

Virus Name: Rio Bravo		Abbreviation: RBV
Status Not Arbovirus	Select Agent No	SALS Level 2
SALS Basis Results of SALS surveys and information from the Catalogue.		
Other Information		
Antigenic Group B		

SECTION I - Full Virus Name and Prototype Number

Prototype Strain Number / Designation M64	Accession Number	Original Date Submitted 2/5/1985
Family Togaviridae	Genus Flavivirus	
Information From Harald N. Johnson	Address California State Health Department, Viral and Rickettsial Disease Laboratory	
Information Footnote Reviewed by editor		

Section II - Original Source

Isolated By (name) Harald N. Johnson (7,21)	Isolated at Institute	
Host Genus Tadarida brasiliensis mexicana (bat)	Species	Host Age/Stage Adult
Sex Male		
<u>Isolated From</u>	<u>Isolation Details</u>	
Other Fluids	Submaxillary salivary glands	
Signs and Symptoms of Illness None	Arthropod	
Time Held Alive before Inoculation		
Collection Method Mist net along corridor of school	Collection Date 10/1/1954	
Place Collected (Minimum of City, State, Country) Rio Bravo school, Kern County, California, USA		
Latitude 35° N	Longitude 119° W	
Macrohabitat 300 ft. A.S.L.; flat irrigated farmland, semi-arid, <10 inches rainfall	Microhabitat Colony of bats in tile roof	Method of Storage until Inoculated Sealed glass in dry ice chest
Footnotes		

Section III - Method of Isolation

Inoculation Date
11/1/1954

Animal (Details will be in Section 6)
nb mice

Route Inoculated Intracerebral	Reisolation Yes
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Other Reasons

Homologous Antibody Formation by Source Animal
Not tested

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)
Cell culture grown virus rapidly inactivated below pH 7.0 (17).

Lipid Solvent (ether - % used to test)	After Treatment Titer	Control Titer
Lipid Solvent (chloroform)	After Treatment Titer	Control Titer
Lipid Solvent (deoxycholate)	After Treatment Titer	Control Titer
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

Hemagglutination

Antigen Source

Erythrocytes (species used)

Yes

SMB ext. by acetone ether

Chick

pH Range

pH Optimum

6.0-7.0

6.2

Temperature Range

Temperature Optimum

4dC to 37dC

37dC

Remarks

Serologic Methods Recommended

HI, CF, NT and protection challenge

Footnotes

See References [1], [2], and [3].

Immune sera	Rio Bravo Antigen			Antigen	Rio Bravo Immune Serum		
	HI	CF	NT		HI	CF	NT
Powassan	0/320			Powassan	40/5120		
RSSE	1280/5120	0/128		RSSE	320/5120	16/128	
SLE	1280/10240			SLE	2560/5120		
Ilheus	640/5120						
Modoc	1280/5120	16/256	<0.5/>6.0	Modoc	320/5120	0/16	<0.5/>2.0
Bussuquara	40/320						

NT: LNI in dex

Identified as same virus as that isolated in Texas by Dr. J.V. Irons [5], Dr. K.F. Burns [4], and in California by Dr. J.B. Enright [6] by NT at one or the other laboratory [3].

Cross immunity tests: not related to SLE, WE, California, CTF, LCM, and Powassan viruses. One way cross with Modoc virus, i.e., Modoc immunized mice resist challenge ic one month later with Rio Bravo virus; Rio Bravo immunized mice do not resist challenge ic one month later with Modoc virus [3].

Rio Bravo virus was determined to be antigenically distinct and cross- reacted minimally with other flaviviruses with undetermined arthropod-borne status [23].

Section VI - Biologic Characteristics

Virus Source (all VERTEBRATE isolates)
 Blood (LV), salivary gland (LV)

Lab Methods of Virus Recovery (ALL ISOLATIONS)
 Newborn and weanling mice, baby chicks, and hamsters

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)	
Vero (CL)	P-12				2	4 mm	7.6* (16)	
LLC-MK2 (CL)					7	2 mm	8.2 (16)	
Duck embryo(PC)	P-7, SM 4				5	Plaques	8.6 (23)	
C6/36 (CL)			No CPE					-(23)

The virus can be cultivated in HeLa, hamster kidney, chick embryo, human diploid and calf kidney cell culture systems but CPE observed only in hamster kidney cell culture (3).

* Expressed in dex

Vertebrate (species and organ) and arthropod	No. isolations/No. tested	No. with antibody/No. tested Test used	Country and region
Tadarida brasiliensis mexicana	3/12		Kern County, California; 1954 (7)
Tadarida brasiliensis mexicana	3/17		Kern County, California; 1957 (3)
Tadarida brasiliensis mexicana	1/5		Sonora State, Mexico; 1960 (11, 12)
Tadarida brasiliensis mexicana	1/1		Solano County, California; 1963 (13)
Tadarida brasiliensis mexicana	5/335		Fort Sam Houston, Texas; 1954 (8)
Tadarida brasiliensis mexicana	>20		Texas; 1954-1957 (5)
Eptesicus fuscus (bat)	1		California; 1954 (6)
Tadarida mexicana (bat)	1		Texas (18)
Weak and non-flying bats	4/46		Texas (19)
Tadarida braziliensis mexicana	1-6%		New Mexico, Texas (22)

Section VIII - Susceptibility to Experimental Infection (include viremia)

Experimental host and age	Passage history and strain	Inoculation Route-Dose	Evidence of infection	AST	Titer
				(days)	log ₁₀ /ml
Mice (nb)	P-2	ic 0.015	Paralysis and death	7	>8
Mice (nb)	P-3	ip 0.015	Paralysis and death	11	>7
Mice (nb)		sc			
Mice (wn)	P-2	ic 0.015	Paralysis and death	9	
Mice (wn)		ip 0.015	None		
hamsters (ad)	P-1	ic 0.015	None		
hamsters (ad)	HB 1	im 0.03	Viremia, days 3-5		
chicks 1 day)	Chick 1	im 0.03	Viremia, day 2		
chick embryo(5 day)	P-2	ys 0.1	Occasional deaths 4-5 days; virus positive		

Primates: Laboratory infections in man; experimental infection in monkeys (antibody only) (10).

Section IX - Experimental Arthropod Infection and Transmission

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
Virus did not multiply in <i>Aedes aegypti</i> , <i>Culex quinquefasciatus</i> or <i>Anopheles quadrimaculatus</i> mosquitoes following inoculation (14). <i>Culex tarsalis</i> mosquitoes did not become infected when fed on viremic blood (3,15).									

Section X - Histopathology

Character of lesions (specify host)

Inclusion Bodies

Intranuclear

Organs/Tissues Affected

Category of tropism

Section XI - Human Disease

In Nature
Reported

Residual

Death

Subclinical

Overt Disease
Reported

Clinical Manifestations

Fever (S), respiratory involvement (R) and lymphadenopathy (R)

Number of Cases

1 in nature (20); several lab infections (10)

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

Febrile illness

Section XII - Geographic Distribution

Known (Virus detected)

California, New Mexico, Texas, USA; Sonora, Mexico

Suspected (Antibody only detected)

Section XIII - References

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Remarks

Previously known as "U.S. bat salivary gland virus" or California bat salivary gland virus". No evidence that Rio Bravo virus produces disease in bats. Virus recovered only from salivary glands of naturally infected bats. Virus shows tropism for salivary glands, kidneys and mammary glands in mice infected by peripheral inoculation.