Virus Name: Murray Valley encephalitis	Abbreviation: MVEV

Status
Arbovirus

Select Agent
No

SALS Level
3

SALS Basis
Results of SALS surveys and information from the Catalogue.

Other Information
DOC Permit Required

Antigenic Group
B

SECTION I - Full Virus Name and Prototype Number

Prototype Strain Number / Designation
MVE/1/1951

Accession Number

Original Date Submitted
3/24/1985

Family
Flaviviridae

Genus
Flavivirus

Information From
Eric L. French, Ph.D.

Address
CSIRO Animal Health Laboratory, Private Bag No. 1, Parkville, N.2, Victoria, Australia

Information Footnote
Reviewed by editor

Section II - Original Source

Isolated By (name)
Dr. E.L. French (1)

Isolated at Institute
Walter and Eliza Hall Inst., Melbourne

Host Genus
Human

Species

Host Age/Stage
19 years

Sex
Male

Isolated From	Isolation Details
Organs/Tissues	**Pooled specimens of cerebellum, pons, medulla, and cerebrum**

Signs and Symptoms of Illness
Acute encephalitis*

Arthropod

Time Held Alive before Inoculation

Collection Method
At necropsy

Collection Date
2/9/1951

Place Collected (Minimum of City, State, Country)
District Base Hospital, Mooroopna, Victoria, AS

Latitude
36° 20' S

Longitude
145° 20' E

Macrohabitat

Microhabitat

Method of Storage until Inoculated
Sealed in tubes on solid carbon dioxide

Footnotes

Section III - Method of Isolation

Inoculation Date
2/10/1951

Animal (Details will be in Section 6)
(Embryonated Egg)

Route Inoculated
CAM

Reisolation
Yes

Other Reasons
Four similar viruses isolated during epidemic of 1951; 36% NT antibody rate in area.

Homologous Antibody Formation by Source Animal
Yes

Test(s) Used
CF, NT

Footnotes

Section IV - Virus Properties

Physicochemical
RNA

Pieces (number of genome segments)	Infectivity	Sedimentation Coefficients(s) (S)
Percentage wt, of Virion Protein	Lipid	Carbohydrate
Virion Polypeptides: Number	Details **7.8% nucleic acid; 11% lipid (4); 10% MB virus: 7 dex to 2.5 dex, 20 min, 50C (5); in 10% rabbit serum inact. at 56C for 15 min.(3)**	
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) **2:1**	After Treatment Titer **3.6 dex**	Control Titer **7.0 dex**
Lipid Solvent (chloroform) **2:1**	After Treatment Titer **1.8 dex**	Control Titer **7.0 dex**
Lipid Solvent (deoxycholate) **0.1%**	After Treatment Titer **2.8 dex**	Control Titer **6.9 dex**

Other (formalin, radiation)
Butanol 2:1: 7.6 to 0 dex; Phospholipase A 10 mcg/ml: 7.0 to 2.3 dex (6)

Virion Morphology

Shape	Dimensions **20-50 nm**
Mean nm	Range nm

Measurement Method **Filtration (3); electron microscopy 25-35 nm (4)**	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 **Yes**	Antigen Source **SMB susp. as crude hemagglutinin**	Erythrocytes (species used) **Goose**
pH Range	pH Optimum **6.5-6.75**	
Temperature Range	Temperature Optimum **4dC**	

Remarks
*** Clinically indistinguishable from Austrailan X disease, JBE, SLE, or EEE and WEE in humans (2).**

Serologic Methods Recommended
NT, CF, HI

Footnotes
*** Clinically indistinguishable from Austrailan X disease, JBE, SLE, or EEE and WEE in humans (2).**

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

The three viruses isolated in Melbourne in 1951 from MVE Cases were sent to the Army Medical Service Graduate School at Washington, D.C., because, due to quarantine regulations, the full range of type arboviruses were not available in Australia. The evidence, based on CF and NT tests, indicating that MVE virus is a member of Group B arboviruses, is from reference [9] .

Cross Neutralization Tests [9] :

	Neutralizing indices (dex)				
	Test viruses				
Rabbit Immune Serum	JE	MVE/1/51	WN	SLE	WEE
Japanese Enc.	4.7	1.4	0.5	0.9	0.9
MVE/1/51	1.9	3.6	1.0	1.6	0
WN	1.7	1.0	3.5	1.2	0
SLE	0.9	0.6	1.0	2.4	0
WEE	0.9	1.0	0.1	0.1	3.6

Cross-Complement Fixation (9):

	Antigen 1:4				
Hyperimmune GP Serum	JE	MVE/1/51	WN	SLE	WEE
JE	128	32	0	0	0
MVE/1/51	8	64	0	0	0
WN	0	16	64	0	0
SLE	8	16	0	16	0
WEE	0	0	0	0	64

The identification of the New Guinea isolate MVE/1/56 is given in Reference [11] . As far as is known it is not related to any virus not in Group B.

In a cross-neutralization study involving 42 flaviviruses, MVE virus was antigenically placed in a subgroup or complex consisting of JBE, WN, SLE, KUN, USU, KOK, STR, and ALF viruses [25] .

Section VI - Biologic Characteristics

Virus Source (all VERTEBRATE isolates)
Blood (LV), pool liver, kidney (LV)

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)
Chick embryo(PC)	MB 16				5	3 mm (16)		
PS(CL)	P-9	3	4+	7.0**	4	2.5-3.5mm	8.2**(26)	
Vero(CL)	P-15				2	9 mm	6.7(27)	
LLC-MK2 (CL)					4	2 mm	8.2(27)	

In addition, may other animal cell lines and mosquito cell cultures are susceptible.

** 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	3/16		Victoria and New South Wales, Australia (1)
Man		109/1,524 CF	Northern Victoria, Australia (12)
Man	1/1		South Australia (10)
Man		15/55 CF,NT	Australia (12)
Man	1		NW Australia (23)
Man	1/1	140/485 NT	New Guinea (22)
Domestic animals			

Horses		31/62 CF	Northern Victoria, Australia (12)
Dogs		5/10 CF	
Foxes		5/9 CF	Mildura, Victoria, Australia (12)
Opossum		2/3 CF	
Birds			
Water birds		40/99 NT	
Land birds		11/60 NT	
Domestic chicks		31/56 NT	
Arthropods			
Cx annulirostris	5/8,963		Mitchell River Mission Australia (13)
Ae normanensis	1/904		
Cx bitaeniorhynchus	1/682		
Sentinal chickens	2		Australia (28)
Whitefaced heron (blood)	1		Australia (29)

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 5	ic 0.03	Death	7	8.5
Mice (nb)		ip 0.03	Death	7	8.5
Mice (nb)		sc			
Mice (wn)	MB 11	ic 0.03	Death	7	7.7
Mice (wn)		ip 0.03	Death	13	<1.0
monkey (ad)	MB 4	ic 0.5	Death (1)	13	5.0
sheep (1-6 wk)		ic 0.5	Death (1)	7	3.0
chickens (2 day	MB 5	sc 0.1	Viremia after 48 hours		11.2
chickens (4 day)		oral0.1	Same		3.0
chickens (28 day)		sc 0.1	Same		
chick embryo (10-12 day)	MB 4	CAM 0.05	Specific pocks (1)	1.75	6.0
chick embryo (10-12 day)		all 0.05	Death (1)	2	5.5
chick embryo (5-8 day)		ys 0.1	Death (1)	2.2	5.5
guinea pigs (1-12 wk)		ic 0.1	Temp rise (1)		
hamsters (6-10 wk)	MB 12	ic,ip,sc 0.1	Death (14)		9.1- 8.0

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
Cx annulirostris Cx quinquefasciatus Ae occidentalis Ae vigilax	Adults fed on infected blood; transmitted infection by bite to chicks; virus content in mosquitoes titrated on CAM (15)								
Ae aegypti	Transovarial transmission following oral infection (24)								

Section X - Histopathology

Character of lesions (specify host)
Brains from fatal infections in man and monkey show perivascular cuffing, neuronal degeneration, neuronophagia and necrosis in brains and cords. Purkinje cells destroyed. Plaques of encephalomalacia in brains of patients dying late in disease. (17, 18)

Inclusion Bodies — Intranuclear

Organs/Tissues Affected
Brain (M)(LV), spinal cord (M), skeletal muscles (LV)

Category of tropism
Neurotropic

Section XI - Human Disease

In Nature
Significant

Residual
Significant

Death
Significant

Subclinical
Reported

Overt Disease

Clinical Manifestations
Fever (S), headache (S), stiff neck (S), myalgia (R), CNS signs (including encephalitis)(S), respiratory involvement (R), leukopenia (R), CNS pleocytosis (R), rash (R), and vomiting (S)

Number of Cases
44 described; 40 (20,2), 4 (10,11,18,23)

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

Section XII - Geographic Distribution

Known (Virus detected)
Australia (1,10,13,18), New Guinea (11),

Suspected (Antibody only detected)

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Remarks

MVE Virus, when suitably diluted, produces well defined pocks on the CAM of 10-12 day chick embryos. In this situation the virus is not neutralized by specific antibody and consequently inoculation of the CAM is the method of choice for the isolation of this virus from clinical material. Two of the 1951 isolations were made only on the CAM, in these instances mouse inoculations failed