Virus Name: Montana Myotis leukoencephalitis		Abbreviation: MMLV
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

Accession Number

Original Date Submitted
1/31/1985

Family
Flaviviridae

Genus
Flavivirus

Information From
J. Frederick Bell

Address
Rocky Mountain Laboratory, Hamilton, Montana

Information Footnote
Reviewed by editor

Section II - Original Source

Isolated By (name)
J. Frederick Bell (1)

Isolated at Institute
Rocky Mountain Lab., Hamilton, Mont.

Host Genus
Myotis lucifugus

Species

Host Age/Stage
Mature

Sex
Female

Isolated From	Isolation Details
Other Fluids	**Saliva - bite**

Signs and Symptoms of Illness
Ruffled fur, paresis

Arthropod

Time Held Alive before Inoculation

Collection Method
By hand

Collection Date
7/29/1958

Place Collected (Minimum of City, State, Country)
Farm dwelling, near Florence, Ravalli County, MT

Latitude
46° 37' N

Longitude
114° 5' W

Macrohabitat
Valley floor; irrigated farms, elevation 3500, Western Montana

Microhabitat
Attic of house

Method of Storage until Inoculated

Footnotes

Section III - Method of Isolation

Inoculation Date
7/30/1958

Animal (Details will be in Section 6)
nb mice

Route Inoculated
Intramuscular by bite

Reisolation
No

Other Reasons
Subsequent isolations from other individuals of same species, bite and other

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)

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)
Chloroform-labile (4 dex decrease) Feldman and Wang, 1961

Virion Morphology

Shape	Dimensions **<100 nm**	
Mean nm	Range nm	
Measurement Method **Passage through 100 nm Gradacol**	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 acetone-ether; sucrose-acetone + - prot.**	**Chick**
pH Range	pH Optimum	
	6.0	
Temperature Range	Temperature Optimum	
	22dC	

Remarks
Low titer (80) by sucrose-acetone method (others not suitable)

Serologic Methods Recommended
CF, HI, and NT

Footnotes
Low titer (80) by sucrose-acetone method (others not suitable)

1. HI. In the HI test, MML hyperimmune mouse serum inhibited Ilheus, St. Louis (Parton) and Powassan (791-A) of group B in low dilution only, but did not inhibit group A antigens WEE and EEE. No others tested.

2. CF

a.	Reaction	MML	Ilheus
	No reaction	MML	WEE
	No reaction	MML	Turlock
	Reaction	MML	ENT
	Reaction	MML	St. Louis
	No reaction	Ilheus	MML
	No reaction	Turlock	
	No reaction	Trivittatus	
	No reaction	Powassan	
	No reaction	Tacaribe	
	No reaction	EBSG	
	No reaction	Modoc	

Sera that did not react at 1:4 dilution in CF test with 1:16 dilution (1 unit) of MML antigen are as follows: Anopheles A, Anopheles B, Rio Bravo (Burns bat), bluetongue, Bunyamwera, Bwamba, California encephalitis, chikungunya, Colorado tick fever (Florio), Culiseta inornata, Cache Valley, dengue 1, dengue 2, dengue 4, EEE, o'nyong-nyong, Herpes, Ilheus, Itaqui, normal mouse, Microtus KF 11, Microtus KF 23, LCM, Mayaro, mouse polio GD 7, Ntaya, Quaranfil, RSSE, Sandfly fever, Semliki Forest, Sindbis, Chenuda, Nyamanini (Ar 1304), Uganda S, WEE, HJ, West Nile, YF 17D, Wyeomyia, Zika.

3. Serum neut. tests. Ilheus, Powassan, ENT sera neutralized only small amount of MML virus. Reverse reaction did not occur.

Antisera vs. fixed rabies (PV-1), Rio Bravo, LCM and 2 strains of mouse poliovirus did not neutralize MML virus.

Two separate cross-neutralization studies, involving 42 and 65 flaviviruses respectively, have shown that MML virus is not closely related to any of the other flaviviruses, and thus cannot be placed in a complex or subgroup [5] , [6] .

Section VI - Biologic Characteristics

Virus Source (all VERTEBRATE isolates)

Lab Methods of Virus Recovery (ALL ISOLATIONS)
Newborn mice

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)	
Vero (CL)	P-12				13	1 mm	4.8* (3)		
LLC-MK2 (CL)					7	2 mm	7.6 (3)		
BHK-21 (CL)	MB 9	3-4		8.3* (4)					

* 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
Little brown bat (Myotis lucifugus)	14/142		Ravalli County, Western Montana, USA
Man		0/26 NT	Western Montana
Man		1/476 HI	Connecticut, 1966(2)
Bovines		0/200 HI	
Crows		0/54 HI	
Small mammals		0/235 HI	

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)	MB 6	ic 0.03	Paresis and death	7	
Mice (nb)		ip 0.1	Paresis and death	8	
Mice (nb)		sc			
Mice (wn)		ic 0.03	Paresis and death	7	
Mice (wn)		ip 0.1	Negative		
Mice (9 day)		ip 0.1	Paresis and death	6	
Mice (13 day)		ip 0.1	Paresis	7	
Mice (17 day)		ip 0.1	Negative		
hamster (ad)		ic 0.03	Negative		
rabbits (ad)		ic 0.1	Negative		
cavies (ad)		ic 0.03	Paresis and death	7	
Myotis lucifugus (ad)		ic 0.3	Paresis	8	6
Eptesicus fuscus (ad)		ic 0.03	Paresis	12	
Chick embryos (8 day)		am.s.	Death	6	

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

Section X - Histopathology

Character of lesions (specify host)
Mice: leukoencephalitis

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)
Montana

Suspected (Antibody only detected)
Unknown

Section XIII - References

1. Bell, J.F. and Thomas, L.A. 1964. Am. J. Trop. Med. Hyg. 13:607-612.
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6. Calisher, C.H., et al. Personal communication. 1983.

Remarks