

Virus Name: Bunyamwera		Abbreviation: BUNV
Status Arbovirus	Select Agent No	SALS Level 2
SALS Basis Results of SALS surveys and information from the Catalogue.		
Other Information		
Antigenic Group Bunyamwera		

SECTION I - Full Virus Name and Prototype Number

Prototype Strain Number / Designation Original	Accession Number	Original Date Submitted 2/3/1985
Family Bunyaviridae	Genus Bunyavirus	
Information From J.P. Woodall	Address YARU, Yale Univ. Sch. Med., New Haven, Connecticut 06510	
Information Footnote Reviewed by editor		

Section II - Original Source

Isolated By (name) Smithburn, et al. (1)	Isolated at Institute Entebbe	
Host Genus Aedes, pool of 14 spp.	Species	Host Age/Stage Adult
Sex Female		
<u>Isolated From</u>	<u>Isolation Details</u>	
Signs and Symptoms of Illness	Arthropod	
Time Held Alive before Inoculation		
Collection Method On human bait and vegetation	Collection Date 9/1/1943	
Place Collected (Minimum of City, State, Country) Bunyamwera III, Bwamba, Uganda		
Latitude 0° 51' N	Longitude 29° 59' E	
Macrohabitat Uninhabited tropical rain forest	Microhabitat Daylight, ground level, outdoors	Method of Storage until Inoculated Alive in Barraud cages
Footnotes		

Section III - Method of Isolation

Inoculation Date
9/20/1943

Animal (Details will be in Section 6)
Monkey

Route Inoculated
Subcutaneous X

Reisolation
Not tried

Other Reasons

Rhesus monkey had been kept in screened room 13 weeks, died after mosquito inoc.

Homologous Antibody Formation by Source Animal

Test(s) Used

Footnotes

Section IV - Virus Properties

Physicochemical

Pieces (number of genome segments)	Infectivity	Sedimentation Coefficients (s) (S)
Percentage wt, of Virion Protein	Lipid	Carbohydrate
Virion Polypeptides: Number	Details	
Non-virion Polypeptides: Number	Details	
Virion Density	Sedimentation Coefficients(s) (S)	
Nucleocapsid Density	Sedimentation Coefficients(s) (S)	

Stability of Infectivity (effects)

pH (infective range)

Lipid Solvent (ether - % used to test) 1:1	After Treatment Titer 0 dex	Control Titer 3.0-5.0 dex (5)
Lipid Solvent (chloroform)	After Treatment Titer	Control Titer
Lipid Solvent (deoxycholate) 1:2000	After Treatment Titer <1.0 dex	Control Titer 3.5-5.0 dex (5)

Other (formalin, radiation)

Inactivated by 0.9% sodium tauroglycocholate (1).

Virion Morphology

Shape Spherical	Dimensions 98 nm	
Mean nm	Range nm	
Measurement Method Electron microscopy (28)	Surface Projections/Envelope	Nucleocapsid Dimensions, Symmetry

Morphogenesis

Site of Constituent Formation in Cell	Site of Virion Assembly	Site of Virion Accumulation
Inclusion Bodies	Other	

Hemagglutination

Hemagglutination Yes	Antigen Source SMB ext. by sucrose-acetone (7); fluorocarbon; serum ext. by acetone-ether (6)	Erythrocytes (species used) Goose
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pH Range 5.7-6.5	pH Optimum 5.9-6.2
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Temperature Range 4-37dC	Temperature Optimum 37dC
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Remarks

Serologic Methods Recommended
NT, CF, HI

Footnotes

Related to other members of Bunyamwera group [2] , [8] , [9] , [16]

Antibodies or Antigens	Bunyamwera Antigen					Bunyamwera Antiserum				
	HI		CF		NT ic	HI		CF		NT ic
	Ht/Ho	Ratio	Ht/Ho	Ratio		Ht/Ho	Ratio	Ht/Ho	Ratio	
Cache Valley	10/320	1/32	64/128	1/2	2.3	40/1280	1/32	128/128	1/1	3.0
Kairi	40/NR		16/256	1/16				4/128	1/32	1.9
Wyeomyia	0/NR		32/256	1/8	3.3			8/128	1/16	
Guaroa	0/640		8/128	1/16		0/640		8/128	1/16	-0.3
Ilesha	0/1280		16/64	1/4		40/1280	1/32	64/128	1/2	
Germiston	80/2560	1/32	0/64			80/1280	1/16	8/128	1/16	
Batai			16/32	1/2	+	10/320	1/32	64/64	1/1	+/-
Calovo	0/40		32/256	1/8		20/80	1/4	64/64	1/1	
Sororoca	0/NR		16/512	1/32				0/32		
Tensaw	20/320	1/16	8/128	1/16	0.5	10/320	1/32	16/128	1/8	0.4

NT: LNI values in dex, ip test; NR = not recorded

Sera used in all tests were mouse, 4-6 inocs. ip, except for the Guaroa NT, when guinea pig serum, 2 inoc. (1 ip, 1 ic), was used.

Ukauwa virus now considered to be a strain of Bunyamwera [17] .

Immunity to this virus did not prevent, although it may have modified, infection in man with another virus of the same group [9] .

Cross-neutralization studies with 23 viruses of BUN serogroup have shown that BUN virus is distinct; it was placed in the BUN complex, one of five complexes comprising the BUN serogroup at that time [35] .

Section VI - Biologic Characteristics

Virus Source (all VERTEBRATE isolates)
Blood (M)

Lab Methods of Virus Recovery (ALL ISOLATIONS)
Newborn mice and primates

Cell system (a)	Virus passage history (b)	Evidence of Infection							Growth Without CPE +/- (g)
		CPE			PLAQUES				
		Day (c)	Extent (d)	Titer TCD50/ml (e)	Day (c)	Size (f)	Titer PFU/ml (e)		
Chick embryo(PC)	Prototype, Ukauwa	2-5	CPE	6.7-8.0* (26)					
Vero (CL)	P-44				5	3 mm	8.0* (14)		
LLC-MK2 (CL)					4	3 mm	8.0 (14)		

Produces CPE in human amnion (PC) and L 929 (CL) (2) HeLa (CL) cells (27) and BHK-21 (CL) (34).

* Expressed in dex

Vertebrate (species and organ) and arthropod	No. isolations/No. tested	No. with antibody/No. tested Test used	Country and region
<p>Man Isolations: 1 in S. Africa (2), 1 Nigeria (2), 2 Uganda (20), 1 Kenya-coastal plain (29), 1 Senegal (36). Antibodies: By NT, 1 Zanzibar (1), to 9% S. Africa , to 82% Congo, to 30% Uganda (1,11,19,20),to 31% Mozambique ; 7/97 Nigeria , 30/91 Tunisia (17), 4/36 Tanzania (11),</p>			
Chimpanzee		to 31% NT	Congo
Monkeys		1/42 NT	Uganda (1)
Domestic animals		61/406 NT	S. Africa
Rodents		1/245 HI	S. Africa
Birds		1/113 NT	S. Africa (23)
<p>Mosquitoes Isolations: Aedes spp., 1 Uganda (1), 2 Cameroun (30); Ae circumluteolus, 5 S. Africa (2); Ae pempaensis, 2 S. Africa (25), 1 Kenya (29); Mansonia africana, 1 Nigeria (31); Ma (Man) uniformis, 1 Kenya (29); Culex spp., 1 Central African Republic (32).</p>			

Experimental host and age	Passage history and strain	Inoculation Route-Dose	Evidence of infection	AST (days)	Titer log ₁₀ /ml
Mice (nb)	SMB 14	ic 0.01	Death	2	11.0
Mice (nb)		ip in,sc	Death		
Mice (nb)		sc			
Mice (wn)		ic 0.03	Paralysis, death	3-17	7.0
Mice (wn)		ip	Paralysis, death	5-12	4.0
albino rats		ic	Antibody		
hamsters		ic or sc	Fatal encephalitis		
rabbits		ic or sc	Antibody		
guinea pigs		ic or ip	Antibody		
rhesus monkeys		sc	Viremia, antibody; 1/3 died (1)		
lambs			Antibody (21)		
man (ad)		iv 500	Severe encephalitis (only 1/3 infected) (18)		
Cercopithecus		ic	Viremia, antibody (2)		
wild rodents(ad)	sc or ip	Viremia, antibody (14,19)			

Most strains have not killed adult mice until after 2 or 3 suckling passages or one rhesus monkey passage. After 100 ic passages in mice, the prototype lost most ip virulence (1).

Arthropod species & virus source(a)	Method of Infection log ₁₀ /ml (b)		Incubation period (c)		Transmission by bite (d)		Assay of arthropod, log ₁₀ /ml (e)		
	Feeding	Injected	Days	°C	Host	Ratio	Whole	Organ	System

Passed by inoculation in *Ae aegypti*, *Cx quinquefasciatus* and *An quadrimaculatus* (3). Transmitted by *Ae circumluteolus* (1). Multiplies in *Ae canadensis* and *Ae triseriatus* after intrathoracic inoculation, transmission to mice by virus-fed *Ae aegypti* (33).

Section X - Histopathology

Character of lesions (specify host)

In mice: viral encephalitis (1) with eosinophilic intranuclear inclusions and degeneration of collagen layers of skin (24); lesions in skeletal muscles, lymphoid tissue and liver (2). Produces intranuclear RNP inclusions in tumor cells .

Inclusion Bodies

Intranuclear

Lower Vertebrates

Organs/Tissues Affected

Brain (LV), lungs (LV), liver (LV), spleen (LV), kidney (LV), skeletal muscles (LV)

Category of tropism

Neurotropic

Section XI - Human Disease

In Nature
Reported

Residual

Death

Subclinical

Overt Disease
Reported

Clinical Manifestations

manif Stiff neck (R), arthralgia (R), CNS signs (including encephalitis)(R), CNS pleocytosis (R)

Number of Cases

8 (5 of these were probable laboratory infections)

Category (i.e. febrile illness, etc.)

Febrile illness with rash

Section XII - Geographic Distribution

Known (Virus detected)

South Africa, Uganda, Nigeria, Cameroun, Central African Republic, Kenya, Senegal (36).

Suspected (Antibody only detected)

Africa*: Congo, Senegal, Mozambique, Egypt, Tunisia, Tanzania(11), Angola (24).

Section XIII - References

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Remarks

Prototype strain is in American Type Culture Collection. * It is quite possible that positive sero reactors may be due to infection with other Bunyamwera group viruses (editor).