

Virus Name: Modoc		Abbreviation: MODV
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 M544	Accession Number	Original Date Submitted 2/5/1985
Family Flaviviridae	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 (1,2)	Isolated at Institute Berkeley, California	
Host Genus Peromyscus maniculatus	Species	Host Age/Stage Adult
Sex Female		
<u>Isolated From</u>	<u>Isolation Details</u>	
Organs/Tissues	Lactating mammary gland (washed 3 times with saline)	
Signs and Symptoms of Illness None	Arthropod	
Time Held Alive before Inoculation		
Collection Method Snap trap	Collection Date 7/9/1958	
Place Collected (Minimum of City, State, Country) Hackamore, Modoc County, California, USA		
Latitude 41° N	Longitude 121° W	
Macrohabitat Pine juniper, sagebrush woodland; semiarid plateau; 4700 ft. ASL	Microhabitat Forest edge, decaying tree trunks, volcanic rock, sagebrush and grass	Method of Storage until Inoculated Sealed glass tube stored in dry ice chest
Footnotes		

Section III - Method of Isolation

Inoculation Date
7/31/1958

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
No

Test(s) Used
NT

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)	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** **Goose**

pH Range pH Optimum

Temperature Range Temperature Optimum

Remarks

Serologic Methods Recommended
HI, CF, NT

Footnotes

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

Immune Serum	Modoc Antigen			Antigen	Modoc Immune Serum		
	HI	CF	NT		HI	CF	NT
Powassan	0/160			Powassan	40/5120		
RSSE	160/5120			RSSE	320/5120	8/256	
SLE	640/10,240			SLE	1280/5120	64/256	
Ilheus	320/5120			Ilheus		64/256	
Rio Bravo	320/5120	0/16	<0.5/>2.0	Rio Bravo	1280/5120	61/256	<0.5/>6.0
Bussuquara	0/320						

HI, CF, NT: Ho/Ht; NT=LNI in dex.

Cross immunity tests: Not related to Powassan. One way cross with Rio Bravo, i.e., Modoc immunized mice resist IC challenge one month later with Rio Bravo virus; Rio Bravo immunized mice do not resist challenge one month later with Modoc virus. No cross immunity with SLE [5].

By CF and NT, Modoc virus was most closely related to but antigenically distinct from Cowbone Ridge, Jutiapa, San Perlita and Sal Vieja viruses [11].

Virus Source (all VERTEBRATE isolates)

Lab Methods of Virus Recovery (ALL ISOLATIONS)
Newborn mice

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)		
Vero (CL)	P-8				2	3 mm	8.0* (10)		
LLC-MK2 (CL)					4	3 mm	7.7 (10)		
Duck embryo (PC)	SM 11				5	Plaques	7.0 (11)		

Virus can be cultivated in HeLa, human diploid, monkey kidney, hamster kidney, calf kidney and chick embryo tissue culture. CPE in HeLa and hamster kidney tissue culture systems (5).

* Expressed in dex

Vertebrate (species and organ) and arthropod	No. isolations/No. tested	No. with antibody/No. tested Test used	Country and region
Peromyscus maniculatus (rodent)	2/20		Modoc County, CA, USA; 1958 (1)
Peromyscus maniculatus	1		Greeley, Colorado, USA; 1961 (6)
Peromyscus maniculatus	1		Vale, Oregon, USA; 1963 (7)
Peromyscus maniculatus(from throat swabs only)	3		Mill Creek Canyon, Bitterroot Valley, Montana, USA (8)
Peromyscus maniculatus (blood)	2		NE Alberta, Canada (14)
Tamiasciurus hudsonicus		1/38 NT	
Eutamias minimus		3/35 NT	
Peromyscus maniculatus		13/109 NT	
Humans		3/50 NT	

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)	MB 2	ic 0.015	Paralysis and death	7	8
Mice (nb)	MB 5	ip 0.015	Paralysis and death	8	7
Mice (nb)		sc			
Mice (wn)	MB 5	ic 0.015	Paralysis and death	6	8
Mice (wn)		ip			
Mice	MB 5	im 0.03	Viremia, no deaths		
hamster (ad)	hamster 1	im 0.03	Viremia, no deaths		
hamster			Chronic infection, viruria(9)		
chicks (1 day)	hamster 2	im 0.03	Viremia, no deaths		
chick embryo(5 day)	MB 3	ys 0.1	Occasional deaths 4-9 days		

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>Culex quinquefasciatus</i> , <i>Anopheles quadrimaculatus</i> , or <i>Aedes aegypti</i> after inoculation with neuroadapted mouse brain virus (11).									

Section X - Histopathology

Character of lesions (specify host)		
<u>Inclusion Bodies</u>	<u>Intranuclear</u>	
Organs/Tissues Affected		
Category of tropism		

Section XI - Human Disease

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

Section XII - Geographic Distribution

Known (Virus detected) California; Oregon; Colorado; and Montana, USA; Alberta, Canada (14)
Suspected (Antibody only detected)

Section XIII - References

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Remarks

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