hepojoki J (2013) Isolation, identification, and characterization of novel arenaviruses, the etiological agents of boid inclusion body disease. J Virol 87:10918–10935
11. Ishii A, Thomas Y, Moonga L, Nakamura I, Ohnuma A, Hang'ombe BM, Takada A, Mweene AS, Sawa H (2012) Molecular surveillance and phylogenetic analysis of Old World arenaviruses in Zambia. J Gen Virol 93:2247–2251
12. Jansen van Vuren P, Wiley MR, Palacios G, Storm N, Markotter W, Birkhead M, Kemp A, Paweska JT (2017) Isolation of a novel orthobunyavirus from bat flies (*Eucampsipoda africana*). J Gen Virol 98:935–945
13. Kuhn JH, Wiley MR, Rodriguez SE, Bào Y, Prieto K, Travassos da Rosa APA, Guzman H, Savji N, Ladner JT, Tesh RB, Wada J, Jahrling PB, Bente DA, Palacios G (2016) Genomic characterization of the genus *Nairovirus* (family *Bunyaviridae*). Viruses 8:164
14. Li C-X, Shi M, Tian J-H, Lin X-D, Kang Y-J, Chen L-J, Qin X-C, Xu J, Holmes EC, Zhang Y-Z (2015) Unprecedented genomic diversity of RNA viruses in arthropods reveals the ancestry of negative-sense RNA viruses. Elife 4:e05378
15. Li K, Lin X-D, Wang W, Shi M, Guo W-P, Zhang X-H, Xing J-G, He J-R, Wang K, Li M-H, Cao J-H, Jiang M-L, Holmes EC, Zhang Y-Z (2015) Isolation and characterization of a novel arenavirus harbored by rodents and shrews in Zhejiang province, China. Virology 476:37–42
16. Marklewitz M, Handrick S, Grasse W, Kurth A, Lukashev A, Drosten C, Ellerbrok H, Leendertz FH, Pauli G, Junglen S (2011) Gouléako virus isolated from West African mosquitoes constitutes a proposed novel genus in the family *Bunyaviridae*. J Virol 85:9227–9234
17. Marklewitz M, Zirkel F, Rwego IB, Heidemann H, Trippner P, Kurth A, Kallies R, Briese T, Lipkin WI, Drosten C, Gillespie TR, Junglen S (2013) Discovery of a unique novel clade of mosquito-associated bunyaviruses. J Virol 87:12850–12865
18. Marklewitz M, Zirkel F, Kurth A, Drosten C, Junglen S (2015) Evolutionary and phenotypic analysis of live virus isolates suggests arthropod origin of a pathogenic RNA virus family. Proc Natl Acad Sci USA 112:7536–7541
19. Marzano S-YL, Domier LL (2016) Novel mycoviruses discovered from metatranscriptomics survey of soybean phyllosphere phytobiomes. Virus Res 213:332–342
20. Marzano S-YL, Nelson BD, Ajayi-Oyetunde O, Bradley CA, Hughes TJ, Hartman GL, Eastburn DM, Domier LL (2016) Identification of diverse mycoviruses through metatranscriptomics characterization of the viromes of five major fungal plant pathogens. J Virol 90:6846–6863
21. Palacios G, Savji N, Hui J, Travassos da Rosa A, Popov V, Briese T, Tesh R, Lipkin WI (2010) Genomic and phylogenetic characterization of Merino Walk virus, a novel arenavirus isolated in South Africa. J Gen Virol 91:1315–1324
22. Radoshitzky SR, Bào Y, Buchmeier MJ, Charrel RN, Clawson AN, Clegg CS, DeRisi JL, Emonet S, Gonzalez J-P, Kuhn JH, Lukashevich IS, Peters CJ, Romanowski V, Salvato MS, Stenglein MD, de la Torre JC (2015) Past, present, and future of arenavirus taxonomy. Arch Virol 160:1851–1874
23. Shi M, Lin X-D, Tian J-H, Chen L-J, Chen X, Li C-X, Qin X-C, Li J, Cao J-P, Eden J-S, Buchmann J, Wang W, Xu J, Holmes EC, Zhang Y-Z (2016) Redefining the invertebrate RNA virosphere. Nature 540:539–543
24. Stenglein MD, Sanders C, Kistler AL, Ruby JG, Franco JY, Reavill DR, Dunker F, DeRisi JL (2012) Identification, characterization, and in vitro culture of highly divergent arenaviruses from boa constrictors and annulated tree boas: candidate etiological agents for snake inclusion body disease. MBio 3:e00180-00112
25. Witkowski PT, Kallies R, Hoveka J, Auste B, Ithete NL, Šoltys K, Szemes T, Drosten C, Preiser W, Klempa B, Mfune JKE, Kruger DH (2015) Novel arenavirus isolates from Namaqua rock mice, Namibia, Southern Africa. Emerg Infect Dis 21:1213–1216
26. Zheng Y, Navarro B, Wang G, Wang Y, Yang Z, Xu W, Zhu C, Wang L, Di Serio F, Hong N (2017) Actinidia chlorotic ringspot-associated virus: a novel emaravirus infecting kiwifruit plants. Mol Plant Pathol 18:569–581

Affiliations

Piet Maes[1] · Sergey V. Alkhovsky[2] · Yīmíng Bào[3] · Martin Beer[4] · Monica Birkhead[5] · Thomas Briese[6] · Michael J. Buchmeier[7] · Charles H. Calisher[8] · Rémi N. Charrel[9] · Il Ryong Choi[10] · Christopher S. Clegg[11] · Juan Carlos de la Torre[12] · Eric Delwart[13,14] · Joseph L. DeRisi[15] · Patrick L. Di Bello[16] · Francesco Di Serio[17] · Michele Digiaro[18] · Valerian V. Dolja[19] · Christian Drosten[20,21,22] · Tobiasz Z. Druciarek[16] · Jiang Du[23] · Hideki Ebihara[24] · Toufic Elbeaino[18] · Rose C. Gergerich[16] · Amethyst N. Gillis[25] · Jean-Paul J. Gonzalez[26] · Anne-Lise Haenni[27] · Jussi Hepojoki[28,29] · Udo Hetzel[29,30] · Thiện Hồ[16] · Ní Hóng[31] · Rakesh K. Jain[32] ·

Petrus Jansen van Vuren[5,33] · Qi Jin[34,35] · Miranda Gilda Jonson[36] · Sandra Junglen[20,22] · Karen E. Keller[37] · Alan Kemp[5] · Anja Kipar[29,30] · Nikola O. Kondov[13] · Eugene V. Koonin[38] · Richard Kormelink[39] · Yegor Korzyukov[28] · Mart Krupovic[40] · Amy J. Lambert[41] · Alma G. Laney[42] · Matthew LeBreton[43] · Igor S. Lukashevich[44] · Marco Marklewitz[20,22] · Wanda Markotter[5,33] · Giovanni P. Martelli[45] · Robert R. Martin[37] · Nicole Mielke-Ehret[46] · Hans-Peter Mühlbach[46] · Beatriz Navarro[17] · Terry Fei Fan Ng[14] · Márcio Roberto Teixeira Nunes[47,48] · Gustavo Palacios[49] · Janusz T. Pawęska[5,33] · Clarence J. Peters[50] · Alexander Plyusnin[28] · Sheli R. Radoshitzky[49] · Víctor Romanowski[51] · Pertteli Salmenperä[28,52] · Maria S. Salvato[53] · Hélène Sanfaçon[54] · Takahide Sasaya[55] · Connie Schmaljohn[49] · Bradley S. Schneider[25] · Yukio Shirako[56] · Stuart Siddell[57] · Tarja A. Sironen[28] · Mark D. Stenglein[58] · Nadia Storm[5] · Harikishan Sudini[59] · Robert B. Tesh[48] · Ioannis E. Tzanetakis[16] · Mangala Uppala[59] · Olli Vapalahti[28,30,60] · Nikos Vasilakis[48] · Peter J. Walker[61] · Guópíng Wáng[31] · Lìpíng Wáng[31] · Yànxiǎng Wáng[31] · Tàiyún Wèi[62] · Michael R. Wiley[49,63] · Yuri I. Wolf[38] · Nathan D. Wolfe[25,64] · Zhìqiáng Wú[23] · Wénxìng Xú[31,65,66,67] · Li Yang[68] · Zuòkūn Yāng[31] · Shyi-Dong Yeh[69] · Yǒng-Zhèn Zhāng[70] · Yàzhōu Zhèng[31] · Xueping Zhou[71] · Chénxī Zhū[31] · Florian Zirkel[21] · Jens H. Kuhn[72]

✉ Jens H. Kuhn
kuhnjens@mail.nih.gov

1 Zoonotic Infectious Diseases Unit, KU Leuven, Leuven, Belgium

2 D. I. Ivanovsky Institute of Virology, N. F. Gamaleya Federal Research Center for Epidemiology and Microbiology, Ministry of Health of the Russian Federation, Moscow, Russia

3 Beijing Institute of Genomics, Chinese Academy of Sciences, Beijing, China

4 Institute of Diagnostic Virology, Friedrich-Loeffler-Institut, Greifswald-Insel Riems, Germany

5 Centre for Emerging Zoonotic and Parasitic Diseases, National Institute for Communicable Diseases, National Health Laboratory Service, Sandringham, South Africa

6 Department of Epidemiology, Center for Infection and Immunity, Mailman School of Public Health, Columbia University, New York, New York, USA

7 Department of Molecular Biology and Biochemistry, University of California, Irvine, CA, USA

8 Arthropod-Borne and Infectious Diseases Laboratory, College of Veterinary Medicine and Biomedical Sciences, Colorado State University, Fort Collins, CO, USA

9 Unité des Virus Emergents, Aix-Marseille University, IRD 190, Inserm 1207, IHU Méditerranée Infection, Marseille, France

10 Plant Breeding Genetics and Biotechnology Division, International Rice Research Institute, Los Baños, Philippines

11 Les Mandinaux, Le Grand Madieu, France

12 Department of Immunology and Microbial Science, IMM-6, The Scripps Research Institute, La Jolla, CA, USA

13 Blood Systems Research Institute, San Francisco, CA, USA

14 Department of Laboratory Medicine, University of California, San Francisco, San Francisco, CA, USA

15 Departments of Medicine, Biochemistry and Biophysics, and Microbiology, University of California, San Francisco, CA, USA

16 Division of Agriculture, Department of Plant Pathology, University of Arkansas System, Fayetteville, AR, USA

17 Istituto per la Protezione Sostenibile delle Piante, Consiglio Nazionale delle Ricerche, Bari, Italy

18 Istituto Agronomico Mediterraneo, Valenzano, Italy

19 Department of Botany and Plant Pathology, Center for Genome Research and Biocomputing, Oregon State University, Corvallis, OR, USA

20 Institute of Virology, Charité, Universitätsmedizin Berlin, Corporate Member of Free University Berlin, Berlin Institute of Health, Humboldt-University Berlin, Berlin, Germany

21 Institute of Virology, University of Bonn Medical Centre, Bonn, Germany

22 German Centre for Infection Research, Braunschweig, Germany

23 Institute of Pathogen Biology, Chinese Academy of Medical Sciences, Beijing, China

24 Department of Molecular Medicine, Mayo Clinic, Rochester, MN, USA

25 Metabiota, San Francisco, CA, USA

26 Center of Excellence for Emerging and Zoonotic Animal Disease, Kansas State University, Manhattan, KS, USA

27 Institut Jacques Monod, CNRS, Université Paris-Diderot, Paris, France

28 Department of Virology, University of Helsinki, Medicum, Helsinki, Finland

29 Vetsuisse Faculty, Institute of Veterinary Pathology, University of Zurich, Zurich, Switzerland

30 Department of Veterinary Biosciences, Faculty of Veterinary Medicine, University of Helsinki, Helsinki, Finland

31 State Key Laboratory of Agromicrobiology, Huazhong Agricultural University, Wuhan, Hubei, China

32 Division of Plant Pathology, Indian Agricultural Research Institute, New Delhi, India

33 Department of Medical Virology, Faculty of Health Sciences, Centre for Viral Zoonoses, University of Pretoria, Pretoria, South Africa

[34] MOH Key Laboratory of Systems Biology of Pathogens, Institute of Pathogen Biology, Peking Union Medical College, Chinese Academy of Medical Sciences, Beijing, China

[35] Collaborative Innovation Center for Diagnosis and Treatment of Infectious Diseases, Beijing, China

[36] Department of Agricultural Biotechnology, Center for Fungal Pathogenesis, College of Agriculture and Life Sciences, Seoul National University, Seoul, Korea

[37] United States Department of Agriculture, Agricultural Research Service, Horticultural Crops Research Laboratory, Corvallis, OR, USA

[38] National Center for Biotechnology Information, National Library of Medicine, National Institutes of Health, Bethesda, MD, USA

[39] Laboratory of Virology, Department of Plant Sciences, Wageningen University, Wageningen, The Netherlands

[40] Department of Microbiology, Institut Pasteur, Paris, France

[41] Division of Vector-Borne Diseases, National Center for Emerging and Zoonotic Infectious Diseases, Centers for Disease Control and Prevention, Fort Collins, CO, USA

[42] Department of Entomology and Plant Pathology, North Carolina State University, Raleigh, NC, USA

[43] Mosaic, Yaoundé, Cameroon

[44] Department of Pharmacology and Toxicology, School of Medicine, Center for Predictive Medicine for Biodefense and Emerging Infectious Diseases, University of Louisville, Louisville, KY, USA

[45] Department of Plant, Soil and Food Sciences, University "Aldo Moro", Bari, Italy

[46] Biocentre Klein Flottbek, University of Hamburg, Hamburg, Germany

[47] Evandro Chagas Institute, Ministry of Health, Pará, Brazil

[48] Department of Pathology, Center for Biodefense and Emerging Infectious Diseases, University of Texas Medical Branch, Galveston, TX, USA

[49] United States Army Medical Research Institute of Infectious Diseases, Fort Detrick, Frederick, MD, USA

[50] Galveston National Laboratory, University of Texas Medical Branch, Galveston, TX, USA

[51] Instituto de Biotecnología y Biología Molecular, Centro Cientifico Technológico-La Plata, Consejo Nacional de Investigaciones Científicas y Técnicas, Universidad Nacional de La Plata, La Plata, Argentina

[52] Blueprint Genetics, Helsinki, Finland

[53] Institute of Human Virology, University of Maryland School of Medicine, Baltimore, MD, USA

[54] Summerland Research and Development Centre, Agriculture and Agri-Food Canada, Summerland, BC, Canada

[55] Department of Planning and Coordination, National Agriculture and Food Research Organization, Tsukuba, Japan

[56] Asian Center for Bioresources and Environmental Sciences, University of Tokyo, Tokyo, Japan

[57] School of Cellular and Molecular Medicine, University of Bristol, Bristol, UK

[58] Department of Microbiology, Immunology and Pathology, Colorado State University, Fort Collins, CO, USA

[59] International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Hyderabad, Telangana, India

[60] Department of Virology, Helsinki University Hospital, University of Helsinki, Helsinki, Finland

[61] School of Biological Sciences, University of Queensland, St. Lucia, QLD, Australia

[62] Fujian Province Key Laboratory of Plant Virology, Institute of Plant Virology, Fujian Agriculture and Forestry University, Fuzhou, Fujian, China

[63] University of Nebraska Medical Center, Omaha, NE, USA

[64] Global Viral, San Francisco, CA, USA

[65] Horticultural Crop (Fruit Trees) Biology and Germplasm Creation, Ministry of Agriculture, Wuhan, Hubei, China

[66] Key Laboratory of Plant Pathology of Hubei Province, Wuhan, Hubei, China

[67] College of Plant Science and Technology, Huazhong Agricultural University, Wuhan, Hubei, China

[68] State Key Laboratory for Molecular Virology and Genetic Engineering, Beijing, China

[69] National Chung-Hsing University, Taichung City, Taiwan

[70] Department of Zoonoses, State Key Laboratory for Infectious Disease Prevention and Control, Collaborative Innovation Center for Diagnosis and Treatment of Infectious Diseases, National Institute for Communicable Disease Control and Prevention, Chinese Center for Disease Control and Prevention, Changping, Beijing, China

[71] State Key Laboratory for Biology of Plant Diseases and Insect Pests, Institute of Plant Protection, Chinese Academy of Agricultural Sciences, Beijing, China

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