Virus Name: Western equine encephalomyelitis	Abbreviation: WEEV

Status
Arbovirus

Select Agent
No

SALS Level
2

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

Other Information
USDA Permit Required, DOC Permit Required, Vaccination Recommended

Antigenic Group
A

SECTION I - Full Virus Name and Prototype Number

Prototype Strain Number / Designation

Accession Number

Original Date Submitted
7/24/1984

Family
Togaviridae

Genus
Alphavirus

Information From
W.C. Reeves

Address
School of Public Health, University of California, Berkeley, California, USA

Information Footnote
Revised

Section II - Original Source

Isolated By (name)
K.F. Meyer, et al. (1)

Isolated at Institute
Hooper Found., Univ. of Ca,

Host Genus
Horse (gelding)

Species

Host Age/Stage
Old

Sex
Male

Isolated From	Isolation Details
Organs/Tissues	**Brain stem and hippocampus**

Signs and Symptoms of Illness
Facial paralysis, fever, beginning of incoordination, seen during first 24 hours of illness; sacrificed

Arthropod

Time Held Alive before Inoculation

Collection Method
Autopsy

Collection Date
10/1/1930

Place Collected (Minimum of City, State, Country)
Merced County, California, USA

Latitude
37° N

Longitude
120° W

Macrohabitat
Rural irrigated farm land

Microhabitat
Farm yard and pasture

Method of Storage until Inoculated
Wet ice; inoc. within 12 hours

Footnotes

Section III - Method of Isolation

Inoculation Date
10/1/1930

Animal (Details will be in Section 6)
Horse

Route Inoculated
Intraocular and ic

Reisolation
Yes

Other Reasons
New virus. Many subsequent isolations of same virus in area.

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) **1**	Infectivity **Yes**	Sedimentation Coefficients(s) **40s (16)**(S)
Percentage wt, of Virion Protein	Lipid	Carbohydrate
Virion Polypeptides: Number **2(16) 3(23)**	Details	
Non-virion Polypeptides: Number	Details	
Virion Density	Sedimentation Coefficients(s) **240 S (1)**(S)	
Nucleocapsid Density	Sedimentation Coefficients(s) (S)	

Stability of Infectivity (effects)

pH (infective range)

Lipid Solvent (ether - % used to test) **25%**	After Treatment Titer **Inactivated (3)**	Control Titer
Lipid Solvent (chloroform)	After Treatment Titer **6 dex inact (4)**	Control Titer
Lipid Solvent (deoxycholate)	After Treatment Titer	Control Titer

Other (formalin, radiation)
Temperature sensitive (ts) mutants of WEE established (20-22)

Virion Morphology

Shape	Dimensions **25-57 nm**	
Mean nm	Range nm	
Measurement Method **25 nm (filtration); 40-48 nm (EM); 57 nm**	Surface Projections/Envelope	Nucleocapsid Dimensions, Symmetry

(centrif

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. with sucrose-acetone**	**Chick,goose**
pH Range	pH Optimum	
5.9-6.8	**6.3**	
Temperature Range	Temperature Optimum	
22dC - 37dC	**37dC**	

Remarks
Optimal pH will vary with virus strains, cell systems, antigen preparations and plate versus tube procedures. * Viral specific hemolytic activity was found to be associated with the E1 glycoprotein hemagglutinin which was separ

Serologic Methods Recommended
HI, CF, NT

Footnotes
Optimal pH will vary with virus strains, cell systems, antigen preparations and plate versus tube procedures. * Viral specific hemolytic activity was found to be associated with the E1 glycoprotein hemagglutinin which was separ

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

Immune ** Sera	Antigen of Registered Virus HI Ht/Ho	Antigen of Registered Virus HI Ratio	Antigens	Immune Serum of Registered Virus ** HI Ht/Ho	Immune Serum of Registered Virus ** HI Ratio
Chikungunya	40/10240	1/256	Chikungunya	40/10240	1/256
Mayaro	320/10240	1/32	Mayaro	80/10240	1/128
Semliki	160/10240	1/64	Semliki	40/10240	1/256
Sindbis	2560/10240	1/4	Sindbis	160/10240	1/64
EEE	160/10240	1/64	EEE	80/10240	1/128
VEE	80/10240	1/128	VEE	160/10240	1/64

** Hyperimmune mouse sera

The above tabulated data [5] are indicative of the antigenic relationships with other members of serogroup A, using hyperimmune sera. WEE is distinguishable, however, from all other members of the group by NT and usually by CF. For antigenic relationship to newly discovered members of Group A, consult their respective catalogue cards.
Rather marked antigenic, cell culture and pathogenic variants have been noted among strains found in nature.

For current antigenic classification of WEE virus and other closely related alphaviruses, see Reference [26] .

Section VI - Biologic Characteristics

Virus Source (all VERTEBRATE isolates)
Blood (LV), CNS (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)	
Ae albopictus (CL)	SM 4		No CPE					+ (20)	
Ae dorsalis (CL)			No CPE					+ (18)	
Cx tarsalis (CL)			No CPE					+ (19)	

A wide variety of cells, both primary and continuous, are susceptible including: chick and duck embryo, hamster and monkey kidney, human cells, HeLa and others. Both CPE and plaques produced.

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
Culex (Mel) dunni	1		Ecuador, 1975 (25)

Man : many isolations, mainly from brain. Serologic surveys by HI and NT; variable up to 50% positive in highly endemic areas in USA; CF usually under 5% positive. Horse: Many isolations, mainly from brain. Serologic surveys (NT) may reach 100% positive in highly endemic area (USA). Cow: No isolations, but HI and NT positives frequently in high rate in highly endemic areas. Pig and Deer: One each; serologic surveys limited. Rodents: Few isolations from Citellus, Sciurus, Mus, and Microtus. Serologic surveys limited. Wild birds: Numerous isolations, mostly from passerine and a few ground species; frequency depends upon area. Also many isolations from sentinel chickens. NT and HI positives in some species, areas, and seasons approaching 100%. Snakes: Isolations from the blood of 37 of 84 wild snakes of 3 genera captured in early spring in Utah (USA) are reported (9). Isolations from 6 leopard frogs reported from Canada (14). Mosquitoes: Isolations from 5 genera (Culex, Aedes, Anopheles, Culiseta, and Psorophora) have been reported but by far the greater number of isolations have been made from Culex tarsalis in the Western USA and from Culiseta melanura in the Eastern USA. Those isolations from Culiseta melanura are now presumed to be Highlands J virus. Isolations also reported from Dermanyssus, Bdellonyssus and Triatoma.

Consult References 6,7,8.

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)		ic .01	Encephalitis and death	2-6	7-8
Mice (nb)		ip .03	Encephalitis and death		7-8
Mice (nb)		sc			
Mice (wn)		ic .03	Encephalitis and death		
Mice (wn)		ip .09	Encephalitis and death		7-8
chick (<24 hr)		ic,sc .03	Encephalitis and death		8-9

Embryonated eggs, 10 days of age, die within 18-36 hrs. following any route of inoculation. All of common laboratory animals including guinea pigs, rabbits, hamsters, and monkeys are susceptible to infection, have a viremia and die if inoculated ic.

Mammals: horses and a number of wild mammals including several species of rodents and bats have been experimentally infected. Viremia is usually of low order but in some rodents may be sufficient to infect mosquitoes. This likewise applies to snakes which may retain virus through a period of hibernation. Snakes transmit to offspring (9). Birds: Wide range of wild bird species are susceptible and circulate virus in high titer. Death and height of viremia varies with species and age.

Consult References 7,8,9.

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
Mosquitoes: wide range of species including Aedes, Culex and Culiseta transmit experimentally.									
Dermecentor anderson: was exp. infected and transovarial transmission was demonstrated (27).									

Section X - Histopathology

Character of lesions (specify host)
Encephalitis characterized by focal microgliosis, destruction of ground substance and round cell perivascular cuffing. Lesions most frequent in caudate nuclei; present in cerebral cortex, cerebellum and brain stem. Lesions rare in cord.

Inclusion Bodies — Intranuclear

Organs/Tissues Affected
Brain (LV)

Category of tropism
Neurotropic except in some wild bird species in which death is toxemic.

Section XI - Human Disease

In Nature
Significant

Residual
Reported

Death
Significant

Subclinical

Overt Disease
Reported

Clinical Manifestations
Fever, headache, prostration, conjunctival inflammation, stiff neck, myalgia, arthralgia, CNS signs (including encephalitis), CNS pleocytosis, vomiting, sudden onset, chills, and convulsions

Number of Cases
Hundreds. Above data from summary of 314 cases (10,11)

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

Section XII - Geographic Distribution

Known (Virus detected)
Greater part of North America, mostly in Western US and Mexico, Argentina, Brazil, British Guiana, Uruguay, Equador (25). Questionable in Czechoslovakia (12,13).

Suspected (Antibody only detected)
Czechoslovakia (12,13).

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Note: The literature on WEE is so extensive that reference can be made to only a few seperate articles. For summary and references on host-range, etc., prior to 1954, Reference 6 should be consulted, and the abstract file will be helpful for subsequent

Remarks

Present evidence indicates that the basic transmission cycle involves birds and mosquitoes, Cx tarsalis and passerine birds in the Western US. Man and horse, the hosts in which clinical disease is manifest in a portion of those infected, are considered tangential hosts and not involved in the basic cycle.