

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

SECTION I - Full Virus Name and Prototype Number

Prototype Strain Number / Designation A 7956	Accession Number	Original Date Submitted 7/20/1984
Family Bunyaviridae	Genus Bunyavirus	
Information From Dr. W.C. Reeves	Address School of Public Health, University of California, Berkeley	
Information Footnote Revised		

Section II - Original Source

Isolated By (name) Dr. W.C. Reeves	Isolated at Institute School of Public Health, Berkeley	
Host Genus Sylvilagus auduboni	Species	Host Age/Stage Adult
Sex Male		
<u>Isolated From</u>	<u>Isolation Details</u>	
Serum/Plasma		
Organs/Tissues	plasma and cells	
Signs and Symptoms of Illness None	Arthropod	
Time Held Alive before Inoculation		
Collection Method Animal shot and bled by syringe and needle	Collection Date 4/17/1961	
Place Collected (Minimum of City, State, Country) Lerdo Road and Main Drain Canal, Kern Co., CA		
Latitude 35° 30' N	Longitude 119° 0' W	
Macrohabitat Semi-desert, rural, near drainage canal for irrigation overflow	Microhabitat Outdoors at ground level	Method of Storage until Inoculated Sealed glass tube at -65dF
Footnotes		

Section III - Method of Isolation

Inoculation Date
3/21/1962

Animal (Details will be in Section 6)
nb mice

Route Inoculated Intracerebral	Reisolation Yes
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Other Reasons
No similar virus in laboratory

Homologous Antibody Formation by Source Animal
Not tested

Test(s) Used

Footnotes

Section IV - Virus Properties

Physicochemical
RNA, Single Strand

Pieces (number of genome segments) 3	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)	After Treatment Titer	Control Titer
Lipid Solvent (chloroform)	After Treatment Titer	Control Titer
Lipid Solvent (deoxycholate) 1:1000	After Treatment Titer <1.0 dex	Control Titer 3.5 dex
Other (formalin, radiation)		

Virion Morphology

Shape	Dimensions	
Mean nm	Range nm	
Measurement Method	Surface Projections/Envelope	Nucleocapsid Dimensions, Symmetry

Morphogenesis

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

Hemagglutination Yes	Antigen Source SMB ext. by sucrose-acetone	Erythrocytes (species used) Goose
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pH Range 6.0-6.4	pH Optimum 6.2	
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Temperature Range 4dC, 22dC, 37dC	Temperature Optimum 37dC	
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Remarks
Low titers (160-320) increased to 640-1280 by sonication

Serologic Methods Recommended
HI, CF and NT

Footnotes
Low titers (160-320) increased to 640-1280 by sonication

Section V - Antigenic Relationship and Lack of Relationship to Other Viruses

	Antigen of Registered Virus				
	HI [1]		CF [2]		NT [3]
Immune Sera	Ht/Ho	Ratio	Ht/Ho	Ratio	Dex Prot.
Buttonwillow	320	1	128	1	3.5
California	0/320	0	0/32	0	0.4
Tahyna					0.6
Trivittatus			0/128	0	0
BUT [4]	5120	1	256(512)	1	
Ingwavuma [4]	160/5120	1/32	16/512	1/32	
Manzanilla [4]			8/512	1/64	
Oropouche [4]			16/256	1/16	

Immune Serum of Registered Virus

Antigen	HI [1]		CF [2]		NT [3]
	Ht/Ho	Ratio	Ht/Ho	Ratio	Dex Prot.
Buttonwillow	320	1	128	1	3.5
California	40/320	1/8	0/128	0	2.0
Tahyna	40/ND				0.8
Trivittatus			0/128	0	1.2
BUT [4]	5120	1	256(512)	1	
Ingwavuma [4]	640/5120	1/8	128/256	1/2	
Manzanilla [4]	160/ND		16/512	1/32	
Oropouche [4]			4/512	1/128	

Neutralization test in hamster kidney cell culture: No protection by the following immune sera: WEE, EEE, SLE, Powassan, Modoc, Rio Bravo, California, Cache Valley. Homologous immune serum protected against two dex virus.

Screen CF tests [3], Buttonwillow antigen and serum against following antigens and sera: Group A, WEE, EEE, Highland J, Uruma, Sindbis, Semliki, chikungunya; Group B, SLE, MVE, JBE, Powassan, Modoc, Ilheus, West Nile, Langat, dengues 1, 2, 3, Ntaya, Uganda S, yellow fever, Zika, Bussuquara, Kunjin; Group C: Marituba, Itaqui; California Group: Tahyna, Melao, Guaroa, trivittatus; Bunyamwera Group, Bunyamwera, Germiston, Wyeomia, Kairi, Ilesha, Chittoor, Cache Valley; Phlebotomus Fever Group, Naples, Sicilian; Bwamba, bluetongue, Junin, Anopheles A, Turlock, Colorado tick fever, Anopheles B, LCM, Theiler's virus, EMC. No crossing with above viruses was observed. Titer of Buttonwillow IMS 64, antigen 32.

Immune rabbit serum—Dr. William McD. Hammon, University of Pittsburgh, found no inhibition of California or Tahyna antigens by Buttonwillow immune mouse serum [1].

SIRACA has antigenically classified Buttonwillow virus as a distinct virus type and placed it in the Manzanilla complex, one of a number of complexes comprising the Simbu serogroup [12].

Section VI - Biologic Characteristics

Virus Source (all VERTEBRATE isolates)
Plasma/cells (LV)

Lab Methods of Virus Recovery (ALL ISOLATIONS)
Newborn mice, primary hamster kidney and Vero cell
cultures

Cell system (a)	Virus passage history (b)	Evidence of Infection						
		CPE			PLAQUES			Growth Without CPE +/- (g)
		Day (c)	Extent (d)	Titer TCD50/ml (e)	Day (c)	Size (f)	Titer PFU/ml (e)	
Hamster kidney(PC)	SM 5	3	4+	6.0*				
Chick embryo(PC)			No CPE			No plaques		
Duck embryo(PC)			No CPE			Plaques with DEAE dextran, protamine sulfate added		
Vero (CL)	SM 3	3-5	CPE	7.5->8.0	3-5		7.5->8.0*	
MA - 111 (CL)		3-5	CPE	7.5->8.0	3-5		7.5->8.0	
PK-15 (CL)		3-5	CPE	7.5->8.0	3-5		7.5->8.0	
Sp1K (CL)		3-5	CPE	7.5->8.0	3-5		7.5->8.0	
BHK-21 (CL)		3-5	CPE	>8.0				
Ae dorsalis (CL)	SM 5		No CPE					+ (10)
Cx tarsalis (CL)			No CPE					+ (11)

* Expressed in dex

Vertebrate (species and organ) and arthropod	No. isolations/No. tested	No. with antibody/No. tested Test used	Country and region
Man (clinical cases)	8/10		Equator Region, Zaire; 1976
Man (laboratory infections)	1/1	1/1 IFA	Porton, Great Britain; 1976
Man (clinical cases)	3/17		Equatorial Province, Sudan; 1976
Man (clinical cases)	4/9		Equatorial Province, Sudan; 1979 (8)
Other human - human cases		38/121 IFA	Equator Region, Zaire; 1976
Other human - human cases		88/461 IFA	Equatorial Province, Sudan; 1976
Other human - human cases		>15/229 IFA	Equatorial Province, Sudan; 1979 (8)
Vervet monkeys		2 IFA	Kenya (13)
Baboons		3 IFA	
Guinea pig		1 IFA	Bosoli, Zaire (14)
Man		6%/>400 IFA	Liberia (15)
Man		7/138 IFA	Tandala, Zaire (16)
Man		17/499 IFA	Cent.Afr. Republic(11)
Guinea pigs		36/138 IFA	Tandala, Zaire (16)

Section VIII - Susceptibility to Experimental Infection (include viremia)

Experimental host and age	Passage history and strain	Inoculation Route-Dose	Evidence of infection	AST (days)	Titer log ₁₀ /ml
Mice (nb)	SM 5	ic 0.01	Death	2.5	9.0
Mice (nb)		ip			

Mice (nb)		sc			
Mice (wn)		ic 0.3	Death	3.0	
Mice (wn)		sc,ip 0.1	Antibody		
embry. chick					
chick eggs (10 day)	SM 2	amn.s. 0.1	2/8 sluggish; virus recovered by cell culture passage	3.0	
sheep, calves (3-8 mo)	SM 3	sc 0.5	No antibody		
laboratory rabbit(9-10 wk)	SM 12	sc 0.25	Low level viremia, 1-4 days		
Sylvilagus auduboni (ad)	SM 3	sc 0.1	Viremia 4/4, antibody 4/4		3.7-4.9
Lepus californicus (ad)		sc 0.1	Viremia 4/4, antibody 4/4		1.7-5.6
Ammospermophilus nelsoni (ad)		sc 0.1	Viremia 4/6, antibody 3/5		2.0-4.4
Citellus beecheyi (ad)		sc 0.1	Viremia 2/3, antibody 2/3		2.7-4.1
Dipodomys nitratoides (ad)		sc 0.1	Viremia 0/6, antibody 1/6		
Peromyscus maniculatus (ad)		sc 0.1	0/17 antibody, viremia not tested		
wild birds * (ad)		sc 0.1	No antibody		

* 14 tricolored blackbirds, 5 house finches, 5 house sparrows, 8 mourning doves, 15 white-crowned sparrows. No HI or neutralizing antibody detected; no viremia in white-crowned sparrows. Others not tested for viremia. In addition, see Reference 7.

Section IX - Experimental Arthropod Infection and Transmission

Arthropod species & virus source(a)	Method of Infection log10/ml (b)		Incubation period (c)		Transmission by bite (d)		Assay of arthropod, log10/ml (e)		
	Feeding	Injected	Days	°C	Host	Ratio	Whole	Organ	System
Culicoides variipenis; viral soaked pledgets, viremic Syl. auduboni.	X				Syl.auduboni				
Aedes nigromaculis; viral soaked pledget.	X								
Anopheles freeborni; viral soaked pledget.									
Aedes melanimon	Did not become infected				Dermacentor parumapertus: Did not become infected				
Culex tarsalis	Did not become infected				Ornithodoros parkeri: Did not become infected				
Culiseta inornata: viral soaked pledget.	Did not become infected								

Section X - Histopathology

Character of lesions (specify host)

Inclusion Bodies

Intranuclear

Organs/Tissues Affected

Category of tropism

Section XI - Human Disease

In Nature	Residual	Death
Subclinical	Overt Disease	
Clinical Manifestations		
Number of Cases	Category (i.e. febrile illness, etc.)	

Section XII - Geographic Distribution

Known (Virus detected) California (5); New Mexico (8); Texas (8); Colorado (13) USA
Suspected (Antibody only detected) Montana; Wisconsin, USA; Canada

Section XIII - References

<ol style="list-style-type: none">1. Hammon, W. McD. Personal communication.2. Work, T.H. Personal communication.3. Eklund, C.M. Personal communication.4. Whitman, L. Personal communication.5. Reeves, W.C., et al. 1970. Am. J. Trop. Med. Hyg. 19:544-551.6. Hardy, J.L., et al. 1970. Am. J. Trop. Med. Hyg. 19:552-563.7. Reeves, W.C. Unpublished data.8. Hayes, R.O. Personal communication. 1973.9. Porterfield, J.S., et al. 1975/76. Intervirology. 6:13-24.10. Cahoon, B.E., et al. 1979. J. Med. Ent. 16:104-111.11. Main, A.M., et al. 1977. J. Med. Ent. 14:107-112.12. Calisher, C.H., et al. 1985. Intervirology. To be submitted.13. Kramer, W. Personal communication. 1985.

Remarks

Six isolates of Buttonwillow virus have been obtained from <i>Culicoides variipennis</i> and <i>culicoides (Selfia) spp.</i> collected in Colorado (13).
