Virus Name: Russian Spring Summer Encephalitis	Abbreviation: RSSEV

Status
Arbovirus

Select Agent
Yes

SALS Level
4

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
Sofjin

Accession Number

Original Date Submitted
2/7/1985

Family
Flaviviridae

Genus
Flavivirus

Information From
M.P. Chumakov and E.N. Levkovich

Address
Institute of Poliomyelitis and Viral Encephalitides, Acad. Med. Sci. Moscow B-27 USSR

Information Footnote
Reviewed by editor

Section II - Original Source

Isolated By (name)
Silber, et al. (1-10)

Isolated at Institute
Far East, USSR

Host Genus
Man

Species

Host Age/Stage
Young adult

Sex
Female

Isolated From	Isolation Details
Organs/Tissues	**Brain**

Signs and Symptoms of Illness
Encephalomyelitis with bulbar symptomatology (12)

Arthropod

Time Held Alive before Inoculation

Collection Method
Autopsy

Collection Date
5/1/1937

Place Collected (Minimum of City, State, Country)
Primorskii Kray, Far East, USSR

Latitude
45° N

Longitude
133° E

Macrohabitat
Taiga forest camp

Microhabitat

Method of Storage until Inoculated
Wet ice, inoculated within 2-3 hours of autopsy

Footnotes

Section III - Method of Isolation

Inoculation Date
5/1/1937

Animal (Details will be in Section 6)
ad mice

Route Inoculated
Intracerebral

Reisolation
Yes

Other Reasons
Conv. sera from TBE-RSSE patients; protective effect of vaccine made from this strain against TBE-RSSE

Homologous Antibody Formation by Source Animal
Not tested

Test(s) Used

Footnotes

Section IV - Virus Properties

Physicochemical
RNA

Pieces (number of genome segments)	Infectivity **Yes (14)**	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)

Lipid Solvent (ether - % used to test) **50%, +4dC, 24 hr**	After Treatment Titer **5.7 dex**	Control Titer **8.8 dex**
Lipid Solvent (chloroform)	After Treatment Titer	Control Titer
Lipid Solvent (deoxycholate) **0.1-0.3%**	After Treatment Titer **3.5 dex**	Control Titer **8.5 dex**

Other (formalin, radiation)
1 M MgCl2, 25/C for 6 days; reduces virus titer to 0 dex

Virion Morphology

Shape **Spherical, sl. Polygonal**	Dimensions **30-40 nm**	
Mean nm	Range nm	
Measurement Method	Surface Projections/Envelope	Nucleocapsid Dimensions,

Electron microscopy (7)	**Envelope bilayer observed**	Symmetry

Morphogenesis

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

Hemagglutination

Hemaggiutination **Yes**	Antigen Source **SMB; chick or pig kidney embryo cell cult. fluid, CAF ext. by borate-saline pH 9.0**	Erythrocytes (species used) **Goose**
pH Range **6.6-7.0**	pH Optimum **6.8**	
Temperature Range	Temperature Optimum **4dC**	

Remarks

Serologic Methods Recommended
HI, CF, NT, agar gel precipitation

Footnotes

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

1. Antigen (or live virus) and immune serum of registered strain of TBE- RSSE virus regularly gives evidence (in HI, CF, NT or cross-immunity tests) of close antigenic relationship to viruses of Group B tick-borne group including Siberian, Ural and Central European strains of tick-borne encephalitis virus, diphasic milk-borne fever in USSR, Omsk Hemorrhagic Fever (Type I and Type II), louping ill (Scotland), Kyasanur Forest Disease (India), Malayan strain Langat, Japanese strain Negishi, Canadian strain Powassan, and Astrakhan strains from Hyalomma pl. plumbeum ticks.
2. Homologous titer is always higher than heterologous titer in these reactions.
3. Antigen or immune serum of registered strain of TBE-RSSE virus in CF or neutralization tests lack antigenic relationships to viruses of Japanese B encephalitis, West Nile, SLE, EEE, WEE, VEE.
4. Registered strain of virus in HI test (Casals) has antigenic relationship to other members of Group B (including viruses of Japanese B encephalitis, SLE, and West Nile) [15] .
5. Strains of tick-borne encephalitis virus of man in Soviet Far Eastern, Siberian, Ural, Central European and Western European areas occurs in the form of at least two antigenic variants; these are demonstrable only by agar precipitation and specific adsorption mehtod (HI). These antigenic differences are minor [17] .
6. According to Casals by use of hyperimmune sera antigenic relationships to other Group B viruses can be demonstrated.

Section VI - Biologic Characteristics

Virus Source (all VERTEBRATE isolates)
Blood (M)(LV), cerebro spinal fluid (M), CNS (M)(LV), heart (M) (LV), lung (M), liver spleen (M)(LV), kidney (M), nasopharyngeal (M), urine (M), lymph node (M)

Lab Methods of Virus Recovery (ALL ISOLATIONS)
Newborn and weanling mice, chick embryos, and guinea pigs; and primary avian cell cultures

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)	

CPE generally is irregular.

Plaques obtained by use of special media in chick or pig embryo cultures.

Multiplication of virus in chick embryo or pig embryo cell cultures obtained to titers 7-8 dex per ml. (titered as mouse infective doses).

Phenomenon of interference with CPE viruses can be used for titration of TBE-RSSE antibodies.

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	Many occasions		Europe and Asia
Man	Many occasions		Endemic region, Europe and Asia
Domestic animals and pets	None		
Forest rodents, at least 10 species	Many occasions	17-20%	Far East and Siberia, USSR
Irinaceus roumanicus (hedgehog)		37%	
Forest birds of order Passeriformes; at least 10 species, including 6 Emberisa species			
Ix. persulcatus	Many		Far East, Siberia, USSR; European areas
Ix. ricinus	Many		
D. silvarum	Many		
D. pictus	Many		
D. marginatus, H. concinna,	Many		
H. japonica douglasi	Many		
Laelapid (Gamasoid) mites	2		Siberian lemming burrows; Taimyr Peninsula, Siberia, USSR

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)	Not generally	ic 0.01	Encephalitis and death	3-6	7-9
Mice (nb)	available	ip 0.03	Encephalitis and death	3-6	7-9
Mice (nb)		sc			
Mice (wn)		ic 0.03	Encephalitis and death	3-6	7-8
Mice (wn)		ip 0.25	Encephalitis and death	3-6	6-7
Syrian hamster (3-4 wk)		ic 0.03	Encephalitis and death	4-8	6-8
Syrian hamster (3-4 wk)		ip 0.25	Encephalitis and death	4-12	5-7
white rats (1-2 day)		ic 0.05	Encephalitis and death	4-6	7.2
domestic pigs (3-4 wk)		ic 0.2	Encephalitis and death	4-8	7
sheep (3-4 mo)		ic 0.5	Encephalitis and death	7-8	
guinea pigs (50-60 gm)		ic 0.1	Encephalitis and death	7-8	4-6
rhesus monkey (2-3 kg)		inthra-thalamic 0.5x2	Paralysis	5-15	
chick embryo (8-9 day)		ys 0.2	Death and/or passage to mice	3-5	6-8
chick embryo (8-9 day)		CAM 0.2	Death and/or passage to mice		

Il'yenko and colleagues reported that several weeks after ic inoc. with certain strains of TBE virus, some rhesus monkeys surviving acute encephalitis developed chronic atheotic movement disorders (19-21). This finding has been confirmed independently for the Vasil'chenko strain (22).

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

Section X - Histopathology

Character of lesions (specify host)
Mouse, Syrian hamster: meningoencephalo-poliomyelo- radiculoneuritis (Panencephalomyelitis). Typical localization: focal: upper cervical cord and medulla oblongata (12).

Inclusion Bodies — Intranuclear

Organs/Tissues Affected
Brain (M)(LV), spinal cord (M)(LV)

Category of tropism
Neurotropism

Section XI - Human Disease

In Nature
Significant

Residual
Significant

Death
Significant

Subclinical
Significant

Overt Disease
Significant

Clinical Manifestations
Fever, headache, prostration, conjunctival inflammation, stiff neck, myalgia, arthralgia, CNS signs (including encephalitis, hemorrhagic sings, leukopenia, CNS pleocytosis, vomiting, and flaccid paralysis of upper cervical cord localization

Number of Cases
Numerous

Category (i.e. febrile illness, etc.)
Febrile illness and encephalitis

Section XII - Geographic Distribution

Known (Virus detected)
USSR (European and Asian parts), Czechoslovakia, Poland, German Democratic Republic, Hungary, Austria, Holland, Yugoslavia, Finland, Switzerland, and others

Suspected (Antibody only detected)

Section XIII - References

1. Silber, L.A. 1939. Soviet Med. p. 23.
2. Silber, L.A. 1939. Arch. Biol. Nauk. 56:2.
3. Silber, L.A. 1946. Am. Rev. Soviet Med. Special Suppl. pp. 1-80.
4. Levkovich, E.N., et al. 1938. Arch. Biol. Nauk 52:162-182.
5. Chumakov, M.P. Tick-borne encephalitis of man, Medical Thesis, Moscow, 1944.
6. Chumakov, M.P. 1943. Neuropath. and Psychiatry 12.
7. Chumakov, M.P. 1939. Arch. Biol. Nauk 56:2,11.
8. Chumakov, M.P. 1944. Med. Parasitologia p. 4.
9. Pavlovsky, E.N. 1940. Arch.Biol.Nauk v.59:1-2.
10. Panov, A.I. 1938. Neuropath., and Psychiatry 7:18-32.
11. Panov, A.I. Tick-borne Encephalitis Med. State Pub. House. 1956.
12. Robinson, I.A. and Sergeeva, J.S. 1939. Arch.Biol.Nauk 2:11.
13. Tikhomirova, T.L., et al. 1964. Tsitologyia 6:592-594.
14. Sokol, F., et al. 1960. Acta Virologica 4:64-74.
15. Casals, J. 1944. J. Exp.Med. 79:341-359.
16. Casals, J. 1957. Trans. N.Y. Acad. Sci. Ser II. 19:219-235.
17. Clarke, D. 1960. J. Exp. Med. 111:21.
18. Clarke, D.H. Proc. Symp. Biol. Virus, TBE Complex, Praha. 1962. pp. 67-75.
19. Komandenko, N.I., et al. 1972. Zh. Nevropatol. Psikhiatr. 72:1000-1007.
20. Il'yenko, V.I., et al. 1974. Vopr. Virusol. 414-418.
21. Asher, D.M. Proc. 13th Inter. Congress Ped. 1971. Vienna Acad. Med. 3(2):379-384.
22. Asher, D.M. 1975. Adv. in Neurology, 10:277-289.
23. Shaiman, M.S. and Tarsevich, L.N., 1975. Unpublished data.

Remarks