Virus Name: Kumlinge	Abbreviation: KUMV

Status
Arbovirus

Select Agent
No

SALS Level
4

SALS Basis
Placed in Level 4 based on the close antigenic relationship with a known Level 4 agent, Russian spring-summer encephalitis, plus insufficient laboratory experience.

Other Information
Vaccination Recommended

Antigenic Group
B

SECTION I - Full Virus Name and Prototype Number

Prototype Strain Number / Designation
A 52 (Prototype of Finnish strains of TBE)

Accession Number

Original Date Submitted
12/25/1984

Family
Flaviviridae

Genus
Flavivirus

Information From
N. Oker-Blom

Address
Department of Virology, University of Helsinki, Finland SF 00290

Information Footnote
Reviewed by editor

Section II - Original Source

Isolated By (name)
N. Oker-Blom, et al. (1)

Isolated at Institute
Helsinki, Finland

Host Genus
Ixodes ricinus

Species

Host Age/Stage
See below*

Sex
Not Answered

Isolated From

Isolation Details

Signs and Symptoms of Illness

Arthropod

Time Held Alive before Inoculation

Collection Method
Blanketing

Collection Date
6/30/1959

Place Collected (Minimum of City, State, Country)
Kumlinge, Aland, SW Finland

Latitude
60° 15' N

Longitude
20° 48' E

Macrohabitat
Deciduous forest-pasture

Microhabitat
Ground vegetation of Corylus avellana grove

Method of Storage until Inoculated
Alive at +22dC

Footnotes

Section III - Method of Isolation

Inoculation Date
7/18/1959

Animal (Details will be in Section 6)
nb mice

Route Inoculated
Intracerebral

Reisolation
Yes

Other Reasons
Repeated isolationsfrom the same area

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 **1.23**	Sedimentation Coefficients(s) (S)	
Nucleocapsid Density	Sedimentation Coefficients(s) (S)	

Stability of Infectivity (effects)

pH (infective range)

Lipid Solvent (ether - % used to test) **1:5; 20 hr, 4dC**	After Treatment Titer **4.4 dex**	Control Titer **7.6 dex**
Lipid Solvent (chloroform)	After Treatment Titer	Control Titer
Lipid Solvent (deoxycholate) **1:1000**	After Treatment Titer **2.0 dex**	Control Titer **7.6 dex**

Other (formalin, radiation)

Virion Morphology

Shape **Spherical**	Dimensions **36 nm**	
Mean nm	Range nm	
Measurement Method **Electron microscopy (2,3)**	Surface Projections/Envelope **Envelope observed; diameter = 3-5 nm (3);**	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	
6.0-6.6	**6.2-6.4**	
Temperature Range	Temperature Optimum	
4-37dC	**21dC (room)**	

Remarks
In density gradient at least two separable hemagglutinins, CF antigens and precipitins (3). * Pool of 14 females, 12 males, 182 nymphes and 93 larvae ** Also aqueous-prot. ext.; cell culture fluid; other methods, see Reference 4.

Serologic Methods Recommended
NT, HI, antibody absorption, immunodiffusion in ag

Footnotes
In density gradient at least two separable hemagglutinins, CF antigens and precipitins (3). * Pool of 14 females, 12 males, 182 nymphes and 93 larvae ** Also aqueous-prot. ext.; cell culture fluid; other methods, see Reference 4.

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

In neutralization and complement-fixation tests, the virus was shown to belong to the TBE complex [1] . By using antibody absorption and diffusion-in-gel techniques, Clarke has shown the Kumlinge (A 52) virus to be a Central European subtype of the tick-borne encephalitis virus [5] , [6] .

Section VI - Biologic Characteristics

Virus Source (all VERTEBRATE isolates)
Blood (LV)

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)	
HeLa (CL)	MB 13 1-20.TC		Sl. CPE	7.5 [a] (12)					
Hela (CL)	MB 2		CPE	9.7 (13)					
U cells (CL)	MB 13 1-10.TC		Sl. CPE	7.0 [b] (12)					

[a] Titer of 9.0 by titration in mice; titer expressed in dex.

[b] Titer of 7.0 by titration in HeLa; 9.7 by titration in mice.

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	5 *		SW Finland (7)
Man		27/8,010 MI, NT, HI	Finland (8)
Endemic areas:			
Man		108/286 NT,HI	Kumlinge(SW Finland)
Man		21/305 NT,HI	Uukuniemi(SE Finland)
Cow		201/211 NT	Kumlinge, Finland
Cow		86/172 NT	Uukuniemi, Finland
Cow		13/6,585 NT,HI	Finland (9)
Sciurus vulgaris	5/9		Kumlinge, Finland(7)
Microtus agrestis	1/14		
Lepus timidus	1/1		Uukuniemi, Finland (7)
Turdus merula	2/9		Kumlinge, Finland (7)
Turdus philomelos	1/8		Uukuniemi, Finland (7)
Emberiza citrinella	1/10		Kumlinge, Finland (7)
Ixodes ricinus	19/12,001		SW, S, SE Finland (7)

* From acute phase blood

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)	MB 3	ic 0.01	Paralysis and death	4	9.8
Mice (nb)		ip 0.03	Paralysis and death	5	9.0
Mice (nb)		sc			
Mice (wn)		ic 0.03	Paralysis and death	5	9.1
Mice (wn)		ip 0.1	Paralysis and death	6	8.0
guinea pig (2 mo)			Antibody formation		
chickens (7 days)		sc	Viremia up to 13 days(11)		6.6
chickens (ad.)		sc	Viremia in 2/12, 1/12 isolations from brain and gizzard after 2 years		4.3
Turdus merula (10 days)	MB 2	sc 100LD50	Viremia in 1/4, antibody formation		2.7
Rana temporaria (ad)	MB 3	sc 0.1	No virus detected		
Bufo bufo (ad)		sc 0.1	No virus detected		

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)

Inclusion Bodies — Intranuclear

Organs/Tissues Affected

Category of tropism

Section XI - Human Disease

In Nature — Residual — Death
Significant

Subclinical — Overt Disease

Clinical Manifestations
Fever (S), headache (S), prostration (S), conjunctival inflammation (R), stiff neck (S), myalgia (R), CNS signs (including encephalitis)(S), CNS Pleocytosis (S), rash (R), vomiting (S) and biphasic fever

Number of Cases — Category (i.e. febrile illness, etc.)
About 5-20 annually (14,15)

Section XII - Geographic Distribution

Known (Virus detected)
Finland (1,7,16)

Suspected (Antibody only detected)

Section XIII - References

1. Oker-Blom, N., et al. 1962. In "Biology of viruses of the tick-borne Encephalitis Complex". II. 1960. (ed. H. Libikova). Academic Press Inc. New York. p. 423-429.
2. Weckstr"m, P. and Nyholm, M. 1965. Nature 205:211-212.
3. Weckstr"m, P. Unpublished results.
4. Salminen, A. 1962. Ann. Med. Exp. Fenn. 40:174-184.
5. Clarke, D.H. 1962. In "Biology of viruses of the tick-borne Encephalitis Complex".II. 1960. (ed. H. Libikova). Academic Press Inc. New York.p. 67.
6. Clarke, D.H. 1964. Bull. Wld. Hlth. Org. 31:45-56.
7. Brummer-Korvenkontio, M., et al. 1973. Am. J. Trop. Med. Hyg. 22:382-389.
8. Kaarianinen, L. 1965. Ann. Med. Exp. Fenn. 43:143-148.
9. Tuomi, J. and Brummer-Korvenkontio, M. 1965. Ann. Med. Exp. Fenn. 43:149-154.
10. Brummer-Korvenkontio, M., et al. 1962. Acta Path. Microbiol. Scand. Suppl. 154; 337.
11. Brummer-Korvenkontio, M., et al. 1970. Scand. J. Clin. Lab. Invest. 25 Suppl.105;113.
12. Kaarianinen, L. 1965. Ann. Med. Exp. Fenn. 43. Suppl. 1-6
13. Buckley, S.M. 1964. Proc. Soc. Exp. Biol. 116:354-358.
14. Oker-Blom, N. 1956. Ann. Med. Exp. Fenn. 34:309.
15. Wahlberg, P., et al. 1964. Acta Med. Scand. Suppl. 412:275.
16. Oker-Blom, N. 1961. Ciba Foundation study Group No. 7:68.
17. Kaarianinen, L., et al. 1961. Ann. Med. Exp. Fenn. 39:316-328.

Remarks