

Virus Name: St. Louis encephalitis		Abbreviation: SLEV
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	Accession Number	Original Date Submitted 2/18/1985
Family Flaviviridae	Genus Flavivirus	
Information From Carl M. Eklund, M.D.	Address Rocky Mountain Laboratory, Hamilton, Montana	
Information Footnote Reviewed by editor		

Section II - Original Source

Isolated By (name) Muckenfuss, R.L., et al. (1,2)	Isolated at Institute St. Louis, Missouri	
Host Genus Man	Species	Host Age/Stage Not known
Sex Not Answered		
<u>Isolated From</u>	<u>Isolation Details</u>	
Organs/Tissues	Brain suspension	
Signs and Symptoms of Illness Typical acute encephalitis	Arthropod	
Time Held Alive before Inoculation		
Collection Method Brain specimen at autopsy	Collection Date	
Place Collected (Minimum of City, State, Country) St. Louis City and County, Missouri, USA		
Latitude 40° N	Longitude 90° W	
Macrohabitat	Microhabitat	Method of Storage until Inoculated Fresh brain suspension (1); 50% glycerine (2)
Footnotes		

Section III - Method of Isolation

Inoculation Date	
Animal (Details will be in Section 6) Monkey *	
Route Inoculated ic and ip	Reisolation Not tried
Other Reasons Independently isolated by (2) and (1) with different methods.	
Homologous Antibody Formation by <u>Source Animal</u> Yes	
Test(s) Used	
Footnotes	

Section IV - Virus Properties

Physicochemical RNA, Single Strand		
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)	
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<u>Stability of Infectivity (effects)</u>		
pH (infective range)		
Lipid Solvent (ether - % used to test) 20%; 30 min., 5C (4)	After Treatment Titer 2.66 dex	Control Titer 4.33 dex
Lipid Solvent (chloroform)	After Treatment Titer	Control Titer
Lipid Solvent (deoxycholate) 1:1000 (5)	After Treatment Titer 3.5;3.8;4.1 dex loss	Control Titer
Other (formalin, radiation)		
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<u>Virion Morphology</u>		
Shape Spherical particles	Dimensions 38 nm	
Mean nm	Range nm	
Measurement Method Electron microscopy (24)	Surface Projections/Envelope Uniform lucid envelope observed	Nucleocapsid Dimensions, Symmetry Electron-dense core; diameter = 27 nm

Morphogenesis

Site of Constituent Formation in Cell	Site of Virion Assembly	Site of Virion Accumulation
Inclusion Bodies	Other	

Hemagglutination

Hemagglutination Yes	Antigen Source SMB ext. by acetone-ether, sucrose-acetone	Erythrocytes (species used) Goose
pH Range 6.0-7.9	pH Optimum 7.0	
Temperature Range 4dC to 37dC	Temperature Optimum 22dC	
Remarks * Rhesus monkey (1); mice (2)		
Serologic Methods Recommended HI, CF, NT		
Footnotes * Rhesus monkey (1); mice (2)		

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

St. Louis virus falls into Group B and as far as is known it is not antigenically related to any viruses not in this group. For published antigenic relation within Group B see References [6] , [7] , [38] .
Recent antigenic studies still place SLE virus in the JBE-MVE-WN complex or subgroup [38] , [39] .

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)		

SLE virus produces CPE and plaques in various continuous and primary cell culture systems. Cell cultures derived from human, primate, rodent, swine and avian tissues and invertebrate cell cultures support the multiplication of SLE virus with or without CPE. SLE virus has produced CPE in primary chick embryo, duck (questionable) and hamster kidney cell cultures; in HeLa human amnion, human epithelial-like, BHK-21, Vero, PS; and plaques in KB, BHK-21, Vero, LLC-MK2, MA-104, BS-C-1, and PS continuous cell cultures. Plaques also were produced in primary chick embryo and duck kidney cell cultures (40).

Vertebrate (species and organ) and arthropod	No. isolations/No. tested	No. with antibody/No. tested Test used	Country and region
<p>ISOLATIONS: Man (blood): 1 St. Louis, MO (9); 2 Panama (27); 1 Trinidad (26,30) Man (CNS): 11 St. Louis (1,2); 1 Texas (29); 1951 1 Florida (10); 1962, 3 Florida (25); 1 Calif. VERTEBRATES (blood): 1 flicker, Kentucky; 1 mourning dove, California, white-tipped dove, silver-beak tanager, pale-vented robin, blue and white manakin, Trinidad; blue jay, mockingbird, domestic goose, pigeon, Texas; house sparrow, Missouri; house sparrow, Illinois; homing pigeon, Florida. (Other tissues): Pool liver, spleen, kidney - 3 house sparrows, chimney swift, cat bird, Illinois; cardinal, blue jay, robin, Missouri. Spleen and liver: Pool of three ruddy ground doves Panama. Brain: 1 homing pigeon Florida. Brain and other organs - flame-headed manakin, Trinidad. MAMMALS: From brain and spleen-Mexican free-tailed bat, Texas; brain, gray fox, California. ARTHROPODS: <i>Culex tarsalis</i>, Washington, California, Montana, Idaho, Oregon, North Dakota, Colorado; <i>Cx peus</i>, California; <i>Aedes dorsalis</i> (melanimon), California; <i>Cx pipiens</i>, Kentucky, Illinois, Missouri, Indiana, Tennessee; <i>Cx quinquefasciatus</i>, Arizona, Texas; <i>Cx nigripalpus</i>, An crucians, Florida; <i>Ornithonyssus sylviarum</i>, <i>Dermanyssus americanus</i>, California; <i>Dermanyssus gallinae</i>, St. Louis, Missouri; <i>Sabethes chloropterus</i>, pool <i>Sabethes</i> spp., pool <i>Trichoprosopon</i> sp., pool <i>Wyeomyia</i> sp., <i>Deinocerites pseudus</i>, Panama; <i>Cx caudelli</i>, <i>Cx coronator</i>, <i>Psorophora ferox</i>, <i>Cx spissipes</i>, <i>Cx taeniopus</i>, <i>Cx virgultus</i>, <i>Cx nigripalpus</i>, <i>Ae serratus</i>, <i>Ae scapularis</i>, Trinidad; <i>Cx nigripalpus</i>, Jamaica; <i>Sabethes belisarioi</i>, <i>Gigantolaelops</i> sp., Brazil. NOTE: Articles listing isolates from man also discuss isolation from arthropods. Field and lab observations indicate that <i>Cx tarsalis</i>, <i>Cx quinquefasciatus</i>, <i>Cx pipiens</i>, and <i>Cx nigripalpus</i> are the most important vectors in the US. ANTIBODIES: Epidemics have occurred in Missouri, Illinois, Kentucky, Texas, Arizona, Colorado, New Jersey and in adjacent Pennsylvania and small numbers of patients seen in several other states. NT, CF and HI antibodies demonstrated. Antibody surveys show high antibody rates in epidemic areas and frequently in areas with sporadic cases. No epidemics outside US - 2 patients in Panama, 1 in Trinidad and 2 in Argentina; mild febrile disease and virus isolated from blood. Serological surveys in Panama, Jamaica, Trinidad and Argentina show presence of antibodies. Among lower vertebrates--antibodies in wild and domestic birds and among domestic and wild mammals but rate higher in birds (9,12,13,14,15,16,17,30,31,32).</p> <p><i>Dermacentor variabilis</i>, 1 isol. from 5 ticks, Memphis, Tennessee, USA (43).</p>			

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)	P-1, Parton	ic 0.02	Death (12)	5	9.0
Mice (nb)		ip 0.05	Death (12)	7	8.0
Mice (nb)		sc			
Mice (wn)		ic 0.03	Death (12)	5	9.0
Mice (wn)		ip 0.05	Death (12)	7	2.0
Mice (6 wk)	P-100, Hubbard	ic 0.03	Death (9)	5	8.0
Mice (6 wk)		in 0.03	Death (9)	6	4.0

Vertebrates shown to be susceptible to experimental infection with signs of infection being death, viremia or development of antibodies: Hamster, rhesus monkey, guinea pig, horse, English sparrow, redwing blackbird, dove, duck, chicken, and chick embryos.

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
<p>Many arthropods have been infected experimentally. Of major importance are the findings with respect to <i>Cx tarsalis</i>, <i>Cx pipiens</i>, <i>Cx quinquefasciatus</i> and <i>Cx nigripalpus</i> (9,33,34,35).</p> <p>Transovarial transmission demonstrated in colonized <i>C. pipiens</i> complex mosquitoes originally collected in Memphis, Tennessee, and McLeansboro, Illinois (37).</p>									

Section X - Histopathology

Character of lesions (specify host)

Perivascular cuffing, cellular infiltration, and nerve cell degeneration in the cortex, midbrain, medulla, pons, and upper levels of the cord (21). Lesions in thymus (L.B. Dias).

Inclusion Bodies

Intranuclear

Organs/Tissues Affected

Brain (M), upper spinal cord (M)

Category of tropism

Neurotropic

Section XI - Human Disease

In Nature

Significant

Residual

Reported

Death

Significant

Subclinical

Overt Disease

Reported

Clinical Manifestations

Fever (S), headache (S), prostration (S), stiff neck (S), CNS signs (including encephalitis) (S), and CNS pleocytosis (S)

Number of Cases

More than 2500

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

Encephalitis

Section XII - Geographic Distribution

Known (Virus detected)

Most parts of USA; Mexico, Trinidad, Brazil, Jamaica, Argentina, Haiti, Canada (36)

Suspected (Antibody only detected)

Surinam (41), Venezuela (42).

Section XIII - References

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Remarks