Virus Name: Toscana	Abbreviation: TOSV

Status
Probable 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
ISS.Phl.3

Accession Number

Original Date Submitted
8/31/1984

Family
Bunyaviridae

Genus
Phlebovirus

Information From
P. Verani et al.

Address
Instituto Superiore di Sanita, Viale Regina Elena 299, I-00161 Rome, Italy

Information Footnote
Reviewed by editor

Section II - Original Source

Isolated By (name)
P. Verani et al. (1, 5)

Isolated at Institute
Instituto Superiore di Sanita, Rome

Host Genus
Phlebotomus perniciosus

Species

Host Age/Stage
80 adults

Sex
Not Answered

Isolated From

Isolation Details

Signs and Symptoms of Illness

Arthropod
Depleted

Time Held Alive before Inoculation
A few hours

Collection Method
Caught by hand

Collection Date
7/17/1971

Place Collected (Minimum of City, State, Country)
Monte Argentario, Toscana, Central Italy

Latitude
42° 25' N

Longitude
11° 10' E

Macrohabitat
Hills surrounding seashore

Microhabitat
Animal stables

Method of Storage until Inoculated
-70dC

Footnotes

Section III - Method of Isolation

Inoculation Date
2/16/1972

Animal (Details will be in Section 6)
nb mice (Tissue Culture)

Route Inoculated
Intracerebral

Reisolation
Yes

Other Reasons

Homologous Antibody Formation by Source Animal

Test(s) Used

Footnotes

Section IV - Virus Properties

Physicochemical

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)
6 dex of infectivity inactivated at pH 3.0

Lipid Solvent (ether - % used to test) **20%**	After Treatment Titer **3.2 dex**	Control Titer **6.6 dex**
Lipid Solvent (chloroform)	After Treatment Titer	Control Titer
Lipid Solvent (deoxycholate) **1:1000**	After Treatment Titer **<2.5 dex**	Control Titer **6.6 dex**

Other (formalin, radiation)

Virion Morphology

Shape **Spherical**	Dimensions **80 nm**	
Mean **84nm**nm	Range **77-97**nm	
Measurement Method **Electron microscopy of thin sections**	Surface Projections/Envelope **Enveloped**	Nucleocapsid Dimensions, Symmetry

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. by sucrose-acetone**	**Goose**
pH Range	pH Optimum	
5.75-6.2	**6.0**	
Temperature Range	Temperature Optimum	
22dC, 37dC	**37dC**	

Remarks
HA production is difficult, usually of poor titer

Serologic Methods Recommended
CF, NT, HI

Footnotes
HA production is difficult, usually of poor titer

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

The virus antigen did not react in CF testing with the following ascitic fluids: Icoaraci, Itaporanga, Karimabad, Punta Toro, Sicilian SF, Gabek Forest, but reacted with the ascitic fluid Naples SF. Antigenic relationships between Toscana and Naples SF by CF, HI, and NT (plaque method) tests were noted as follows:

Ascitic fluid	Antigen or Virus					
	Toscana			SFN		
	CF	HI	NT	CF	HI	NT
Toscana	256/128 *	160	640	128/128	80	160
SFN	64/64	40	0	256/128	640	640

* Antibody titer/antigen titer

At YARU [2] , it was shown by CF testing that immune serum to Toscana virus did not react with the antigens of Anhanga, Arumowot, Bujaru, Candiru, Chagres, Icoaraci, Itaporanga, Karimabad, Punta Toro, Sicilian SF, Gabek Forest. It was related to Naples SF by CF.

Cross NT (plaque method) were performed at Pacific Research Unit Hawaii [3] using Toscana virus and hyperimmune ascitic fluids (homologous titer = >5120) against each of the following viruses and specific antisera with negative results: Aguacate, Alenquer, Anhanga, Arumowot, Buenaventura, Bujaru, Cacao, Caimito, Candiru, Chagres, Charleville, Chilibre, Gordil, Tehran, Icoaraci, Itaporanga, Karimabad, Nique, Pacui, Punta Toro, Rift Valley fever (antiserum), Rio Grande, Salehabad, Sicilian SF, Gabek Forest, Urucuri. Antigenic relationships between Toscana, Naples SF, Frijoles, and Saint Floris were noted as follows:

Antiserum or Ascitic Fluid	Virus			
	Toscana	SFN	Frijoles	Saint Floris
Toscana	> 5120	10	40	80
SFN	20	320	40	40
Frijoles	0	0	10240	0
Saint Floris	0	0	0	5120

Section VI - Biologic Characteristics

Virus Source (all VERTEBRATE isolates)

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)	
Vero (CL)	SMB 4	2	4+	7.0**	5	pinpoint	9.0**		
Vero (CL)	SMB 4 V2	2	4+	7.5					
BHK-21 (CL)	SMB 4	2	4+						
CV-1 (CL)		2	4+						

** 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		76/357 PRNT	Toscana, Italy (4)
Man		2/135 PRNT	Piemonte, Italy
Man		1/67 PRNT	Sicily, Italy
Man		0/120 HI	Lazio, Italy
Sheep		3/75 PRNT	Toscana, Italy
Apodemus sylvaticus		10/119 PRNT	
Phlebotomus perniciosus	3/329 (4 pools)		Monte Argentario, Toscana, Italy
Phlebotomus perniciosus(males)	several		Italy (6)
Man (CSF)	1		Albufeira, Portugal * (7)
Pipistrellus kuhli	1		Tuscany Region, Italy (8)

* Virus isolated and identified in Sweden.

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)	SMB 4	ic 0.01	Death	3*	9.0
Mice (nb)		ip			
Mice (nb)		sc			
Mice (wn)	SMB 3	ic 0.03	Death	3.7	
Mice (wn)		ip 0.05	Death	6.5	
guinea pig		ic 0.10	Paralysis, irregular deaths		
guinea pig		ip 1.0	Antibodies		
rabbit		ic 0.20	Paralysis, few deaths		
rabbit		ip 2.50	Antibodies		
Monkey (Macaca fascicularis)	SMB 4	ic 1.0	Death	9	
Macaca fascicularis		ip 2.0	Antibodies		

*Incubation rather than AST

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
	Phlebotomus perniciosus fed on blood through chick membranes; 3-14 days post-feeding, 21-51% of flies infected. In one exp.,100 flies exposed to membrane blood meals, then eggs were laid. Virus recovered from 2 3rd instar larvae F1 progeny (6).								

Section X - Histopathology

Character of lesions (specify host)

Inclusion Bodies — Intranuclear

Organs/Tissues Affected

Category of tropism

Section XI - Human Disease

In Nature — Residual — Death

Reported

Subclinical — Overt Disease

Clinical Manifestations

Severe headache, Slight fever, photophobia; spontaneous recovery.

Number of Cases — Category (i.e. febrile illness, etc.)

> 1 — **Aseptic meningitis**

Section XII - Geographic Distribution

Known (Virus detected)

Toscana, Italy

Suspected (Antibody only detected)

Section XIII - References

1. Verani, P., et al. 1980. Zbl. Bak. Hyg. Suppl. 9, pp. 147-153.
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7. Ehrnst, A., et al. 1985. Lancet i:1212-1213.
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Remarks