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

Isolated From	Isolation Details
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

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
Inclusion Bodies	Other	

Hemagglutination

Hemaggiutination	Antigen Source	Erythrocytes (species used)
Yes	**SMB ext. by sucrose-acetone**	**Goose**
pH Range **6.0-6.4**	pH Optimum **6.2**	
Temperature Range **4dC, 22dC, 37dC**	Temperature Optimum **37dC**	

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] Ht/Ho	HI [1] Ratio	CF [2] Ht/Ho	CF [2] Ratio	NT [3] 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. Homologus 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	
		Day (c)	Extent (d)	Titer TCD50/ml (e)	Day (c)	Size (f)	Titer PFU/ml (e)	+/- (g)	
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

Section VII - Natural Host Range (Additional text can be added below table)

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, Zire; 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 log10/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
Dipdomys 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)		Transmision 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

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Remarks

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