



Taxonomy of the order *Bunyavirales*: second update 2018

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Abstract

In October 2018, the order *Bunyavirales* was amended by inclusion of the family *Arenaviridae*, abolishment of three families, creation of three new families, 19 new genera, and 14 new species, and renaming of three genera and 22 species. This article presents the updated taxonomy of the order *Bunyavirales* as now accepted by the International Committee on Taxonomy of Viruses (ICTV).

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Introduction

The virus order *Bunyavirales* was established in 2017 to accommodate related viruses with segmented, linear, single-stranded, negative-sense or ambisense RNA genomes classified into nine families [2]. Here, we present the changes that were proposed via an official ICTV taxonomic proposal (TaxoProp 2017.012M.A.v1.Bunyavirales_rev) at <http://www.ictvonline.org/> in 2017 and were accepted by the ICTV Executive Committee (EC) in October 2018. These changes are now part of the official ICTV taxonomy as of October 2018.

Taxonomic changes at the order rank

In October 2018, the order *Bunyavirales* was amended by inclusion of the previously unassigned family *Arenaviridae*. The families *Feraviridae*, *Jonviridae*, and *Tospoviridae* were dissolved, and their genera (*Orthoferavirus*, *Orthojonvirus*, and *Orthotospovirus*) were renamed (*Feravirus*, *Jonvirus*, and *Tospovirus*, respectively) and moved into established families (*Feravirus*, *Jonvirus*→*Phasmaviridae* and *Tospovirus*→*Peribunyaviridae*). Three new families were created for novel invertebrate viruses: *Cruliviridae* for Wēnlǐng crustacean virus 9 (WICV-9), *Myopoviridae* for Húběi myriapoda virus 5 (HbMV-5), and *Wupedeviridae* for Wǔhàn millipede virus 2 (WhMV-2) [4].

Taxonomic changes at the family rank

Fimoviridae

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

Hantaviridae

In October 2018, the family was expanded by the addition of three new genera (*Loanvirus*, *Mobatvirus*, and *Thottimvirus*) for the species *Longquan orthohantavirus*, *Laibin orthohantavirus*, *Nova orthohantavirus*, *Quezon orthohantavirus*, *Imjin orthohantavirus*, and *Thottapalayam orthohantavirus* (now renamed *Longquan loanvirus*, *Lai-bin mobatvirus*, *Nova mobatvirus*, *Quezon mobatvirus*,

Imjin thottimvirus, and *Thottapalayam thottimvirus*, respectively).

Nairoviridae

In October 2018, the family was expanded by the addition of two new genera, *Shaspivirus* and *Striwavivirus*, for Shāyáng spider virus 1 (SySV-1) and Sānxiá water strider virus 1 (SxWSV-1) discovered in invertebrates, respectively [1, 4].

Peribunyaviridae

In October 2018, the family was expanded by the addition of the new genus *Shangavirus* for the species *Shuangao insect herbevirus* (now renamed *Insect shangavirus*).

Phasmaviridae

In October 2018, the family was expanded by the addition of the new genus *Inshuvirus* for the species *Shuangao insect orthophasmavirus 2* (now renamed *Insect inshuvirus*) and the new genus *Wuhivirus* for Wǔhàn insect virus 2 (WhIV-2) discovered in invertebrates [1].

Phenuiviridae

In October 2018, the family was expanded by the addition of the new genus *Banyangvirus* for the species *SFTS phlebovirus* (now renamed *Huaiyangshan banyangvirus*) and the new genera *Beidivirus*, *Horwuvirus*, *Hudivirus*, *Hudovirus*, *Mobuvirus*, *Pidchovirus*, and *Wubeivirus* for Húběi diptera virus 3 (HbDV-3), Wǔhàn horsefly virus (WhHV), Húběi diptera virus 4 (HbDV-4), Húběi lepidoptera virus 1 (HbLV-1), Mothra virus (MTHV), Pidgey virus (PGYV), and Húběi diptera virus 5 (HbDV-5)/Wǔhàn fly virus 1 (WhFV-1), respectively, discovered in invertebrates [1, 3, 4].

Summary

A summary of the current, ICTV-accepted taxonomy of the order *Bunyavirales* is presented in Table 1.

Table 1 ICTV-accepted taxonomy of the order *Bunyavirales* as of October 2018. Listed are all bunyaviruses that are classified into species

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

Table 1 (continued)

Genus	Species [¶]	Virus (abbreviation) [¶]
	<i>Rotterdam reptarenavirus</i>	ROUT virus (ROUTV) University of Helsinki virus 1 (UHV-1)
Family Cruliviridae		
<i>Lincrovirus</i>	<i>Crustacean lincrovirus</i> *	Wenling crustacean virus 9 (WICV-9)
Family Fimoviridae		
<i>Emaravirus</i>	<i>Actinidia chlorotic ringspot-associated emaravirus</i>	Actinidia chlorotic ringspot-associated virus (AcCRaV)
	<i>European mountain ash ringspot-associated emaravirus</i> *	European mountain ash ringspot-associated virus (EMARaV)
	<i>Fig mosaic emaravirus</i>	fig mosaic virus (FMV)
	<i>High Plains wheat mosaic emaravirus</i>	High Plains wheat mosaic virus (HPWMoV)
	<i>Pigeonpea sterility mosaic emaravirus 1</i>	pigeonpea sterility mosaic virus (PPSMV)
	<i>Pigeonpea sterility mosaic emaravirus 2</i>	pigeonpea sterility mosaic virus 2 (PPSMV-2)
	<i>Raspberry leaf blotch emaravirus</i>	raspberry leaf blotch virus (RLBV)
	<i>Redbud yellow ringspot-associated emaravirus</i>	redbud yellow ringspot-associated virus (RYRaV)
	<i>Rose rosette emaravirus</i>	rose rosette virus (RRV)
Family Hantaviridae		
<i>Orthohantavirus</i>	<i>Amga orthohantavirus</i>	Amga virus (MGAV) ²
	<i>Andes orthohantavirus</i>	Andes virus (ANDV) Castelo dos Sonhos virus (CASV) Lechiguanas virus (LECV = LECHV) Orán virus (ORNV)
	<i>Asama orthohantavirus</i>	Asama virus (ASAV)
	<i>Asikkala orthohantavirus</i>	Asikkala virus (ASIV)
	<i>Bayou orthohantavirus</i>	bayou virus (BAYV) Catacamas virus (CATV)
	<i>Black Creek Canal orthohantavirus</i>	Black Creek Canal virus (BCCV)
	<i>Bowe orthohantavirus</i>	Bowé virus (BOWV)
	<i>Bruges orthohantavirus</i>	Bruges virus (BRGV)
	<i>Cano Delgadito orthohantavirus</i>	Caño Delgadito virus (CADV)
	<i>Cao Bang orthohantavirus</i>	Cao Bả̃ng virus (CBNV) Liánghé virus (LHEV)
	<i>Choclo orthohantavirus</i>	Choclo virus (CHOV)
	<i>Dabieshan orthohantavirus</i>	Dàbiéshān virus (DBSV)
	<i>Dobrava-Belgrade orthohantavirus</i>	Dobrava virus (DOBV) Kurkino virus (KURV) Saaremaa virus (SAAV) Sochi virus (SOCV)
	<i>El Moro Canyon orthohantavirus</i>	Carrizal virus (CARV) El Moro Canyon virus (ELMCV) Huitzilac virus (HUIV)
	<i>Fugong orthohantavirus</i>	Fúgòng virus (FUGV)
	<i>Fusong orthohantavirus</i>	Fūsōng virus (FUSV)
	<i>Hantaan orthohantavirus</i> *	Amur virus (AMRV) Hantaan virus (HTNV) Soochong virus (SOOV)
	<i>Jeju orthohantavirus</i>	Jeju virus (JJUV)
	<i>Kenkeme orthohantavirus</i>	Kenkeme virus (KKMV)
	<i>Khabarovsk orthohantavirus</i>	Khabarovsk virus (KHAV) Topografov virus (TOPV)
	<i>Laguna Negra orthohantavirus</i>	Laguna Negra virus (LANV)

Table 1 (continued)

Genus	Species [¶]	Virus (abbreviation) [¶]
		Maripa virus (MARV)
		Río Mamoré virus (RIOMV)
	<i>Luxi orthohantavirus</i>	Lúxī virus (LUXV)
	<i>Maporal orthohantavirus</i>	Maporal virus (MAPV)
	<i>Montano orthohantavirus</i>	Montaño virus (MTNV)
	<i>Necocli orthohantavirus</i>	Necocli virus (NECV)
	<i>Oxbow orthohantavirus</i>	Oxbow virus (OXBV)
	<i>Prospect Hill orthohantavirus</i>	Prospect Hill virus (PHV)
	<i>Puumala orthohantavirus</i>	Hokkaido virus (HOKV)
		Muju virus (MUJV)
		Puumala virus (PUUV)
	<i>Rockport orthohantavirus</i>	Rockport virus (RKPV)
	<i>Sangassou orthohantavirus</i>	Sangassou virus (SANGV)
	<i>Seoul orthohantavirus</i>	gōu virus (GOUV)
		Seoul virus (SEOV)
	<i>Sin Nombre orthohantavirus</i>	New York virus (NYV) ³
		Sin Nombre virus (SNV)
	<i>Thailand orthohantavirus</i>	Anjzorobe virus (ANJZV)
		Serang virus (SERV) ⁴
		Thailand virus (THAIV)
	<i>Tula orthohantavirus</i>	Adler virus (ADLV)
		Tula virus (TULV)
	<i>Yakeshi orthohantavirus</i>	Yákèshí virus (YKSV)
<i>Loanvirus</i>	<i>Longquan loanvirus</i> *	Lóngquán virus (LQUV)
<i>Mobatvirus</i>	<i>Laibin mobatvirus</i>	Láibīn virus (LAIV)
	<i>Nova mobatvirus</i> *	Nova virus (NVAV)
	<i>Quezon mobatvirus</i>	Quezon virus (QZNV)
<i>Thottimvirus</i>	<i>Imjin thottimvirus</i>	Imjin virus (MJNV)
	<i>Thottapalayam thottimvirus</i> *	Thottapalayam virus (TPMV)
Family Mypoviridae		
<i>Hubavirus</i>	<i>Myriapod hubavirus</i> *	Húběi myriapoda virus 5 (HbMV-5)
Family Nairoviridae		
<i>Orthonairovirus</i>	<i>Artashat orthonairovirus</i>	Artashat virus (ARTSV)
	<i>Chim orthonairovirus</i>	Chim virus (CHIMV)
	<i>Crimean-Congo hemorrhagic fever orthonairovirus</i>	Crimean-Congo hemorrhagic fever virus (CCHFV)
	<i>Dera Ghazi Khan orthonairovirus</i>	Abu Hammad virus (AHV) ⁵
		Abu Mina virus (AMV)
		Dera Ghazi Khan virus (DGKV)
		Sapphire II virus (SAPV)
	<i>Dugbe orthonairovirus</i> *	Dugbe virus (DUGV)
		kupe virus (KUPEV)
	<i>Hazara orthonairovirus</i>	Hazara virus (HAZV)
		Tofla virus (TFLV)
	<i>Hughes orthonairovirus</i>	Caspiy virus (CASV)
		Farallon virus (FARV)
		Great Saltee virus (GRSV)
		Hughes virus (HUGV)
		Punta Salinas virus (PSV)
		Raza virus (RAZAV)
		Soldado virus (SOLV)

Table 1 (continued)

Genus	Species [¶]	Virus (abbreviation) [¶]
	<i>Kasokero orthonairovirus</i>	Zirqa virus (ZIRV) Kasokero virus (KASV = KASOV) Leopards Hill virus (LPHV) Yogue virus (YOGV)
	<i>Keterah orthonairovirus</i>	Gossas virus (GOSV) Issyk-kul virus (ISKV) Keterah virus (KTRV) ⁶ Uzun-Agach virus (UZAV)
	<i>Nairobi sheep disease orthonairovirus</i>	Nairobi sheep disease virus (NSDV) ⁷
	<i>Qalyub orthonairovirus</i>	Bandia virus (BDV) Geran virus (GERV) Qalyub virus (QYBV)
	<i>Sakhalin orthonairovirus</i>	Avalon virus (AVAV) Clo Mor virus (CMV = CLMV) Sakhalin virus (SAKV) Taggert virus (TAGV) Tillamook virus (TILLV)
	<i>Tamdy orthonairovirus</i>	Burana virus (BURV) Huángpí tick virus 1 (HpTV-1) Tamdy virus (TAMV) Tāchéng tick virus 1 (TcTV-1) Wēnzhōu tick virus (WzTV)
	<i>Thiafora orthonairovirus</i>	Erve virus (ERVEV) Thiafora virus (TFAV)
<i>Shaspivirus</i>	<i>Spider shaspivirus</i> *	Shāyáng spider virus 1 (SySV-1)
<i>Striwavirus</i>	<i>Strider striwavirus</i> *	Sānxiá water strider virus 1 (SxWSV-1)
Family Peribunyaviridae		
<i>Herbevirus</i>	<i>Herbert herbevirus</i> *	Herbert virus (HEBV)
	<i>Kibale herbevirus</i>	Kibale virus (KIBV)
	<i>Tai herbevirus</i>	Tai virus (TAIV)
<i>Orthobunyavirus</i>	<i>Acara orthobunyavirus</i>	Acará virus (ACAV) Morange virus (MORV)
	<i>Akabane orthobunyavirus</i>	Akabane virus (AKAV) Sabo virus (SABOV) Tinaroo virus (TINV) Yaba-7 virus (Y7V)
	<i>Alajuella orthobunyavirus</i>	Alajuella virus (ALJV) Brus Laguna virus (BLAV) San Juan virus (SJV)
	<i>Anopheles A orthobunyavirus</i>	Anopheles A virus (ANAV) Arumateua virus (ARTV = ARMTV) Caraipé virus (CPEV = CRPV) Las Maloyas virus (LMV) Lukuni virus (LUKV) Trombetas virus (TRMV)
	<i>Anopheles B orthobunyavirus</i>	Tucuruí virus (TUCV = TUCRV) Anopheles B virus (ANBV) Boracéia virus (BORV)
	<i>Bakau orthobunyavirus</i>	Bakau virus (BAKV) Ketapang virus (KETV)

Table 1 (continued)

Genus	Species [¶]	Virus (abbreviation) [¶]
		Nola virus (NOLAV)
		Tanjong Rabok virus (TRV)
		Telok Forest virus (TFV)
	<i>Batama orthobunyavirus</i>	Batama virus (BMAV)
	<i>Benevides orthobunyavirus</i>	Benevides virus (BVSV = BENV)
	<i>Bertioga orthobunyavirus</i>	Bertioga virus (BERV)
		Cananéia virus (CNAV)
		Guaratuba virus (GTBV)
		Itimirim virus (ITIV)
		Mirim virus (MIRV)
	<i>Bimiti orthobunyavirus</i>	bimiti virus (BIMV)
	<i>Botambi orthobunyavirus</i>	Botambi virus (BOTV)
	<i>Bunyamwera orthobunyavirus</i> *	Anadyr virus (ANADV)
		Batai virus (BATV) ⁸
		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) ⁹
		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)
	<i>Bushbush orthobunyavirus</i>	Benfica virus (BENV = BNFV)
		Bushbush virus (BSBV)
		Juan Díaz virus (JDV)
	<i>Bwamba orthobunyavirus</i>	Bwamba virus (BWAV)
		Pongola virus (PGAV)
	<i>California encephalitis orthobunyavirus</i>	Achiote virus (ACHOV)
		California encephalitis virus (CEV)
		infirmatus virus (INFV)
		Inkoo virus (INKV)
		Jamestown Canyon virus (JCV)
		Jerry Slough virus (JSV)
		Keystone virus (KEYV)
		Khatanga virus (KHATV) ¹⁰
		La Crosse virus (LACV)
		Lumbo virus (LUMV)
		Melao virus (MELV)

Table 1 (continued)

Genus	Species [¶]	Virus (abbreviation) [¶]
		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 (TVT _V)
	<i>Capim orthobunyavirus</i>	Capim virus (CAPV)
	<i>Caraparu orthobunyavirus</i>	Apeú virus (APEUV)
		Bruconha virus (BRUV)
		Caraparú virus (CARV)
		El Huayo virus (EHUV)
		Itaya virus (ITYV)
		Ossa virus (OSSAV)
		Vinces virus (VINV)
	<i>Catu orthobunyavirus</i>	Catú virus (CATUV)
	<i>Estero Real orthobunyavirus</i>	Estero Real virus (ERV)
	<i>Gamboa orthobunyavirus</i>	Calchaquí virus (CQIV)
		Gamboa virus (GAMV)
		Pueblo Viejo virus (PVV)
		Soberanía virus (SOBV)
	<i>Guajara orthobunyavirus</i>	Guajará virus (GJAV)
	<i>Guama orthobunyavirus</i>	Ananindeua virus (ANUV)
		Guamá virus (GMAV)
		Mahogany Hammock virus (MHV)
		Moju virus (MOJUV)
	<i>Guaroa orthobunyavirus</i>	Guaroa virus (GROV)
	<i>Kaeng Khoi orthobunyavirus</i>	Kaeng Khoi virus (KKV)
	<i>Kairi orthobunyavirus</i>	Kairi virus (KRIV)
	<i>Koongol orthobunyavirus</i>	koongol virus (KOOV)
		wongal virus (WONV)
	<i>Madrid orthobunyavirus</i>	Madrid virus (MADV)
	<i>Main Drain orthobunyavirus</i>	Main Drain virus (MDV)
	<i>Manzanilla orthobunyavirus</i>	Buttonwillow virus (BUTV)
		Cát Quế virus (CQV)
		Ingwavuma virus (INGV)
		Inini virus (INIV)
		Manzanilla virus (MANV)
		Mermet virus (MERV)
	<i>Marituba orthobunyavirus</i>	Gumbo Limbo virus (GLV)
		Marituba virus (MTBV)
		Murutucú virus (MURV)
		Nepuyo virus (NEPV)
		Restan virus (RESV)
		Zungarococha virus (ZUNV)
	<i>Minatitlan orthobunyavirus</i>	Minatitlán virus (MNTV)
		Palestina virus (PLSV)
	<i>MPoko orthobunyavirus</i>	M'Poko virus (MPOV)
		Yaba-1 virus (Y1V)
	<i>Nyando orthobunyavirus</i>	Nyando virus (NDV)

Table 1 (continued)

Genus	Species [¶]	Virus (abbreviation) [¶]
	<i>Olifantsvlei orthobunyavirus</i>	Eretmapodites virus (ERETV) Bobia virus (BIAV) Dabakala virus (DABV) Olifantsvlei virus (OLIV) Oubi virus (OUBIV)
	<i>Oriboca orthobunyavirus</i>	Itaqui virus (ITQV) Oriboca virus (ORIV)
	<i>Oropouche orthobunyavirus</i>	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)
	<i>Patois orthobunyavirus</i>	Abras virus (ABRV) Babahoya virus (BABV) Pahayokee virus (PAHV) Patois virus (PATV) Shark River virus (SRV)
	<i>Sathuperi orthobunyavirus</i>	Douglas virus (DOUV) Sathuperi virus (SATV)
	<i>Shamonda orthobunyavirus</i>	Peaton virus (PEAV) Sango virus (SANV) Shamonda virus (SHAV)
	<i>Shuni orthobunyavirus</i>	Aino virus (AINOV) Kaikalur virus (KAIV) Shuni virus (SHUV)
	<i>Simbu orthobunyavirus</i>	Oya virus (OYAV) Simbu virus (SIMV)
	<i>Tacaiuma orthobunyavirus</i>	CoAr 1071 virus (CA1071V) CoAr 3627 virus (CA3626V) Tacaiuma virus (TCMV) Virgin River virus (VRV)
	<i>Tete orthobunyavirus</i>	Bahig virus (BAHV) Matruh virus (MTRV) Tete virus (TETEV) Tsuruse virus (TSUV) Weldona virus (WELV)
	<i>Thimiri orthobunyavirus</i>	Thimiri virus (THIV)
	<i>Timboteua orthobunyavirus</i>	Timboteua virus (TBTV)
	<i>Turlock orthobunyavirus</i>	Lednice virus (LEDV) Turlock virus (TURV) Umbre virus (UMBV)
	<i>Wolkberg orthobunyavirus</i>	Wolkberg virus (WBV)
	<i>Wyeomyia orthobunyavirus</i>	Anhembí virus (AMBV) BeAr 328208 virus (BAV) Cachoeira Porteira virus (CPOV) Iaco virus (IACOV) Macauã virus (MCAV)

Table 1 (continued)

Genus	Species [¶]	Virus (abbreviation) [¶]
		Rio Pracupi virus
		Sororoca virus (SORV)
		Taiassui virus (TAIAV)
		Tucunduba virus (TUCV)
		Wyeomyia virus (WYOV)
	<i>Zegla orthobunyavirus</i>	Zegla virus (ZEGV)
<i>Shangavirus</i>	<i>Insect shangavirus</i>	Shuāngào insect virus 1 (SgIV-1)
<i>Tospovirus</i>	<i>Groundnut bud necrosis tospovirus</i>	groundnut bud necrosis virus (GBNV) ¹¹
	<i>Groundnut ringspot tospovirus</i>	groundnut ringspot virus (GRSV)
	<i>Groundnut yellow spot tospovirus</i>	groundnut yellow spot virus (GYSV) ¹²
	<i>Impatiens necrotic spot tospovirus</i>	impatiens necrotic spot virus (INSV)
	<i>Iris yellow spot tospovirus</i>	iris yellow spot virus (IYSV)
	<i>Polygonum ringspot tospovirus</i>	Polygonum ringspot virus (PoIRSV)
	<i>Tomato chlorotic spot tospovirus</i>	tomato chlorotic spot virus (TCSV)
	<i>Tomato spotted wilt tospovirus*</i>	tomato spotted wilt virus (TSWV)
	<i>Watermelon bud necrosis tospovirus</i>	watermelon bud necrosis virus (WBNV)
	<i>Watermelon silver mottle tospovirus</i>	watermelon silver mottle virus (WSMoV)
	<i>Zucchini lethal chlorosis tospovirus</i>	zucchini lethal chlorosis virus (ZLCV)
Family Phasmaviridae		
<i>Feravirus</i>	<i>Ferak feravirus*</i>	Ferak virus (FERV)
<i>Inshuvirus</i>	<i>Insect inshuvirus*</i>	Shuāngào insect virus 2 (SgIV-2)
<i>Jonvirus</i>	<i>Jonchet jonvirus*</i>	jonchet virus (JONV)
<i>Orthophasmavirus</i>	<i>Kigluaik phantom orthophasmavirus*</i>	Kigluaik phantom virus (KIGV)
	<i>Nome phantom orthophasmavirus</i>	Nome phantom virus (NOMV)
	<i>Wuchang cockroach orthophasmavirus 1</i>	Wūchāng cockroach virus 1 (WcCV-1)
	<i>Wuhan mosquito orthophasmavirus 1</i>	Wūhàn mosquito virus 1 (WhMV-1)
	<i>Wuhan mosquito orthophasmavirus 2</i>	Wūhàn mosquito virus 2 (WhMV-2)
<i>Wuhivirus</i>	<i>Insect wuhivirus*</i>	Wūhàn insect virus 2 (WhIV-2)
Family Phenuiviridae		
<i>Banyangvirus</i>	<i>Huaiyangshan banyangvirus*</i>	severe fever with thrombocytopenia syndrome virus (SFTSV)
<i>Beidivirus</i>	<i>Dipteran beidivirus*</i>	Húběi diptera virus 3 (HbDV-3)
<i>Goukovirus</i>	<i>Cumuto goukovirus</i>	Cumuto virus (CUMV)
	<i>Gouleako goukovirus*</i>	Gouléako virus (GOLV)
	<i>Yichang insect goukovirus</i>	Yíchāng insect virus (YcIV)
<i>Horwuvirus</i>	<i>Horsefly horwuvirus*</i>	Wūhàn horsefly virus (WhHV)
<i>Hudivirus</i>	<i>Dipteran hudivirus*</i>	Húběi diptera virus 4 (HbDV-4)
<i>Hudovirus</i>	<i>Lepidopteran hudovirus*</i>	Húběi lepidoptera virus 1 (HbLV-1)
<i>Mobuvirus</i>	<i>Mothra mobuvirus*</i>	Mothra virus (MTHV)
<i>Phasivirus</i>	<i>Badu phasivirus*</i>	Badu virus (BADUV)
	<i>Phasi Charoen-like phasivirus</i>	Phasi Chaeron-like virus (PCLV)
	<i>Wuhan fly phasivirus[#]</i>	
	<i>Wutai mosquito phasivirus</i>	Wútái mosquito virus (WtMV)
<i>Phlebovirus</i>	<i>Bujaru phlebovirus</i>	Bujaru virus (BUJV)
		Munguba virus (MUNV)
		Alenquer virus (ALEV)
		Ariquemmes virus (ARQV)
		Candirú virus (CDUV)
		Itaituba virus (ITAV)
		Jacundá virus (JCNV)

Table 1 (continued)

Genus	Species [¶]	Virus (abbreviation) [¶]
		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)
	<i>Chilibre phlebovirus</i>	Cacao virus (CACV)
		Chilibre virus (CHIV)
	<i>Frijoles phlebovirus</i>	frijoles virus (FRIV)
		Joá virus (JOAV)
	<i>Punta Toro phlebovirus</i>	Buenaventura virus (BUEV)
		Campana virus (CMAV)
		Capira virus (CAPIV)
		Coclé virus (CCLV)
		Leticia virus (LTCV)
		Punta Toro virus (PTV)
	<i>Rift Valley fever phlebovirus*</i>	Rift Valley fever virus (RVFV)
	<i>Salehabad phlebovirus</i>	Adana virus (ADAV)
		Adria virus (ADRV)
		Alcube virus
		Arbia virus (ARBV)
		Arumowot virus (AMTV)
		Medjerda Valley virus (MVV)
		Odrénisrou virus (ODRV)
		Olbia virus (OLBV)
		Salehabad virus (SALV)
		Bregalaka virus (BREV)
		Zaba virus (ZABAV)
	<i>Sandfly fever Naples phlebovirus</i>	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)
	<i>Uukuniemi phlebovirus</i>	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)

Table 1 (continued)

Genus	Species [¶]	Virus (abbreviation) [¶]
<i>Pidchovirus</i>	<i>Pidgey pidchovirus</i> *	Pidgey virus (PGYV)
<i>Tenuivirus</i>	<i>Echinochloa hoja blanca tenuivirus</i>	Echinochloa hoja blanca virus (EHBV)
	<i>Iranian wheat stripe tenuivirus</i>	Iranian wheat stripe virus (IWSV)
	<i>Maize stripe tenuivirus</i>	maize stripe virus (MStV = MSpV)
	<i>Rice grassy stunt tenuivirus</i>	rice grassy stunt virus (RGSV)
	<i>Rice hoja blanca tenuivirus</i>	rice hoja blanca virus (RHBV)
	<i>Rice stripe tenuivirus</i> *	rice stripe virus (RSV = RStV)
	<i>Urochloa hoja blanca tenuivirus</i>	Urochloa hoja blanca virus (UHBV)
<i>Wubeivirus</i>	<i>Dipteran wubeivirus</i> *	Húběi diptera virus 5 (HbDV-5)
	<i>Fly wubeivirus</i>	Wǔhàn fly virus 1 (WhFV-1)
Family Wupedeviridae		
<i>Wumivirus</i>	<i>Millipede wumivirus</i> *	Wǔhàn millipede virus 2 (WhMV-2)

*Asterisks denote type species

¹junior synonyms: Cardamones virus, Hainán Medical University virus, Xīngyì virus

²synonym: Artybash virus (ARTV)

³synonym: New York 1 virus (NY-1V)

⁴synonym: Jurong virus

⁵includes the strain previously referred to as Tunis virus (TUNV)

⁶includes the strain previously referred to as soft tick bunyavirus (STBV)

⁷includes the strain previously referred to as Ganjam virus (GANV)

⁸synonyms: Čalovo virus (CVOV), Chittoor virus (CHITV), Olkya virus, Olyka virus, UgMP-6830 virus

⁹includes the strain previously referred to as Garissa virus

¹⁰also mistakenly referred to in the literature as Chantanga virus (CHATV) and Chatanga virus (CHATV)

¹¹synonym: peanut bud necrosis virus (PDNV)

¹²synonym: peanut yellow spot virus (PYSV)

[#]The virus of this species was moved into a new genus (*Wubeivirus*) and species (*Fly wubeivirus*), but due to a formal error, the species *Wuhan fly phasivirus* was not deleted. A taxonomic proposal to rectify this oversight has been submitted

[¶]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

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Compliance with ethical standards

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References

- 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
- Maes P, Alkhovsky SV, Bào Y, Beer M, Birkhead M, Briese T, Buchmeier MJ, Calisher CH, Charrel RN, Choi IR, Clegg CS, Torre JCDL, Delwart E, DeRisi JL, Bello PLD, Serio FD, Digiaro M, Dolja VV, Drosten C, Druciarek TZ, Du J, Ebihara

H, Elbeaino T, Gergerich RC, Gillis AN, Gonzalez J-PJ, Haenni A-L, Hepojoki J, Hetzel U, Hò T, Hóng N, Jain RK, Vuren PJV, Jin Q, Jonson MG, Junglen S, Keller KE, Kemp A, Kipar A, Kondov NO, Koonin EV, Kormelink R, Korzyukov Y, Krupovic M, Lambert AJ, Laney AG, LeBreton M, Lukashевич IS, Marklewitz M, Markotter W, Martelli GP, Martin RR, Mielke-Ehret N, Mühlbach H-P, Navarro B, Ng TFF, Nunes MRT, Palacios G, Pawęska JT, Peters CJ, Plyusnin A, Radoshitzky SR, Romanowski V, Salmenperä P, Salvato MS, Sanfaçon H, Sasaya T, Schmaljohn C, Schneider BS, Shirako Y, Siddell S, Sironen TA, Stenglein MD, Storm N, Sudini H, Tesh RB, Tzanetakis IE, Uppala M, Vapalahti O, Vasilakis N, Walker PJ, Wáng G, Wáng L, Wáng Y, Wèi T,

Wiley MR, Wolf YI, Wolfe ND, Wú Z, Xú W, Yang L, Yāng Z, Yeh S-D, Zhāng Y-Z, Zhèng Y, Zhou X, Zhū C, Zirkel F, Kuhn JH (2018) Taxonomy of the family *Arenaviridae* and the order *Bunyavirales*: update 2018. *Arch Virol* 163:2295–2310

- Makhsous N, Shean RC, Droppers D, Guan J, Jerome KR, Greninger AL (2017) Genome sequences of three novel bunyaviruses, two novel rhabdoviruses, and one novel nyamivirus from Washington State moths. *Genome Announc* 5:e01668-01616
- 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

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