Virus Name: Semliki Forest	Abbreviation: SFV

Status
Arbovirus

Select Agent
No

SALS Level
3

SALS Basis
Fatal human laboratoryinfection, 1978, probably aerosol. This is recognized to be a unique incident in a long history of work with SFV under minimal biocontainment conditions. However, since the virulence characteristics of the strain responsible in this case require further study and the prevalence of subclinical infections in laboratories working with SFV remains unknown, the committee recommends Level 3 until further information is available warranting reconsideration at a lower level.

Other Information

Antigenic Group
A

SECTION I - Full Virus Name and Prototype Number

Prototype Strain Number / Designation
Original

Accession Number

Original Date Submitted
2/3/1985

Family
Togaviridae

Genus
Alphavirus

Information From
J.P. Woodall

Address
YARU, Yale Univ. Sch. Med., New Haven, Connecticut 06510

Information Footnote
Reviewed by editor

Section II - Original Source

Isolated By (name)
Smithburn and Haddow (1)

Isolated at Institute
Entebbe

Host Genus
Aedes (Aedimorphus) abnormalis

Species

Host Age/Stage
Adult

Sex
Female

Isolated From

Isolation Details

Signs and Symptoms of Illness

Arthropod

Time Held Alive before Inoculation

Collection Method
On human bait

Collection Date
8/1/1942

Place Collected (Minimum of City, State, Country)
Bundiyama, Bwamba County, Uganda

Latitude
0° 44' N

Longitude
30° 3' E

Macrohabitat
Relict forest continuous with tropical rain forest

Microhabitat
Daylight; ground level, outdoors

Method of Storage until Inoculated
Alive

Footnotes

Section III - Method of Isolation

Inoculation Date
8/17/1942

Animal (Details will be in Section 6)
ad mice

Route Inoculated
Intracerebral

Reisolation
Not tried

Other Reasons
Rhesus monkey 193 inoculated sc with same mosquito material produced NT antibodies

Homologous Antibody Formation by Source Animal

Test(s) Used

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	
Non-virion Polypeptides: Number	Details	
Virion Density	Sedimentation Coefficients(s) (S)	
Nucleocapsid Density	Sedimentation Coefficients(s) (S)	

Stability of Infectivity (effects)

pH (infective range)
Lyophilizes well; survives better at 20% than 84% RH (21).

Lipid Solvent (ether - % used to test) **1:1**	After Treatment Titer **0 dex**	Control Titer **6.4 dex (14)**
Lipid Solvent (chloroform)	After Treatment Titer	Control Titer
Lipid Solvent (deoxycholate) **1:2000**	After Treatment Titer **<1.0 dex**	Control Titer **5.5-6.0 dex (14)**

Other (formalin, radiation)
Resistant to trypsin, chymotrypsin and papain (22)

Virion Morphology

Shape	Dimensions **20-67 nm**
Mean nm	Range nm

Measurement Method **Filtration (2) and electron microscopy (27)**	Surface Projections/Envelope	Nucleocapsid Dimensions, Symmetry **Capsid**

Morphogenesis

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

Hemagglutination

Hemaggiutination **Yes**	Antigen Source **SMB (4) or serum (6) HeLa and human amnion; acetone-ether or sucrose-acetone and protamine; fluorocarbon.**	Erythrocytes (species used) **Several***
pH Range **6.0-7.2**	pH Optimum **6.4-6.8**	
Temperature Range **4dC-37dC**	Temperature Optimum **25-37dC**	

Remarks
Low mouse passage virus is more neutralizable than high passage (15). * Goose, chick, cockerel (and hen if protamine antigen used).

Serologic Methods Recommended
HI,CF,NT

Footnotes
Low mouse passage virus is more neutralizable than high passage (15). * Goose, chick, cockerel (and hen if protamine antigen used).

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

Apparently identical to Kumba virus [5] , [15] .

Indistinguishable by cross-neutralization from Paramaribo virus, but a human Paramaribo convalescent serum in NT with Semliki gave Ht/Ho = 2.8/5.7 [25] .
Cross-reactive by HI with other members of Casals' Group A, and sometimes cross-reactive with these by NT, but easily differentiated [15] .
Mice immunized with Mayaro or Sindibs [17] or attenuated VEE [7] show significant protection against Semliki challenge. Guinea pigs are protected against small doses of VEE or EEE by 2 (but not 1) doses of Semliki [7] .
The course of a human EEE Infection may have been modified by pre-existing Semliki immunity [26] .

SIRACA considers Semliki Forest virus to be a distinct virus type in serogroup A [10] ; it is a member of the Semliki complex, one of six complexes comprising serogroup A [10] .

Section VI - Biologic Characteristics

Virus Source (all VERTEBRATE isolates)

Lab Methods of Virus Recovery (ALL ISOLATIONS)
Newborn and weanling 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)	SM 14				2	20 mm	9.3** (45)		
LLC-MK2 (CL)					3	9 mm	10.0 (45)		

CPE and plaques in chick embryo (PC) (13), duck embryo (PC) and rhesus monkey kidney (PC) (43), BHK-21 (CL) and Vero (CL) (35). CPE in the HeLa (CL) (44) and mouse embryo cells (PC) (24). Multiplication in Aedes aegypti and Ae albopictus cell lines (36).

** 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 Antibodies: By NT, Africa up to 46% (3,8,9,29), India 3/192 (30); Malaya, Borneo up to 37% (11,18); N. Vietnam, Thailand up to 34% (18); Philippines 18/119. By HI, Gambia 30/49 (31).			
Aedes vexans	1		USSR, far east, 1971 (40)
Culex pipiens	1		USSR, far east, 1973 (40)
Sentinel mice	5		Nigeria (30)
Chimpanzee		up to 38% NT	Congo (Leo)
Wild birds	1		Central African Republic (34)
Quelea erythrops; wild birds;	1	2 CF, 1 HI	Nigeria (38); Yugoslavia (19)
Atelerix albiventris	1		Nigeria (38)
Rodents		12/245 HI	S. Africa
Domestic animals		13/386 NT	
Man (CSF, brain)	1		W. Germany (41, 42)

Mosquito isolations: 1 Aedes (Aedimorphus) abnormalis, Uganda(1); see Remarks.. 1 Ae (Adm) argenteopunctatus, Mozambique (16). 1 Eretmapodites grahami , Cameroun (5,32).1Ae palpalpis group, Central African Republic (34). 1 Ae (Adm) dentatus, Central plateau Kenya (39). 1 An (Cel) funestus, North Kenya (39). Aedes vittatus, Senegal (46).

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)	P-9	ic 0.02	Viremia, death	2	12.0
Mice (nb)		ip			
Mice (nb)		sc			
Mice (wn)	P-4	ic 0.03	Death (1)	3-4	7.3
Mice (wn)		ip 0.5	None at 10-2		
Mice (5-6 wk)	P-55	ic,ip,in	Death (1)	3-6	6.7+
rabbits, gp(yg)	P-19	ic,sc	Fever (ic), antibody (1)		
rabbits, gp	High passage	ic 0.1	Fever, paralysis, death (1)		
hamsters		ic, ip	Fatal ic, ip variable. Can infect progeny through milk		
rhesus monkeys	High passage	ic	Fever, paralysis, death (1)		
wild monkeys		ic	Sickness in most, usually followed by recovery and antibody		
wild monkeys		sc	No sign of infection, usually antibody (1)		
chick embryo (6-12 day)	High passage	various	Death; 11-24 hrs (12,28)		
chickens		ic,im	Viremia and antibody in some (32)		
wild birds			Viremia (33)		

Rats born of immune mothers show immune tolerance (23).

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
Serial salivary gland passage after parenteral inoculation achieved with Ae aegypti, An quadrimaculatus, Cx quinquefasciatus, Cx salinarius (37), Cx tarsalis, Ornithodoros savignyi and larval insects.									
Transmitted by Ae aegypti, Ae togoi, An albimanus, An quadrimaculatus.									

Section X - Histopathology

Character of lesions (specify host)
In experimental animals: viral encephalitis, hyperamia of renal cortex, intestinal haemorrhage and mononuclear infiltration (1). In chick embryos, scattered necrotic cells (12).

Inclusion Bodies — Intranuclear

Organs/Tissues Affected
Brain (LV); kidney (LV)

Category of tropism
Neurotropic

Section XI - Human Disease

In Nature	Residual	Death
Subclinical **Reported**	Overt Disease **Reported**	
Clinical Manifestations **CNS signs (including encephalitis) (R)**		
Number of Cases **Two (laboratory infections)**	Category (i.e. febrile illness, etc.) **Encephalitis**	

Section XII - Geographic Distribution

Known (Virus detected)
Africa: Uganda, Mozambique, Cameroun, Central African Republic, Kenya, Nigeria, Senegal (46); USSR (40).

Suspected (Antibody only detected)
Africa*: South Congo (Leo), Gambia; Far East: Malaysia, Borneo, Indonesia; N. Vietnam; Thailand, Philippines, India.

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Remarks

Prototype strain is in American Type Culture Collection. Two other rhesus monkeys became immune to Semliki after inoculation with wild-caught mosquitoes in Uganda, but no virus was isolated. * It is quite possible that positive sero reactors may be due to infection with other Group A viruses. Editor.