Mosquito-Associated Viruses in West Africa

Subjects: Virology

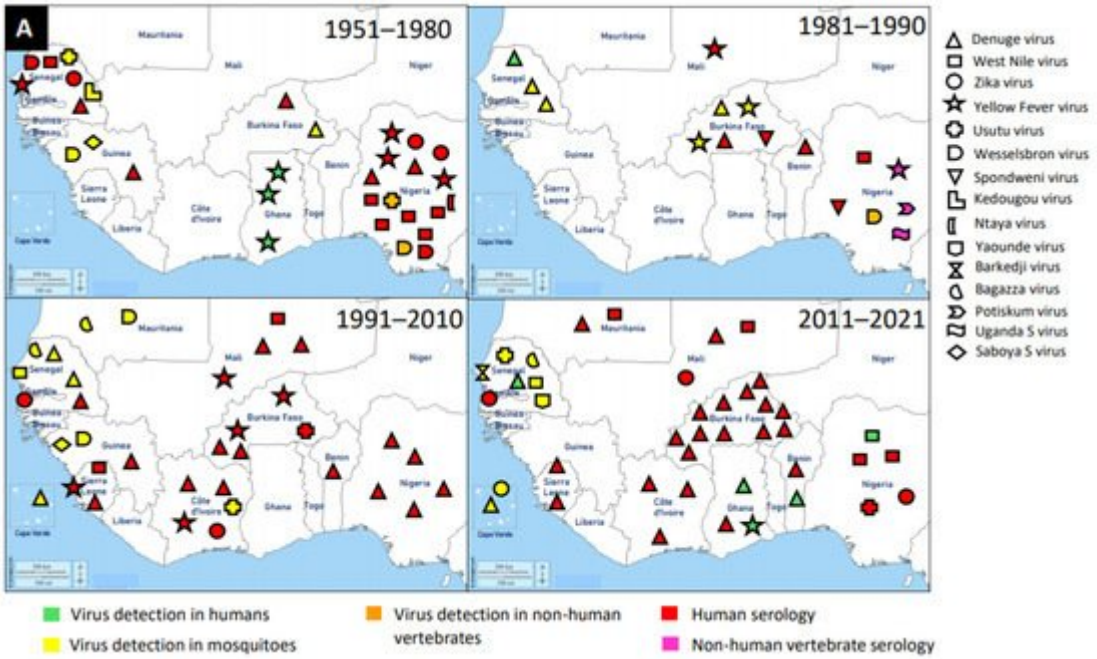
Contributor: Hanna Jöst , Athanase Badolo

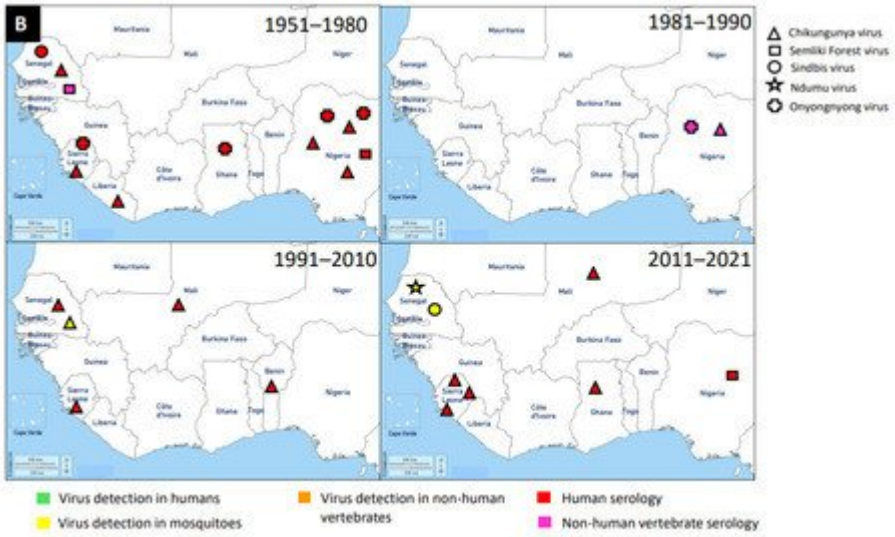
A cumulative number of MAVs are being discovered in hematophagous arthropods all over the world. There is a potential impact on the fitness and competence of the vector. Therefore, more research is needed to expand the knowledge about their prevalence, distribution, and diversity. The trend of MAVs reported in the literature enlightens how researches about MAVs are on the increase. The past decades have shown a dramatic surge in the literature recounting novel MSVs and classical arboviruses. The increase in research interest has provided new understanding about viral diversity and evolution. Finally, the new viruses discovered have created curiosity in their use as potential biological control agents.

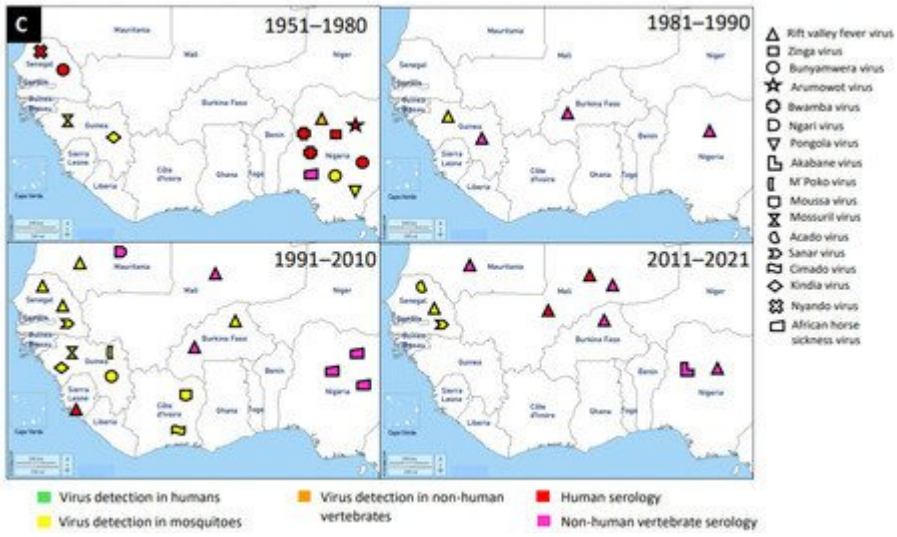
Mosquito-Associated Viruses

1. Flaviridae

Flaviviruses are enveloped, spherical, and about 50 nm in diameter. The surface proteins of the viral capsid are arranged in an icosahedral-like symmetry. They have a monopartite, linear, ssRNA(+) genome of about 9.7–12 kb [1]. These viruses can be divided into three main groups: those that are maintained in an arthropod–vertebrate cycle and strictly depend on each other are called dual-host flaviviruses [2]; those that are limited to vertebrates with an unknown arthropod relationship are known as vertebrate-specific flavivirus [3]; and those that replicate only in insect cell lines are termed insect-specific flaviviruses [2][4][5]. Flaviviruses and flavivirus-specific antibodies detected in West Africa are shown in Figure 1.


A
1951–1980
1981–1990
1991–2010
2011–2021
Denuge virus
West Nile virus
Zika virus
Yellow Fever virus
Usutu virus
Wesselsbron virus
Spondweni virus
Kedougou virus
Ntaya virus
Yaounde virus
Barkedji virus
Bagazza virus
Potiskum virus
Uganda S virus
Saboya S virus
Virus detection in humans
Virus detection in mosquitoes
Virus detection in non-human vertebrates
Human serology
Non-human vertebrate serology


B
1951–1980
1981–1990
1991–2010
2011–2021
Chikungunya virus
Semliki Forest virus
Sindbis virus
Ndumu virus
Onyongnyong virus
Virus detection in humans
Virus detection in mosquitoes
Virus detection in non-human vertebrates
Human serology
Non-human vertebrate serology


C
1951–1980
1981–1990
1991–2010
2011–2021
Rift valley fever virus
Zinga virus
Bunyamwera virus
Arumowot virus
Bwamba virus
Ngari virus
Pongola virus
Akabane virus
M Poko virus
Moussa virus
Mossuril virus
Acado virus
Sanar virus
Cimado virus
Kindia virus
Nyando virus
African horse sickness virus
Virus detection in humans
Virus detection in mosquitoes
Virus detection in non-human vertebrates
Human serology
Non-human vertebrate serology

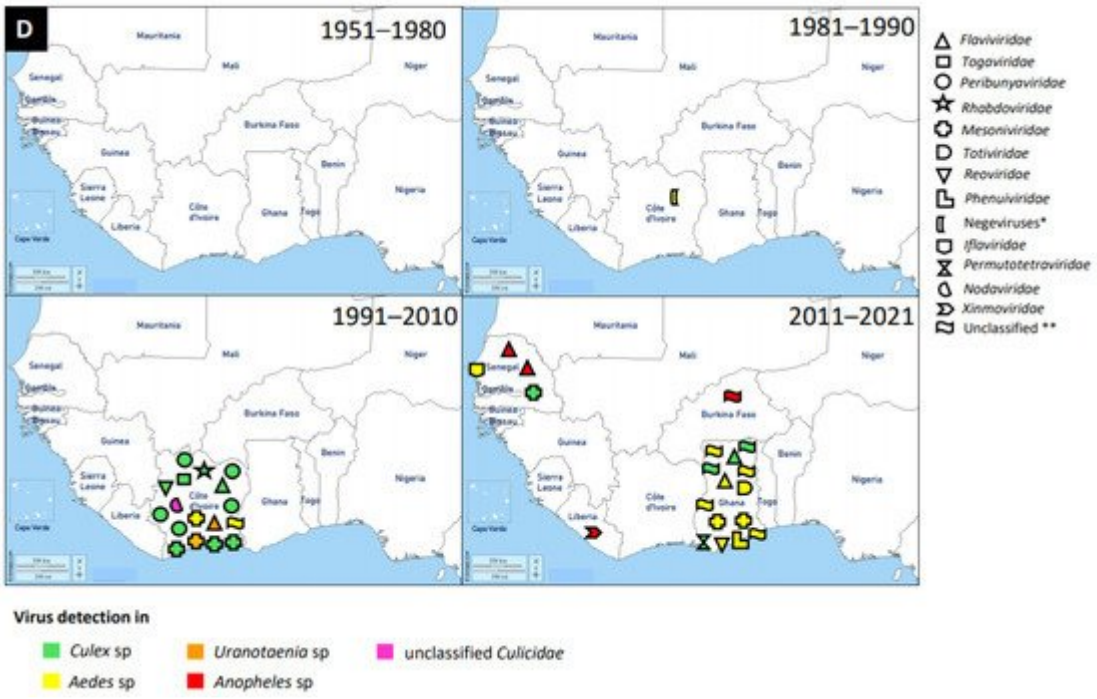


Figure 1. Distribution of MAVs in West Africa. A–C Mosquito-borne viruses (**A**) Flaviviridae; (**B**) Togaviridae; (**C**) Peribunyaviridae, Rhabdoviridae and Reoviridae; (**D**) Mosquito-specific viruses. Location of the signs in the country was chosen randomly and does not refer to the location where the study was performed; * = Proposed taxon; ** = Unclassified viruses.

The application of next generation sequencing (NGS) techniques in virus discovery has led to the identification and isolation of numerous MSVs [6]. West Africa is not left out in this discovery, and MAVs known to cause outbreaks and those which are not associated with human infections are outlined in Table 1. The first mosquito-specific flavivirus isolated was cell fusing agent virus (CFAV) in 1975 [7], but this virus was never identified in West Africa until 2016 in Ghana [8]. CFAV was isolated from mosquitoes collected via a mosquito surveillance field work from 2015 to 2016 in Ghana. Examples of other MSVs identified in West Africa include: Nounane virus and Nienokoue virus (Côte d'Ivoire); Anopheles flavivirus-like virus and Barkedji virus (Senegal); and Culex flavivirus (Ghana) [9][10] [8][11][12]. Nounane and Nienokoue viruses were identified in Tai National Park, a tropical rainforest zone, from the *Culex* and *Uranotaenia* mosquitoes respectively [11][12].

Table 1. Mosquito-associated viruses (MAVs) discovered in West Africa from 1951–2021.

Family	Name of Virus	Year of Virus Detection	Country	Source of Virus Detection	Reference
Flaviviridae	**Mosquito-borne viruses**				
	Dengue	2009	Cape Verde	*Aedes aegypti*	[13]

Family	Name of Virus	Year of Virus Detection	Country	Source of Virus Detection	Reference
		2014/15	Cape Verde	*Ae. aegypti*	[14]
		2016/17	Ghana	Serology/Human	[15]
		2016/17	Ghana	Human	[16]
		2014/2016	Ghana	Serology/Human	[17]
		1974	Senegal	*Ae. luteocephalus*, Serology/Human	[18]
		1983	Senegal	Human	[19]
		1990	Senegal	*Aedes* sp	[20]
		2015/19	Senegal	Human	[21]
		1999	Senegal	*Aedes* sp	[22]
		2009/10	Senegal	*Ae. aegypti,* Serology/Human	[23]
		1964	Nigeria	Serology/Human	[24]
		1975	Nigeria	Serology/Human	[25]
		2001	Nigeria	Serology/Human	[26]
		2010 *	Nigeria	Serology/Human	[27]
		2011	Nigeria	Serology/Human	[28]
		2013 *	Nigeria	Serology/Human	[29]
		2014 *	Nigeria	Serology/Human	[30]
		1987/93	Benin	Serology/Human	[31]
		2010	Benin	Serology/Human	[32]
		2019	Benin	Serology/Human; Human	[33]
		2015	Mauritania	Serology/Human	[34]
		2017	Burkina Faso	Serology/Human	[35]

Family	Name of Virus	Year of Virus Detection	Country	Source of Virus Detection	Reference
		2016	Burkina Faso	Serology/Human	[36]
		2019	Burkina Faso	Serology/Human	[37]
		1980	Burkina Faso	*Aedes* sp	[38]
		1983/86	Burkina Faso	*Aedes* sp	[39]
		2013/14	Burkina Faso	Serology/Human	[40]
		2015/17	Burkina Faso	Serology/Human	[41]
		2014	Burkina Faso	Serology/Human	[42]
		2016/17	Burkina Faso	Serology/Human	[43]
		2016	Burkina Faso	Serology/Human	[44]
		1982	Burkina Faso	Serology/Human	[45]
		2004	Burkina Faso	Serology/Human	[46]
		2016	Burkina Faso	Serology/Human	[47]
		2013/14	Burkina Faso	Serology/Human	[48]
		2017	Burkina Faso	Serology/Human	[35]
		2003/4	Burkina Faso	Serology/Human	[49]
		2016	Burkina Faso	Serology/Human	[50]

Family	Name of Virus	Year of Virus Detection	Country	Source of Virus Detection	Reference
		2009/13	Mali	Serology/Human	[51]
		2006	Mali	Serology/Human	[52]
		1999	Côte d'Ivoire	Mosquitoes, Serology/Human	[53]
		2010	Côte d'Ivoire	Serology/Human, Human	[54]
		2011/12	Côte d'Ivoire	Serology/Human, Human	[55]
		2017	Côte d'Ivoire	Serology/Human, Human	[56]
		2019	Côte d'Ivoire	Serology/Human	[57]
	Dengue	1978/91	Guinea	Mosquitoes	[58]
		2006/8	Sierra Leone	Serology/Human	[59]
		2016 *	Sierra Leone	Serology/Human	[60]
		2012/13	Sierra Leone	Serology/Human	[61]
	West Nile	2012/13	Senegal	*Culex* sp, *Aedes* sp	[62]
		1972/75	Senegal	Serology/Human	[63]
		1998/99	Senegal	*Masonia uniformis*	[64]
		1951/55	Nigeria	Serology/Human	[65]
		1968/69	Nigeria	Serology/human	[66]
		1963	Nigeria	Serology/Human	[67]
		1975	Nigeria	Serology/Human	[68]
		1987	Nigeria	Serology/Horses	[69]
		2011/12	Nigeria	Serology/Horses	[70]

Family	Name of Virus	Year of Virus Detection	Country	Source of Virus Detection	Reference
		2018	Nigeria	Human	[71]
		2015	Mauritania	Serology/Human	[34]
		2009/13	Mali	Serology/Human	[51]
		2006/8	Sierra Leone	Serology/Human	[59]
	Zika	2016	Cape Verde	*Ae. aegytpi*	[72]
		2016	Mali	Serology/Human	[73]
		1972/75	Senegal	Serology/Human	[63]
		1999	Côte d'Ivoire	Mosquitoes, Serology/Human	[53]
		2010/14	Gambia	Serology	[74]
		1975 *	Nigeria	Serology	[25]
		1951/55	Nigeria	Serology/Human	[65]
		2018	Nigeria	Serology	[71]
	Yellow Fever	1989	Nigeria	Serology/horses	[69]
		1951/55	Nigeria	Serology/Human	[65]
		1968/69	Nigeria	Serology/Human	[66]
		1975	Nigeria	Serology/Human	[68]
		1972/75	Senegal	Serology/Human	[63]
		1976	Senegal	*Aedes* sp	[75]
		2003/8	Burkina Faso	Serology/Human	[76]
		1983/86	Burkina Faso	*Aedes* sp	[39]
		1983	Burkina Faso	*Aedes* sp	[77]

Family	Name of Virus	Year of Virus Detection	Country	Source of Virus Detection	Reference
		1999	Burkina Faso	Serology/Human	[78]
		1987	Mali	Serology/Human	[79]
		2006	Mali	Serology/Human	[52]
		1999	Côte d'Ivoire	Mosquitoes, Serology/Human	[53]
		2006/09	Sierra Leone	Serology/Human	[59]
		1977/80	Ghana	Human	[80]
		1963	Ghana	Human	[80]
		1969/70	Ghana	Human	[80]
		2011	Ghana	Human	[81]
	Usutu	2012/13	Senegal	*Culex* sp	[62]
		1972/1977	Senegal	*Aedes* sp	[82]
		1972	Nigeria	*Turdus libonyanus*	[83]
		2018	Nigeria	Serology/Human	[71]
		2004	Burkina Faso	Serology/Human	[83]
		2004	Côte d'Ivoire	*Culex quinquefasciatus*	[83]
	Wesselsbron	1972/75	Senegal	Serology/Human	[63]
		1971 *	Nigeria	Serology/Horse	[84]
		1975	Nigeria	Serology/Human	[68]
		1989 *	Nigeria	Serology/Horse	[69]
		1998	Mauritania	*Aedes vexans*	[64]
		1978/91	Guinea	Mosquitoes	[58]
	Spondweni	1982 *	Burkina	Serology/Human	[85]

Family	Name of Virus	Year of Virus Detection	Country	Source of Virus Detection	Reference
			Faso		
	Kedougou	1978 *	Senegal	*Aedes* sp	[86]
	Ntaya	1977	Nigeria	Serology/Human	[87]
	Yaounde	2012/13	Senegal	*Culex* sp	[62]
	Bagazza	2012/13	Senegal	*Culex* sp	[62]
		1998/99	Senegal	*Aedes fowleri*	[64]
		1998/99	Mauritania	*Culex neavei*	[64]
	Barkedji	2012/13	Senegal	*Culex* sp, *Aedes* sp	[62]
	Potiskum	1989 *	Nigeria	Serology/Horses	[69]
	Uganda S	1989 *	Nigeria	Serology/Horses	[69]
	Saboya	1978/91	Guinea	Mosquitoes	[58]
Togaviridae					
	Chikungunya	1963	Nigeria	*Aedes* sp	[88]
		1969	Nigeria	Serology/Human	[89]
		1968/69	Nigeria	Serology/Human	[66]
		1989 *	Nigeria	Serology/Horse	[69]
		1974	Nigeria	Serology/Human	[90]
		2009/10	Senegal	Serology, *Aedes* sp	[91]
		1972/75	Senegal	Serology/Human	[63]
		2016/17	Ghana	Serology/Human	[15]
		2006	Benin	Serology/Human	[92]
		2009/13	Mali	Serology/Human	[51]
Togaviridae					
	Chikungunya	2012/13	Sierra Leone	Serology/Human	[93]

Family	Name of Virus	Year of Virus Detection	Country	Source of Virus Detection	Reference
		2016/17	Sierra Leone	Serology/Human	[94]
		2006/8	Sierra Leone	Serology/Human	[59]
		2012/13	Sierra Leone	Serology/Human	[61]
		1975/77	Sierra Leone	Serology/Human	[87]
		1977	Liberia	Serology/Human	[87]
	Semliki Forest	1971	Senegal	Serology/Horses	[95]
		1951/55	Nigeria	Serology/Human	[65]
		2014 *	Nigeria	Serology/Human	[96]
	Sindbis	2012/13	Senegal	*Culex* sp	[62]
		1972/75	Senegal	Serology	[63]
	Ndumu	2012/13	Senegal	Several mosquitoes	[63]
	Onyongnyong	1989 *	Nigeria	Serology/Horses	[69]
		1974	Nigeria	Serology/Human	[87]
		1975	Nigeria	Serology/Human	[87]
		1954	Ghana	Serology/Human	[87]
		1975/77	Sierra Leone	Serology/Human	[87]
Phenuiviridae					
	Rift Valley fever	1993/96	Burkina Faso	*Aedes* sp	[39]
		1987	Burkina Faso	Serology/Sheep	[97]
		2005/7	Burkina Faso	Serology/livestock	[98]

Family	Name of Virus	Year of Virus Detection	Country	Source of Virus Detection	Reference
		1985/87	Burkina Faso	Serology/livestock	[99]
		2006/8	Sierra Leone	Serology/Human	[59]
		1987 *	Guinea	Serology/Bats	[100]
		1978/91	Guinea	Mosquitoes	[58]
		2016	Mali	Serology/Human	[101]
		2015	Mali	Serology/Human	[102]
		2005/14	Mali	Serology/Bovine	[103]
		2016	Niger	Serology/Human/ Livestock	[104]
		1959	Nigeria	Serology/Sheep	[105]
		2016	Nigeria	Serology/Camels	[106]
		1989	Nigeria	Seroloy/Horses	[69]
[134]		1998	Senegal	*Culex* sp, Serology	[107]
		2012/13 [135]	Senegal	*Aedes ochraceus*	[62]
		1998/99	Senegal	*Culex poicilipes*	[64]
		1998	Mauritania	*Culex poicilipes*	[64]
		2015	Mauritania [136][137]	Serology/Human	[34]
Peribunyaviridae					[136]
	Zinga	1975/1977	Nigeria	Serology/Human	[87]
	Bunyamwera	1978 *	Senegal	Serology/Human	[63]
		1951/55	Nigeria	Serology/Human [138]	[65]
		1963	Nigeria	*M. africana*	[88]
		1978/91	Guinea	Mosquitoes	[58][89]
	Arumowot	1968/69	Nigeria	Serology/Human	[66]

apsid with
enome of
ertebrate
osquitoes

lphavirus
tified and
oire [136].

enezuelan
of severe
pain [135].
e that the
n 1963 in
ne recent
on Torrent
ra [140]. A

broader spectrum of pathogens was suggested by the distribution of sequencing reads and must be considered in clinical diagnostics and epidemiological surveillance [140]. Until now, a greater number of cases of CHIKV were reported in Sierra Leone, Nigeria, and Senegal, compared to the very few cases in Ghana, Benin, Mali, and

Family	Name of Virus	Year of Virus Detection	Country	Source of Virus Detection	Reference
	Bwamba	1969/72	Nigeria	Serology/Human	[108]
		1951/55	Nigeria	Serology/Human	[65]
	Ngari	2010	Mauritania	Serology/Goat	[109]
	Nyando	1972 *	Senegal	Serology/Human	[110]
[141]	**Pongola**	1963	Nigeria	*M. africana*	[88]
	Akabane	[142] 2015	Nigeria	Serology/Livestock	[111]
	M'Poko	1978/91	Guinea	Mosquitoes	[58]
Rhabdoviridae				[143][144][145]	
	Mossuril	1978/91	Guinea	Mosquitoes	[58]
[146]					
Reoviridae					
	Acado	2012/13	Senegal	*Culex sp*	[62]
	Sanar	2012/13	Senegal	*Culex neavei, M. uniformis*	[147][148]
	[149]	1998/99	Senegal	*Culex poicilipes*	[64]
	Kindia [150][116]	1978/91	Guinea	Mosquitoes	[58]
	African horse sickeness	1971 *	Nigeria	Serology/Horse	[84]
		1993 *	Nigeria	Serology/Camels/Donkey/ Dogs/Horses	[112]
		1993 *	Nigeria	Serology/Horse	[113]
		1995 *	Nigeria	Serology/Horse	[114]
Flaviviridae			**Mosquito-specific viruses**		
	Culex flavivirus	2016	Ghana	*Culex* sp	[115]
	Cell fusing agent virus	2016	Ghana [3]	*Aedes aegypti*	[115]
	Anopheles flavivirus-like 2	2012	Senegal	*Anopheles* sp	[116]

arboviruses.

The medically important mosquito-borne member of the family *Phenuiviridae*, with several reports, is the RVFV. RVFV was reported in Burkina Faso, Sierra Leone, Guinea, Mali, Nigeria, Senegal, and Mauritania. It is likely that

Family	Name of Virus [14][15][16]	Year of Virus Detection [16]	Country	Source of Virus Detection	Reference
	Anopheles flavivirus-like 1	2012	Senegal	*Anopheles* sp	[116]
	Nienokoue	2004	Côte d'Ivoire	*Culex* species mosquitoes	[117]
	Nounane	2004	Côte d'Ivoire	*Uranotaenia mashonaensis*	[118]
Togaviridae					
	Taï Forest alphavirus	2004	Côte d'Ivoire	*Culex decens*	[119]
Peribunyaviridae					
	Ferak	2004	Côte d'Ivoire	*Culex decens*	[120]
	Jonchet	2004	Côte d'Ivoire	*Culex* sp	[120]
	Herbert	2004	Côte d'Ivoire	*Culex nebulosus*	[121]
	Tai	2004	Côte d'Ivoire	*Culex* sp	[121]
Rhabdoviridae					
	Moussa	2004	Côte d'Ivoire	*Culex decens*	[122]
Mesoniviridae					
	Odorna	2016	Ghana	*Aedes aegypti*	[115]
	Dianke	2013	Senegal	*Culex poicilipes*	[123]
	Cavally	2016	Ghana	*Aedes aegypti*	[115]
	Cavally	2004	Côte d'Ivoire	*Aedes harrisoni*	[124]
	Nse	2004	Côte d'Ivoire	*Culex nebulosus*	[125]
	Meno	2004	Côte	*Uranotaenia chorleyi*	[125]

6 in Mali,
n culicine
, L.F.;
quitoes
T.K.
na.
yashi,
ed
F.; Ido,
ed of
négal
Dengue
l.-P.
es
.; Faye,
negal,
ogic

1 Findings and Epidemiologic Considerations. Emerg. Infect. Dis. 2003, 9, 362–367.

11. Faye, O.; Ba, Y.; Faye, O.; Talla, C.; Diallo, D.; Chen, R.; Mondo, M.; Ba, R.; Macondo, E.; Siby, T.; et al. Urban Epidemic of Dengue Virus Serotype 3 Infection, Senegal, 2009. Emerg. Infect. Dis.

Family	Name of Virus	Year of Virus Detection	Country	Source of Virus Detection	Reference
			d'Ivoire		
	Hana	2004	Côte d'Ivoire	*Culex* sp	[125]
	Moumo	2004	Côte d'Ivoire	*Culex* sp	[125]
Totiviridae					
	Aedes aegypti totivirus	2016	Ghana	*Aedes aegypti*	[115]
Reoviridae					
	Aedes pseudoscutellaris reovirus	2015	Ghana	*Aedes aegypti*	[115]
	Cimodo	2008	Côte d'Ivoire	*Culex nebulosus*	[126]
Phenuiviridae					
	Phasi Charoen-like phasivirus	2016	Ghana	*Aedes aegypti*	[115]
	Gouleako	2004	Côte d'Ivoire	*Culex* sp	[127]
Negeviruses **					
	Dezidougou	1984	Côte d'Ivoire	*Aedes aegypti*	[128]
Iflaviridae					
	Aedes vexans iflavirus	2017	Senegal	*Aedes vexans*	[129]
Permutotetraviridae					
	Culex permutotetra-like virus	2016	Ghana	*Culex* sp	[115]
Nodaviridae					

during the 2017 Outbreak in Ouagadougou, Burkina Faso: A Retrospective Cohort Study. PLoS ONE 2020, 15, e0238431.

24. Tarnagda, Z.; Cissé, A.; Bicaba, B.W.; Diagbouga, S.; Sagna, T.; Ilboudo, A.K.; Tialla, D.; Lingani, M.; Sondo, K.A.; Yougbaré, I.; et al. Dengue Fever in Burkina Faso, 2016. Emerg. Infect. Dis.

Family	Name of Virus	Year of Virus Detection	Country	Source of Virus Detection	Reference
	Mosinovirus	2004	Côte d'Ivoire	*Culicidae*	[130]
Xinmoviridae					
	Bolahun virus variant 2	2012/15	Liberia	*Anopheles gambiae*	[116]
Unclassified * **					
Unclassified Riboviria	Bolahun virus variant 1	2012/15	Burkina Faso	*Anopheles gambiae*	[116]
Unclassified Riboviria	Aedes aegypti virga-like virus	2016	Ghana	*Aedes aegypti*	[115]
Unclassified Riboviria	West Accra	2015	Ghana	*Aedes aegypti*	[115]
Unclassified Riboviria	Mole Culex	2016	Ghana	*Culex* sp	[115]
Unclassified Riboviria	Goutanap	2004	Côte d'Ivoire	*Culex nebulosus*	[131]
Unclassified Riboviria	Goutanap	2016	Ghana	*Culex* sp	[115]
Unclassified Riboviria	Tesano Aedes	2016	Ghana	*Aedes aegypti*	[115]
Unclassified Riboviria	Korle-bu Aedes	2016	Ghana	*Aedes aegypti*	[115]

* = Taxonomic Hierarchy Uncertain; ** = Proposed Genus; *** = Unclassified Viruses Identified from Mosquitoes in Burkina Faso by Next-Generation Sequencing.

The presence of flaviviruses in West Africa is not limited to MSVs, but also medically important MBVs, such as DENV, WNV, ZIKV, YFV, and Usutu virus (USUV). McNamara et al. seem to provide the first report on mosquito-borne flaviviruses, including YFV, WNV, ZIKV, and Uganda S virus in the 1950s [116]. West Africa has experienced several outbreaks of DENV, with the first reported in Nigeria in 1964 [3]. The likelihood of urbanization-driven DENV circulation in Burkina Faso in 2017 [132] and 2018 [133]. In addition to DENV outbreaks in Burkina Faso, there were reports in other countries, such as Nigeria, Côte d'Ivoire, Senegal, Sierra Leone, Benin, Mali, Cape Verde, Ghana, Mauritania, and Guinea in a decreasing order of

32. Hashimoto, T.; Kutsuna, S.; Maeki, T.; Tajima, S.; Takaya, S.; Katanami, Y.; Yamamoto, K.; Takeshita, N.; Hayakawa, K.; Kato, Y.; et al. A Case of Dengue Fever Imported from Burkina Faso to Japan in October 2016. Jpn. J. Infect. Dis. 2017, 70, 675–677.

33. Gonzalez, J.P.; Du Saussay, C.; Gautun, J.C.; McCormick, J.B.; Mouchet, J. Dengue in Burkina Faso (Ex-Upper Volta): Seasonal Epidemics in the Urban Area of Ouagadougou. Bull. Soc. Pathol. Exot. Fil. 1985, 78, 7–14.

34. Eldin, C.; Gautret, P.; Nougairede, A.; Sentis, M.; Ninove, L.; Saidani, N.; Million, M.; Brouqui, P.; Charrel, R.; Parola, P. Identification of Dengue Type 2 Virus in Febrile Travellers Returning from Ouagadougou (Burkina Faso) to France, June to October 2016. Euro Surveill. 2017, 22, 30561.

35. Eldin, C.; Gautret, P.; Nougairede, A.; Sentis, M.; Ninove, L.; Saidani, N.; Million, M.; Brouqui, P.; Charrel, R.; Parola, P. Identification of Dengue Type 2 Virus in Febrile Travellers Returning from

incidence. Thereafter, Burkina Faso reported several DENV outbreaks, like other West African countries. The main vectors for DENV are *Aedes* mosquitoes (mainly *Aedes aegypti*) through which DENV is transmitted to humans (amplifying host). DENV was mainly detected via serological investigations in humans, although *Ae. aegypti* mosquitoes were also documented as a source of detection.

Burkina Faso to France, Related to an Ongoing Outbreak, October to November 2016. Eurosurveillance 2016, 21, 30425.

36. Diallo, I.; Sondo, K.A.; Tieno, H.; Tamelokpo, E.Y.; Zoungrana, J.; Sagna, Y.; Savadogo, M.; Poda, A.; Guira, O.; Diendere, E.A.; et al. A Propos de 98 Cas de Dengue Hospitalisés Dans Une Clinique Privée de Ouagadougou: Aspects Épidémiologiques, Diagnostiques et Évolutifs. Bull. Soc. Pathol. Exot. 2017, 110, 291–296.
37. Collenberg, E.; Ouedraogo, T.; Ganamé, J.; Fickenscher, H.; Kynast-Wolf, G.; Becher, H.; Kouyaté, B.; Kräusslich, H.-G.; Sangaré, L.; Tebit, D.M. Seroprevalence of Six Different Viruses among Pregnant Women and Blood Donors in Rural and Urban Burkina Faso: A Comparative Analysis. J. Med. Virol. 2006, 78, 683–692.
38. Baronti, C.; Piorkowski, G.; Touret, F.; Charrel, R.; de Lamballerie, X.; Nougairede, A. Complete Coding Sequences of Two Dengue Virus Type 2 Strains Isolated from an Outbreak in Burkina Faso in 2016. Genome Announc. 2017, 5, e00209-17.
39. Safronetz, D.; Sacko, M.; Sogoba, N.; Rosenke, K.; Martellaro, C.; Traoré, S.; Cissé, I.; Maiga, O.; Boisen, M.; Nelson, D.; et al. Vectorborne Infections, Mali. Emerg. Infect. Dis. 2016, 22, 340–342.
40. Phoutrides, E.K.; Coulibaly, M.B.; George, C.M.; Sacko, A.; Traore, S.; Bessoff, K.; Wiley, M.R.; Kolivras, K.N.; Adelman, Z.; Traore, M.; et al. Dengue Virus Seroprevalence Among Febrile Patients in Bamako, Mali: Results of a 2006 Surveillance Study. Vector Borne Zoonotic Dis. 2011, 11, 1479–1485.
41. Akoua-Koffi, C.; Diarrassouba, S.; Benie, V.; Ngbichi, J.; Bozoua, T.; Bosson, A.; Akran, V.; Carnevale, P.; Ehouman, A. Investigation Autour d'un Cas Mortel de Fièvre Jaune En Côte d'Ivoire En 1999. Bull. Soc. Pathol. Exot. 2001, 94, 227–230.
42. Aoussi, E.B.F.; Ehui, E.; Kassi, N.A.; Kouakou, G.; Nouhou, Y.; Adjogoua, E.V.; Eholié, S.; Bissagnéné, E. Seven Native Cases of Dengue in Abidjan, Ivory Coast. Méd. Mal. Infect. 2014, 44, 433–436.
43. L'Azou, M.; Jean-Marie, J.; Bessaud, M.; Cabié, A.; Césaire, R.; de Lamballerie, X.; Courbil, R.; Richard, P. Dengue Seroprevalence in the French West Indies: A Prospective Study in Adult Blood Donors. Am. J. Trop. Med. Hyg. 2015, 92, 1137–1140.
44. WHO. Dengue Fever—Côte d'Ivoire—Disease Outbreak News 4 August 2017; WHO: Geneva, Switzerland, 2017.
45. WHO. Weekly Bulletin on Outbreaks and Other Emergencies—Week 42 2019, 14–20 October 2019; WHO: Geneva, Switzerland, 2019.
46. Butenko, A.M. Arbovirus Circulation in the Republic of Guinea. Med. Parazitol. 1996, 2, 40–45.

47. Schoepp, R.J.; Rossi, C.A.; Khan, S.H.; Goba, A.; Fair, J.N. Undiagnosed Acute Viral Febrile Illnesses, Sierra Leone. Emerg. Infect. Dis. 2014, 20, 1176–1182.
48. de Araújo Lobo, J.M.; Mores, C.N.; Bausch, D.G.; Christofferson, R.C. Short Report: Serological Evidence of Under-Reported Dengue Circulation in Sierra Leone. PLoS Negl. Trop. Dis. 2016, 10, e0004613.
49. Dariano, D.F.; Taitt, C.R.; Jacobsen, K.H.; Bangura, U.; Bockarie, A.S.; Bockarie, M.J.; Lahai, J.; Lamin, J.M.; Leski, T.A.; Yasuda, C.; et al. Surveillance of Vector-Borne Infections (Chikungunya, Dengue, and Malaria) in Bo, Sierra Leone, 2012–2013. Am. J. Trop. Med. Hyg. 2017, 97, 1151–1154.
50. Ndiaye, E.H.; Diallo, D.; Fall, G.; Ba, Y.; Faye, O.; Dia, I.; Diallo, M. Arboviruses Isolated from the Barkedji Mosquito-Based Surveillance System, 2012–2013. BMC Infect. Dis. 2018, 18, 642.
51. Renaudet, J.; Jan, C.; Ridet, J.; Adam, C.; Robin, Y. A Serological Survey of Arboviruses in the Human Population of Senegal. Bull. Soc. Pathol. Exot. Fil. 1978, 71, 131–140.
52. Diallo, M.; Nabeth, P.; Ba, K.; Sall, A.A.; Ba, Y.; Mondo, M.; Girault, L.; Abdalahi, M.O.; Mathiot, C. Mosquito Vectors of the 1998-1999 Outbreak of Rift Valley Fever and Other Arboviruses (Bagaza, Sanar, Wesselsbron and West Nile) in Mauritania and Senegal. Med. Vet. Entomol. 2005, 19, 119–126.
53. Macnamara, F.N.; Horn, D.W.; Porterfield, J.S. Yellow Fever and Other Arthropod-Borne Viruses; a Consideration of Two Serological Surveys Made in South Western Nigeria. Trans. R. Soc. Trop. Med. Hyg. 1959, 53, 202–212.
54. Guyer, B. Serological Survey for Arboviruses in Igbo-Ora, Western Nigeria. Ann. Trop. Med. Parasitol. 1972, 66, 243–250.
55. Tomori, O.; Fagbami, A.; Fabiyi, A. Isolations of West Nile Virus from Man in Nigeria. Trans. R. Soc. Trop. Med. Hyg. 1978, 72, 103–104.
56. Fagbami, A.H. Zika Virus Infections in Nigeria: Virological and Seroepidemiological Investigations in Oyo State. J. Hyg. 1979, 83, 213–219.
57. Olaleye, O.D.; Oladosu, L.A.; Omilabu, S.A.; Baba, S.S.; Fagbami, A.H. Complement Fixing Antibodies against Arboviruses in Horses at Lagos, Nigeria. Rev. Elev. Med. Vet. Pays Trop. 1989, 42, 321–325.
58. Sule, W.F.; Oluwayelu, D.O.; Adedokun, R.A.M.; Rufai, N.; McCracken, F.; Mansfield, K.L.; Johnson, N. High Seroprevelance of West Nile Virus Antibodies Observed in Horses from Southwestern Nigeria. Vector Borne Zoonotic Dis. 2015, 15, 218–220.
59. Oderinde, B.S.; Mora-Cárdenas, E.; Carletti, T.; Baba, M.M.; Marcello, A. Prevalence of Locally Undetected Acute Infections of Flaviviruses in North-Eastern Nigeria. Virus Res. 2020, 286,

198060.

60. Campos, M.; Ward, D.; Morales, R.F.; Gomes, A.R.; Silva, K.; Sepúlveda, N.; Gomez, L.F.; Clark, T.G.; Campino, S. Surveillance of Aedes aegypti Populations in the City of Praia, Cape Verde: Zika Virus Infection, Insecticide Resistance and Genetic Diversity. Parasites Vectors 2020, 13, 481.
61. Diarra, I.; Nurtop, E.; Sangaré, A.K.; Sagara, I.; Pastorino, B.; Sacko, S.; Zeguimé, A.; Coulibaly, D.; Fofana, B.; Gallian, P.; et al. Zika Virus Circulation in Mali. Emerg. Infect. Dis. 2020, 26, 945–952.
62. Buechler, C.R.; Bailey, A.L.; Weiler, A.M.; Barry, G.L.; Breitbach, M.E.; Stewart, L.M.; Jasinska, A.J.; Freimer, N.B.; Apetrei, C.; Phillips-Conroy, J.E.; et al. Seroprevalence of Zika Virus in Wild African Green Monkeys and Baboons. mSphere 2017, 2, e00393-16.
63. Salaun, J.J.; Germain, M.; Robert, V.; Robin, Y.; Monath, T.P.; Camicas, J.L.; Digoutte, J.P. Yellow Fever in Senegal from 1976 to 1980 (Author's Transl). Med. Trop. 1981, 41, 45–51.
64. Yaro, S.; Zango, A.; Rouamba, J.; Diabaté, A.; Dabiré, R.; Kambiré, C.; Tiendrebeogo, S.M.R.; Yonli, T.; Ouango, J.G.; Diagbouga, S.P. Situation Épidémiologique de La Fièvre Jaune Au Burkina Faso de 2003 à 2008. Bull. Soc. Pathol. Exot. 2010, 103, 44–47.
65. Baudon, D.; Robert, V.; Roux, J.; Lhuillier, M.; Saluzzo, J.F.; Sarthou, J.L.; Cornet, M.; Stanghellini, A.; Gazin, P.; Molez, J.F. The 1983 Yellow Fever Epidemic in Burkina Faso. Bull. World Health Organ. 1986, 64, 873–882.
66. Barennes, H.; Baldet, T.; Cassel, A.-M.; Kabiré, C.; Kambou, C. An Epidemic Risk of Yellow Fever in Burkina Faso despite a Rapid Immunisation Riposte: Role of a Multidisciplinary Investigation Team. Sante 2002, 12, 323–329.
67. Cordellier, R. The Epidemiology of Yellow Fever in Western Africa. Bull. World Health Organ. 1991, 69, 73–84.
68. Agadzi, V.K.; Boatin, B.A.; Appawu, M.A.; Mingle, J.A.; Addy, P.A. Yellow Fever in Ghana, 1977–1980. Bull. World Health Organ. 1984, 62, 577–583.
69. WHO. Yellow Fever in Ghana (Emergencies Preparedness, Response); WHO: Geneva, Switzerland, 2012.
70. Cornet, M.; Robin, Y.; Chateau, R.; Heme, G.; Adam, C.; Valade, M.; Gonidec, G.; Jan, C.; Renaudet, J.; Dieng, P.L.; et al. Isolements d'arbovirus Au Sénégal Oriental à Partir de Moustiques (1972–1977) et Notes Sur l'épidémiologie Des Virus Transmis Par Les Aedes, En Particulier Du Virus Amaril. Cah. ORSTOM. Sér. Entomol. Méd. Parasitol. 1979, 17, 149–163.
71. Nikolay, B.; Diallo, M.; Boye, C.S.B.; Sall, A.A. Usutu Virus in Africa. Vector Borne Zoonotic Dis. 2011, 11, 1417–1423.

72. Kemp, G.; Humburg, J.; Alhaji, I. Isolation and Identification of African Horse-Sickness Virus in Nigeria. Vet. Rec. 1971, 89, 127–128.
73. Wolfe, M.; Calisher, C.; Mcguire, K. Spondweni Virus Infection in a Foreign Resident of Upper Volta. Lancet 1982, 320, 1306–1308.
74. Robin, Y.; Cornet, M.; Le Gonidec, G.; Chateau, R.; Heme, G. [Kedougou Virus (Ar D14701): A New Arbovirus (“Flavivirus”) Isolated in Senegal (Author’s Transl)]. Ann. Microbiol. 1978, 129, 239–244.
75. Woodruff, A.W.; Bowen, E.T.; Platt, G.S. Viral Infections in Travellers from Tropical Africa. BMJ 1978, 1, 956–958.
76. Boorman, J.P.T.; Draper, C.C. Isolations of Arboviruses in the Lagos Area of Nigeria, and a Survey of Antibodies to Them in Man and Animals. Trans. R. Soc. Trop. Med. Hyg. 1968, 62, 269–277.
77. Moore, D.L.; Reddy, S.; Akinkugbe, F.M.; Lee, V.H.; David-West, T.S.; Causey, O.R.; Carey, D.E. An Epidemic of Chikungunya Fever at Ibadan, Nigeria, 1969. Ann. Trop. Med. Parasitol. 1974, 68, 59–68.
78. Tomori, O.; Fagbami, A.; Fabiyi, A. The 1974 Epidemic of Chikungunya Fever in Children in Ibadan. Trop. Geogr. Med. 1975, 27, 413–417.
79. Sow, A.; Faye, O.; Diallo, M.; Diallo, D.; Chen, R.; Faye, O.; Diagne, C.T.; Guerbois, M.; Weidmann, M.; Ndiaye, Y.; et al. Chikungunya Outbreak in Kedougou, Southeastern Senegal in 2009–2010. Open Forum Infect. Dis. 2018, 5, ofx259.
80. Bacci, A.; Marchi, S.; Massougbodji, A.; Perrin, R.X.; Chippaux, J.-P.; Sambri, V.; Landini, M.P.; Fievet, N.; Varani, S.; Rossini, G. High Seroprevalence of Chikungunya Virus Antibodies Among Pregnant Women Living in an Urban Area in Benin, West Africa. Am. J. Trop. Med. Hyg. 2015, 92, 1133–1136.
81. Ansumana, R.; Jacobsen, K.H.; Gbakima, A.A.; Hodges, M.H.; Lamin, J.M.; Leski, T.A.; Malanoski, A.P.; Lin, B.; Bockarie, M.J.; Stenger, D.A. Presumptive Self-Diagnosis of Malaria and Other Febrile Illnesses in Sierra Leone. Pan Afr. Med. J. 2013, 15.
82. Zhang, Y.; Ye, F.; Xia, L.X.; Zhu, L.W.; Kamara, I.L.; Huang, K.Q.; Zhang, Y.; Liu, J.; Kargbo, B.; Wang, J.; et al. Next-Generation Sequencing Study of Pathogens in Serum from Patients with Febrile Jaundice in Sierra Leone. Biomed. Environ. Sci. 2019, 32, 363–370.
83. Odend’hal, S. Semliki Forest Virus. In The Geographical Distribution of Animal Viral Diseases; Elsevier: Amsterdam, The Netherlands, 1983; pp. 373–375.
84. Hubálek, Z.; Rudolf, I.; Nowotny, N. Arboviruses Pathogenic for Domestic and Wild Animals. Adv. Virus. Res. 2014, 89, 201–275.

85. Gonzalez, J.P.; Le Guenno, B.; Some, M.J.R.; Akakpo, J.A. Serological Evidence in Sheep Suggesting Phlebovirus Circulation in a Rift Valley Fever Enzootic Area in Burkina Faso. Trans. R. Soc. Trop. Med. Hyg. 1992, 86, 680–682.

86. Boussini, H.; Lamien, C.E.; Nacoulma, O.G.; Kabore, A.; Poda, G.; Viljoen, G.J. Prevalence of Rift Valley Fever in Domestic Ruminants in the Central and Northern Regions of Burkina Faso. Rev. Sci. Tech. OIE 2014, 33, 893–901.

87. Akakpo, A.J.; Some, M.J.; Bornarel, P.; Jouan, A.; Gonzalez, J.P. Epidemiology of Rift Valley Fever in Western Africa. I. Serologic Survey in Domestic Ruminants of Burkina Faso. Bull. Soc. Pathol. Exot. Fil. 1989, 82, 321–331.

88. Boiro, I.; Konstaninov, O.K.; Numerov, A.D. Isolation of Rift Valley Fever Virus from Bats in the Republic of Guinea. Bull. Soc. Pathol. Exot. Fil. 1987, 80, 62–67.

89. Tong, C.; Javelle, E.; Grard, G.; Dia, A.; Lacrosse, C.; Fourié, T.; Gravier, P.; Watier-Grillot, S.; Lancelot, R.; Letourneur, F.; et al. Tracking Rift Valley Fever: From Mali to Europe and Other Countries, 2016. Eurosurveillance 2019, 24, 1800213.

90. Haneche, F.; Leparc-Goffart, I.; Simon, F.; Hentzien, M.; Martinez-Pourcher, V.; Caumes, E.; Maquart, M. Rift Valley Fever in Kidney Transplant Recipient Returning from Mali with Viral RNA Detected in Semen up to Four Months from Symptom Onset, France, Autumn 2015. Eurosurveillance 2016, 21, 30222.

91. Subudhi, S.; Dakouo, M.; Sloan, A.; Stein, D.R.; Grolla, A.; Jones, S.; Dibernardo, A.; Rosenke, K.; Sas, M.; Traore, A.; et al. Seroprevalence of Rift Valley Fever Virus Antibodies in Cattle in Mali, 2005–2014. Am. J. Trop. Med. Hyg. 2018, 98, 872–874.

92. Lagare, A.; Fall, G.; Ibrahim, A.; Ousmane, S.; Sadio, B.; Abdoulaye, M.; Alhassane, A.; Mahaman, A.E.; Issaka, B.; Sidikou, F.; et al. First Occurrence of Rift Valley Fever Outbreak in Niger, 2016. Vet. Med. Sci. 2019, 5, 70–78.

93. Ferguson, W. Identification of Rift Valley Fever in Nigeria. Bull. Epizoot Dis. Afr. 1959, 7, 317–318.

94. Musa, A.A.; Yila, S.A.; Allam, L.; Sackey, A.; Alhaji, N.B.; Garba, B.S.; Mambula-Machunga, S.; Nafarnda, W.D.; Owolodun, O.A.; Dzikwi, A.A. Serological Evidence of Rift Valley Fever Infection and Risk Factors among One-Humped Camels (Camelus Dromedarius) in Northern Nigeria. bioRxiv 2020.

95. Diallo, M.; Lochouarn, L.; Sall, A.A.; Mondo, M.; Ba, K.; Girault, L.; Mathiot, C. First Isolation of the Rift Valley Fever Virus from Culex Poicilipes (Diptera: Culicidae) in Nature. Am. J. Trop. Med. Hyg. 2000, 62, 702–704.

96. Tomor, O.; Monath, T.P.; Lee, V.; Fagbami, A.; Fabiyi, A. Bwamba Virus Infection: A Sero-Survey of Veterbrates in Five Ecological Zones in Nigeria. Trans. R. Soc. Trop. Med. Hyg. 1974, 68, 461–465.

97. Eiden, M.; Vina-Rodriguez, A.; El Mamy, B.O.; Isselmou, K.; Ziegler, U.; Höper, D.; Jäckel, S.; Balkema-Buschmann, A.; Unger, H.; Doumbia, B.; et al. Ngari Virus in Goats during Rift Valley Fever Outbreak, Mauritania, 2010. Emerg. Infect. Dis. 2014, 20, 2174–2176.
98. Digoutte, J.P.; Gagnard, V.J.; Bres, P.; Pajot, F.X. Nyando Virus Infection in Man. Bull. Soc. Pathol. Exot. Filiales 1972, 65, 751–758.
99. Oluwayelu, D.O.; Aiki-Raji, C.O.; Umeh, E.C.; Mustapha, S.O.; Adebiyi, A.I. Serological Investigation of Akabane Virus Infection in Cattle and Sheep in Nigeria. Adv. Virol. 2016, 2016, 1–4.
100. Baba, S.S.; Olaleye, O.D.; Ayanbadejo, O.A. Haemagglutination-Inhibiting Antibodies against African Horse Sickness Virus in Domestic Animals in Nigeria. Vet. Res. 1993, 24, 483–487.
101. Oladosu, L.A.; Olayeye, O.D.; Baba, S.S.; Omilabu, S.A. Isolation and Identification of African Horse Sickness Virus during an Outbreak in Lagos, Nigeria. Rev. Sci. Tech. OIE 1993, 12, 873–877.
102. Adeyefa, C.A.; Hamblin, C. Continuing Prevalence of African Horse Sickness in Nigeria. Rev. Elev. Med. Vet. Pays Trop. 1995, 48, 31–33.
103. Amoa-Bosompem, M.; Kobayashi, D.; Murota, K.; Faizah, A.N.; Itokawa, K.; Fujita, R.; Osei, J.H.N.; Agbosu, E.; Pratt, D.; Kimura, S.; et al. Entomological Assessment of the Status and Risk of Mosquito-Borne Arboviral Transmission in Ghana. Viruses 2020, 12, 147.
104. Fauver, J.R.; Grubaugh, N.D.; Krajacich, B.J.; Weger-Lucarelli, J.; Lakin, S.M.; Fakoli, L.S.; Bolay, F.K.; Diclaro, J.W.; Dabiré, K.R.; Foy, B.D.; et al. West African Anopheles Gambiae Mosquitoes Harbor a Taxonomically Diverse Virome Including New Insect-Specific Flaviviruses, Mononegaviruses, and Totiviruses. Virology 2016, 498, 288–299.
105. Junglen, S.; Korries, M.; Grasse, W.; Wieseler, J.; Kopp, A.; Hermanns, K.; León-Juárez, M.; Drosten, C.; Kümmerer, B.M. Host Range Restriction of Insect-Specific Flaviviruses Occurs at Several Levels of the Viral Life Cycle. mSphere 2017, 2, e00375-16.
106. Junglen, S.; Kopp, A.; Kurth, A.; Pauli, G.; Ellerbrok, H.; Leendertz, F.H. A New Flavivirus and a New Vector: Characterization of a Novel Flavivirus Isolated from Uranotaenia Mosquitoes from a Tropical Rain Forest. J. Virol. 2009, 83, 4462–4468.
107. Hermanns, K.; Zirkel, F.; Kopp, A.; Marklewitz, M.; Rwego, I.B.; Estrada, A.; Gillespie, T.R.; Drosten, C.; Junglen, S. Discovery of a Novel Alphavirus Related to Eilat Virus. J. Gen. Virol. 2017, 98, 43–49.
108. Marklewitz, M.; Zirkel, F.; Kurth, A.; Drosten, C.; Junglen, S. Evolutionary and Phenotypic Analysis of Live Virus Isolates Suggests Arthropod Origin of a Pathogenic RNA Virus Family. Proc. Natl. Acad. Sci. USA 2015, 112, 7536–7541.

109. Marklewitz, M.; Zirkel, F.; Rwego, I.B.; Heidemann, H.; Trippner, P.; Kurth, A.; Kallies, R.; Briese, T.; Lipkin, W.I.; Drosten, C.; et al. Discovery of a Unique Novel Clade of Mosquito-Associated Bunyaviruses. J. Virol. 2013, 87, 12850–12865.

110. Quan, P.-L.; Junglen, S.; Tashmukhamedova, A.; Conlan, S.; Hutchison, S.K.; Kurth, A.; Ellerbrok, H.; Egholm, M.; Briese, T.; Leendertz, F.H.; et al. Moussa Virus: A New Member of the Rhabdoviridae Family Isolated from Culex Decens Mosquitoes in Côte d'Ivoire. Virus Res. 2010, 147, 17–24.

111. Diagne, M.M.; Gaye, A.; Ndione, M.H.D.; Faye, M.; Fall, G.; Dieng, I.; Widen, S.G.; Wood, T.G.; Popov, V.; Guzman, H.; et al. Dianke Virus: A New Mesonivirus Species Isolated from Mosquitoes in Eastern Senegal. Virus Res. 2020, 275, 197802.

112. Zirkel, F.; Kurth, A.; Quan, P.-L.; Briese, T.; Ellerbrok, H.; Pauli, G.; Leendertz, F.H.; Lipkin, W.I.; Ziebuhr, J.; Drosten, C.; et al. An Insect Nidovirus Emerging from a Primary Tropical Rainforest. MBio 2011, 2, e00077-11.

113. Zirkel, F.; Roth, H.; Kurth, A.; Drosten, C.; Ziebuhr, J.; Junglen, S. Identification and Characterization of Genetically Divergent Members of the Newly Established Family Mesoniviridae. J. Virol. 2013, 87, 6346–6358.

114. Hermanns, K.; Zirkel, F.; Kurth, A.; Drosten, C.; Junglen, S. Cimodo Virus Belongs to a Novel Lineage of Reoviruses Isolated from African Mosquitoes. J. Gen. Virol. 2014, 95, 905–909.

115. Marklewitz, M.; Handrick, S.; Grasse, W.; Kurth, A.; Lukashev, A.; Drosten, C.; Ellerbrok, H.; Leendertz, F.H.; Pauli, G.; Junglen, S. Gouleako Virus Isolated from West African Mosquitoes Constitutes a Proposed Novel Genus in the Family Bunyaviridae. J. Virol. 2011, 85, 9227–9234.

116. Vasilakis, N.; Forrester, N.L.; Palacios, G.; Nasar, F.; Savji, N.; Rossi, S.L.; Guzman, H.; Wood, T.G.; Popov, V.; Gorchakov, R.; et al. Negevirus: A Proposed New Taxon of Insect-Specific Viruses with Wide Geographic Distribution. J. Virol. 2013, 87, 2475–2488.

117. Parry, R.; Naccache, F.; Ndiaye, E.H.; Fall, G.; Castelli, I.; Lühken, R.; Medlock, J.; Cull, B.; Hesson, J.C.; Montarsi, F.; et al. Identification and RNAi Profile of a Novel Iflavirus Infecting Senegalese Aedes vexans arabiensis Mosquitoes. Viruses 2020, 12, 440.

118. Schuster, S.; Zirkel, F.; Kurth, A.; van Cleef, K.W.R.; Drosten, C.; van Rij, R.P.; Junglen, S. A Unique Nodavirus with Novel Features: Mosinovirus Expresses Two Subgenomic RNAs, a Capsid Gene of Unknown Origin, and a Suppressor of the Antiviral RNA Interference Pathway. J. Virol. 2014, 88, 13447–13459.

119. Kallies, R.; Kopp, A.; Zirkel, F.; Estrada, A.; Gillespie, T.; Drosten, C.; Junglen, S. Genetic Characterization of Goutanap Virus, a Novel Virus Related to Negeviruses, Cileviruses and Higreviruses. Viruses 2014, 6, 4346–4357.

Retrieved from https://encyclopedia.pub/entry/history/show/25576