Virus Name: Sandfly fever Sicilian	Abbreviation: SFSV

Status
Arbovirus

Select Agent
No

SALS Level
2

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

Other Information

Antigenic Group
Phlebotomus Fever

SECTION I - Full Virus Name and Prototype Number

Prototype Strain Number / Designation
Sabin

Accession Number

Original Date Submitted
7/11/1984

Family
Bunyaviridae

Genus
Phlebovirus

Information From
Robert B. Tesh

Address
Yale Arbovirus Research Unit

Information Footnote
Revised

Section II - Original Source

Isolated By (name)
A.B. Sabin (1)

Isolated at Institute
Child. Hosp. Res. Fdn., Cincinnati

Host Genus
Man (pooled sera from two patients)

Species

Host Age/Stage
Adult

Sex
Male

Isolated From	Isolation Details
Serum/Plasma	

Signs and Symptoms of Illness
Fever, chills, headache, myalgia, conjuntival injection

Arthropod

Time Held Alive before Inoculation

Collection Method

Collection Date
9/8/1943

Place Collected (Minimum of City, State, Country)
Palermo region, Sicily, Italy

Latitude
38° 10' N

Longitude
13° 50' E

Macrohabitat
American troops in World War II during Phlebotomus fever epidemic

Microhabitat

Method of Storage until Inoculated
No refrigeration for two days, then frozen on dry ice

Footnotes

Section III - Method of Isolation

Inoculation Date
10/6/1943

Animal (Details will be in Section 6)
4 men*

Route Inoculated
Intracutaneous

Reisolation
Yes

Other Reasons

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) **3**	Infectivity	Sedimentation Coefficients(s) (S)
Percentage wt, of Virion Protein	Lipid	Carbohydrate
Virion Polypeptides: Number **3**	Details **MW: 21 x 103, 57 x 103 and 22 x 103 daltons (2)**	
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) **20%**	After Treatment Titer **<1.0 dex**	Control Titer **6.4 dex (3)**
Lipid Solvent (deoxycholate)	After Treatment Titer **Inactivated (4)**	Control Titer

Other (formalin, radiation)

Virion Morphology

Shape **Spherical**	Dimensions **100 + 10 nm in diameter (2)**	
Mean nm	Range nm	
Measurement Method **Electron microscopy (2)**	Surface Projections/Envelope **10 nm external fringe of surface projections**	Nucleocapsid Dimensions, Symmetry

Morphogenesis

Site of Constituent Formation in Cell	Site of Virion Assembly	Site of Virion Accumulation
Cytoplasm	**By budding into smooth-surfaced vesicles in Golgi region (4)**	
Inclusion Bodies	Other	

Hemagglutination

Hemaggiutination	Antigen Source	Erythrocytes (species used)
Yes	**SMB ext. by sucrose-acetone + sonication**	**Various**
pH Range	pH Optimum	
6.0-6.8	**6.0**	
Temperature Range	Temperature Optimum	
4dC - 37dC	**Not dependent**	

Remarks
The use of trypsinized red cells enhances agglutination (5)

Serologic Methods Recommended
HI, CF, NT

Footnotes
The use of trypsinized red cells enhances agglutination (5)

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

HI tests [7] :

Antigen (4 units)	HI titer of antibody to:									
	SFN	ICO	CHG	ANH	BUJ	ITP	SFS	KAR	CDU	AMT
Naples	1280	160	80	40	20	20	0	80	0	20
Icoaraci	80	640	20	20	40	0	0	160	0	80
Chagres	320	80	>320	160	40	0	0	80	0	160
Anhanga	40	20	40	2560	160	0	0	40	0	40
Bujaru	20	40	20	80	80	0	0	20	0	40
Itaporanga	10	160	80	10	80	320	0	40	0	80
Sicilian	0	10	10	0	80	0	80	20	0	10
Karimabad	20	80	0	0	40	0	0	>320	0	20
Candiru	0	40	0	10	0	10	0	80	160	0
Arumowot	20	40	20	0	20	0	0	20	0	160

Naples: SFN, Chagres: CHG, Bujaru: BUJ, Sicilian: SFS, Candiru: CDU Icoaraci: ICO, Anhanga: ANH, Itaporanga: ITP, Karimabad: KAR, Arumowot: AMT

In plaque neutralization test, SFS immune serum (homologous titer = 5120) inhibited FRI virus to a 1:160 dilution. In cross-CF and neutralization tests, SFS virus antigen and immune serum were unrelated to AGU, ALE, ANH, AMT, BUE, BUJ, CAC, CAI, CDU, CHG, CHI, GOR, TEH, ICO, TOS, ITA, ITP, KAR, SFN, NIQ, PAC, PT, RVF, RG, SAF, SAL, URU, GF, or TUR viruses, antigens or immune reagents [7] , [8] .

Section VI - Biologic Characteristics

Virus Source (all VERTEBRATE isolates)
Blood (M)

Lab Methods of Virus Recovery (ALL ISOLATIONS)
Newborn mice and Vero cell cultures. Human volunteers used in original isolation of virus

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)	Man 2, SM 34	4-6	4+		6-7	2-3 mm	5.7** (8)		
LLC-MK2 (CL)	SM 37		3+		6	2 mm	>7.0 (9)		
BHK-21 (CL)	SM 46	2-3	4+	7.3**(29)	3-4	Plaques	6.0 (10)		
Hamster embryo(PC)	SM 46	2	CPE		5	2-3 mm	8.5 (30)		

SFS virus did not grow in Aedes albopictus, Aedes aegypti or Toxorhynchites amboinensis cell lines (21,22).

** 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	1		Sicily, Italy (1)
Man	3		Nile Delta, Egypt(11)
Man	1/47		Pakistan (12, 13)
Man	3/6		Iran (12, 13)
Phlebotomus sp. (females)	17/106,404 (254 pools)		Nile Delta, Egypt(14, 15)
Phlebotomus sp. (males)	2/9,489 (31 pools)		Nile Delta, Egypt(15)
Phlebotomus papatasi (females)	1		Pakistan (16)
Phlebotomus sp.	9/26,734 (264 pools)		India (17)
Phlebotomus sp. (females)	49/10,615		Isfahan Prov.Iran(18)
Phlebotomus sp. (males)	1/1,870		

Antibodies to SFS virus have been found in human populations living in southern Europe, northern Africa and central Asia. For a summary of previous serologic studies, see Reference 19; for results of serologic studies in animals, see References 3 and 20.

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)	Man 2, SM 34	ic	Death,* no viremia detected (8)	4.5	
Mice (nb)		ip			
Mice (nb)		sc			
Mice (wn)		ic			
Mice (wn)		ip	Antibody and survival (8)		
hamster (nb)		ic	Death (8)		

* The original SFS strain was passed twice in humans and then serially passed in newborn mice three times before it began to cause illness. In subsequent mouse passages, the AST decreased (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

Experimental transmission of Sandfly fever virus (type unknown) to man by bite of infected Phlebotomus papatasi has been demonstrated repeatedly (1,23,24,25).

SFS did not survive or replicate in Aedes albopictus or Culex quinquefasciatus after inoculation (27).

Section X - Histopathology

Character of lesions (specify host)
Newborn mice and hamsters inoc. ic: encephalitic lesions produced.

Inclusion Bodies — Intranuclear

Organs/Tissues Affected

Category of tropism
Neurotropic

Section XI - Human Disease

In Nature	Residual	Death
Significant	**Reported**	

Subclinical — Overt Disease

Clinical Manifestations
Fever, myalgia, headache, retroorbital pain, conjunctival injection, anorexia, and malaise (1,24,28)

Number of Cases	Category (i.e. febrile illness, etc.)
Many	**Febrile illness**

Section XII - Geographic Distribution

Known (Virus detected)
Italy, Egypt, Iran, Pakistan, India

Suspected (Antibody only detected)
Bangladesh, Iraq, USSR, Turkey, Greece, Yugoslavia, Saudia Arabia, Tunisia, Morocco, Sudan, Somalia (19)

Section XIII - References

1. SABIN, A.B. 1951. Arch. ges. Virusforsch 4:367-410.
2. ROBESON, G., et al. 1979. J. Virol. 30:339-350.
3. BERGE, T.O., ed. International Catalogue of Arboviruses Including Certain Other Viruses of Vertebrates. Second edition, DHEW Pub. No. (CDC) 75-8301. Atlanta. 1975. pp. 626-627.
4. BISHOP, D.H.L. and Shope, R.E. In: Comprehensive Virology, H. Fraenkel-Conrat and R.R. Wagner, editors. Plenum Press, N.Y. 1979. pp. 1-156.
5. GAIDAMOVICH, S.Ya. and KURAKHMEDOVA, S.H. 1974. Arch. ges. Virusforsch 45:177-184.
6. ANDRADE, A.H.P. and Shope, R.E. Unpublished data.
7. TESH, R.B., et al. 1975. Am. J. Trop. Med. Hyg. 24:135-144.
8. TESH, R.B. Unpublished data.
9. STIM, T.B. 1969. J. Gen. Virol. 5:329-338.
10. SALIM, A.R. 1967. Trans. Roy. Soc. Trop. Med. Hyg. 61:259-264.
11. TAYLOR, R.M. 1959. Proc. VI Int. Congresses Trop. Med. and Malaria 5:149-158.
12. SUYEMOTO, W. Personal communication.
13. BARNETT, H. and SUYEMOTO, W. 1961. Trans. N.Y. Acad. Sci. 23:609-617.
14. SCHMIDT, J.R., et al. 1960. Am. J. Trop. Med. Hyg. 9:450-454.
15. SCHMIDT, J.R., et al. 1970. Am. J. Trop. Med. Hyg. 20:483-490.
16. GEORGE, J.F. 1971. J. Med. Ent. 7:670-676.
17. GOVERDHAN, M.K., et al. 1976. Indian J. Med. Res. 64:57-63.
18. TESH, R.B., et al. 1977. Am. J. Trop. Med. Hyg. 26:282-287.
19. TESH, R.B., et al. 1976. Bull. World Health Organ. 54:663-674.
20. TESH, R.B., et al. 1977. Am. J. Trop. Med. Hyg. 26:288-293.
21. KNUDSON, D.L. and BUCKLEY, S.M. In: Methods in Virology. K. Maramorosch and H. Koprowski, editors. Academic Press, N.Y. 1977. pp. 323-291.
22. TESH, R.B. 1980. J. Med. Ent. 17:338-343.
23. SABIN, A.B. 1955. Am. J. Trop. Med. Hyg. 4:198-207.
24. DOERR, R., et al. Das Pappatacifieber, Franz Deuticke, Leipzig, 1909.
25. WHITTINGHAM, H.E. 1924. J. State Med. 32:461-469.
26. MOCHKOVSKI, S.D., et al. 1937. Med. Parasitol. Parasitic Dis. 6:922-937.
27. TESH, R.B. 1975. J. Med. Ent. 12:1-4.
28. BARTELLONI, P.J. and TESH, R.B. 1976. Am. J. Trop. Med. Hyg. 25:456-462.
29. KARABATSOS, N. and BUCKLEY, S.M. 1967. Am. J. Trop. Med. Hyg. 16:99-105.
30. SALIM, A.R. 1967. Am. J. Trop. Med. Hyg. 16:92-98.

Remarks