Virus Name: Uukuniemi		Abbreviation: UUKV
Status **Probable Arbovirus**	Select Agent **No**	SALS Level **2**

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

Other Information

Antigenic Group
Uukuniemi

SECTION I - Full Virus Name and Prototype Number

Prototype Strain Number / Designation	Accession Number	Original Date Submitted
S 23		10/17/1984

Family	Genus
Bunyaviridae	**Uukuvirus**

Information From	Address
N. Oker-Blomm and P. Saikku	**Department of Virology, University of Helsinki, Finland SF 00290**

Information Footnote
Reviewed by editor

Section II - Original Source

Isolated By (name)	Isolated at Institute	
N. Oker-Blom, et al. (1)	**Helsinki, Finland**	
Host Genus **Ixodes ricinus (L.) (pool of 182 engorged specimens)**	Species	Host Age/Stage **Adult**

Sex
Female

Isolated From	Isolation Details
Signs and Symptoms of Illness	Arthropod **Engorged**

Time Held Alive before Inoculation
22 days

Collection Method	Collection Date
Picked off from cows	**6/26/1950**

Place Collected (Minimum of City, State, Country)
Uukuniemi, SE Finland

Latitude	Longitude
61° 48' N	**30° 3' E**

Macrohabitat	Microhabitat	Method of Storage until Inoculated
Deciduous forest-pasture	**On cows**	**Alive at 22dC**

Footnotes

Section III - Method of Isolation

Inoculation Date
7/18/1960

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

Route Inoculated
Intracerebral

Reisolation
Yes

Other Reasons
Repeated isolations from the same area.

Homologous Antibody Formation by Source Animal

Test(s) Used

Footnotes

Section IV - Virus Properties

Physicochemical
RNA, Single Strand

Pieces (number of genome segments)
3

Infectivity

Sedimentation Coefficients(s)
29; 23; 17 s (7)(S)

Percentage wt, of Virion Protein

Lipid

Carbohydrate

Virion Polypeptides: Number
3

Details
Nucleocapsid (N): 25,000 MW; glycoproteins (G1, G2): 75,000, 65,000 MW (4, 33, 34).

Non-virion Polypeptides: Number

Details

Virion Density
1.20 gm/cc in CsCl

Sedimentation Coefficients(s)
450 s(S)

Nucleocapsid Density
1.31 gm/cc in CsCl (4)

Sedimentation Coefficients(s)
(S)

Stability of Infectivity (effects)

pH (infective range)
Rel. stable at pH 4.6-11.4 (mouse brain suspension)(8)

Lipid Solvent (ether - % used to test)
1:5

After Treatment Titer
1.7 dex

Control Titer
5.6 dex

Lipid Solvent (chloroform)

After Treatment Titer

Control Titer

Lipid Solvent (deoxycholate)
1:1000

After Treatment Titer
1.0 dex

Control Titer
5.5 dex

Other (formalin, radiation)
Not stabilized by MgCl2; sens. to chloroform, nonionic and ionic detergents (4,8,9)

Virion Morphology

Shape

Dimensions
95 nm

Mean
nm

Range
nm

Measurement Method	Surface Projections/Envelope	Nucleocapsid Dimensions, Symmetry
Electron microscopy (2-5)	**10 nm spikes, hexagonal array (2); lipid envelope (4,6)**	

Morphogenesis

Site of Constituent Formation in Cell	Site of Virion Assembly	Site of Virion Accumulation
	Buds through smooth surface cytoplasmic membranes (3)	**Cisternae and vesicles of Golgi complex and endoplasmic reticulum**
Inclusion Bodies	Other	

Hemagglutination

Hemaggiutination	Antigen Source	Erythrocytes (species used)
Yes	**SMB ext. by sucrose-acetone; BHK-21 culture fluid-serum free**	**Goose**
pH Range	pH Optimum	
5.6-6.6	**5.6-5.8**	
Temperature Range	Temperature Optimum	
4dC, RT, 3dC		

Remarks
HA not readily produced from all strains

Serologic Methods Recommended
CF, HI, NT

Footnotes
HA not readily produced from all strains

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

Neutralizing indices in suckling mice [1] :

Immune serum	Virus strain		
	S 23	AK 9	Tribec
Uukuniemi (S 23)	2.0 *	0.1	0.0
Tick-borne encephalitis (TBE)	<0.6	1.9	ND
AK 9 (local strain of TBE)	0.4	>2.7	ND
Tribec	<0.9	ND	>1.8
Lymphocytic choriomeningitis	0.0	ND	ND

* LNI in dex.

In Yale Arbovirus Research Unit the Uukuniemi virus was found to be related to some recent isolates (mainly from ticks) which together form the Uukuniemi group.
Results of complement-fixation tests (J. Casals):

Antigen	Immune serum			
	S 23	Potepli	GA	MWA
Uukuniemi S 23	256/128	512/128	8/8	0
Uukuniemi, Potepli	128/256	512/256	8/8	0
Grand Arbaud	16/16	16/16+	256/256	Traces
Manawa	0	0	8/8	512/512

Serum titer/antigen titer; O = no fixation at dilutions 1:8.

Results of hemagglutination-inhibition test (J. Casals):

Serum	Antigen, 8 Units					
	UUK	GA	MWA	LJN	BHA	QRF
Uukuniemi	640	40	40	0	0	0
Grand Arbaud	160	160	40	0	0	0
Manawa	80	20	160	0	0	0
Lanjan	0	0	0	80	0	0
Bhanja	0	0	0	0	80	0
Silverwater	0	0	0	0	0	0
Quaranfil	0	0	0	0	0	80
Johnston Atoll	0	0	0	0	0	320

0 = <10

(Ponteves and Zaliv Terpeniya are Uukuniemi group viruses listed in this catalogue not appearing in these tables.)

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)	
BHK-21 (CL)	TC, SMB	7	CPE	7.0**					
BHK-21 (CL)					4	Plaques	8.5**		
BS-C-1 (CL)	SMB	14	CPE	7.0					
Chick embryo (PC)	TC, SMB	5	CPE	2.0					
Chick embryo(PC)					4	Plaques	7.5		
Chick embryo(PC)		5		7.0 (a)					
PK (CL)		5	CPE	6.6					
LLC-MK2(CL)						Plaques			
Vero(CL), marten(CL), dormouse kidney(CL)			Partial to no CPE					+	

** Expressed in dex

(a) Interference assay

See references 3, 9, 26, 27

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		0/191 NT	Kumlinge, SW-Finland (11)
Man		6/100 HI	Czechoslovakia (12)
Man		19/127 HI	Hungary (13)
Cow		0/727 NT	N. Finland (11)
Cow		371/1,809 NT	S., Middle-Finland (11)
Cow		95/100 NT	Uukuniemi, Finland(11)
Cow		84/92 NT	Kumlinge, Finland (11)
Apodemus flavicollis	1	11/288 CF	Czechoslovakia (14, 15)
Apodemus flavicollis	1		Poland (16)
Passerine birds in summer (10 species)	12/736	5/23 HI	SW-, SE-Finland(9, 17) Czechoslovakia (18)
Blackbird, Turdus merula	1		USSR (10)
Ixodes ricinus	12/12,001		SE-, SW-Finland (9)
Ixodes ricinus	39/30,872		Czechoslovakia (19, 20)
Ixodes ricinus	2/3,811		Poland (16)
Ixodes ricinus	3/4,204		USSR (21)
I. ricinus	2		Norway (32)
I. ricinus and I. persulcatus	17		Lithuania (30)
I. Uriae	1 *		Norway (32)

* Uukuniemi-like

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 3	ic 0.01	Paralysis, death (9,22-24)	6	7.8
Mice (nb)		ip 0.03	Paralysis, death (9,22-24)	12	2.6
Mice (nb)		sc			
Mice (wn)		ic 0.03	No symptoms (9,22-24)		
Mice (wn)		ip 0.1	Antibody production (9,22-24)		
Apodemus flavicollis		ic, sc	No viremia; isolations from organs (14)		
Microtus arvalis (nb)		ic	Death (14)	5-8	7.0
Chlethrionomys glareolus (ad)		ic	No viremia; isolations from organs (14)		
guinea pig (2 mo)			Antibody formation		
chicken (6 day)		sc	Viremia, antibody formation (9)		3.6
embryonated egg (6-11 day)		CAM, ys	Death, CAM inflamm.(22)	3-6	7.5 (yolk)
rhesus monkey		ic	Viremia, meningeal symptoms (25)		
rhesus monkey		ip	Viremia		7.0

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
Ixodes ricinus	Passes transtadially (28); experimental transovarial transmission demonstrated (35).								
Aedes aegytpi	Multiplication, transmission (5)								

Section X - Histopathology

Character of lesions (specify host)
Meningoencephalitis, myelitis (14,23) and myositis (24) in suckling rodents; lymphocytary meningitis in rhesus monkeys when inoculated ic (25).

Inclusion Bodies — Intranuclear

Organs/Tissues Affected

Category of tropism
Neurotropic

Section XI - Human Disease

In Nature	Residual	Death
Subclinical	Overt Disease	
Clinical Manifestations		
Number of Cases	Category (i.e. febrile illness, etc.)	

Section XII - Geographic Distribution

Known (Virus detected)
Finland (1), Czechoslovakia (19), Poland (16), USSR (10,21,29), Lithuania (30), Norway (32).

Suspected (Antibody only detected)

Section XIII - References

1. OKER-BLOM, N. et al. 1964. Ann. Med. Exp. Fenn. 42:109.
2. SAIKKU, P. et al. 1970. Acta Virol. 14:103.
3. BONSDORFF, C.-H. von et al. 1970. Acta Virol. 14:109.
4. PETTERSSON, R. et al. 1971. Virology 46:721.
5. RAIKOVA, A. et al. 1971. Vopr. Virusol. 16:731.
6. RENKONEN, O. et al. 1972. Virology 50:899.
7. PETTERSSON, R. and KAARIANEN, L. 1973. Virology 56:608-619.
8. KOLMAN, J. 1970. Acta Virol. 14:159.
9. SAIKKU, P. and BRUMMER-KORVENKONTIO, M. 1973. Am. J. Trop. Med. Hyg. 22:390.
10. GAIDAMOVICH, S. et al. 1971. Acta Virol. 15:155. p.
11. SAIKKU, P. 1973. Am. J. Trop. Med. Hyg. 22:400.
12. SEKEYOVA, M. et al. 1970. Folia Parasitol. 17:341.
13. MOLNAR, E. et al. 1973. J. Hyg. Epid. Microbiol. Immunol. 17:1.
14. KOZUCH, O. et al. 1970. Acta Virol. 14:163.
15. KOLMAN, J. and HUSOVA, M. 1972. Folia Parasitol 19:61.
16. WROBLEWSKA- MULARCZYKOWA, Z. et al. 1970. Folia Parasitol. 17:375.
17. SAIKKU, P. 1974. Med. Biol. 52:98-103.
18. ERNEK, E. et al. 1971. Acta Virol. 15;335. p.
19. KOLMAN, J. et al. 1966. Acta Virol. 10:171.
20. KOLMAN, J. and HUSOVA, M. 1971. Folia Parasitol. 18:329.
21. GAIDAMOVICH, S. et al. 1971. Acta Virol. 15:333.
22. KOLMAN, J. 1970. Acta Virol. 14:151.
23. RAJCANI, J. and GRESIKOVA, M. 1970. Acta Virol. 14:59.
24. GUSOVSKY, Ya. et al. 1973. Vopr. Virusol. 18:167.
25. GRESIKOVA, M. et al. 1970. Acta Virol. 14:408.
26. STIM, T. 1969. J. Gen. Virol. 5:329.
27. MARHOUL, Z. 1970. Acta Virol. 14:249.
28. KOLMAN, J. and MEERGANSOVA, J. 1972. Folia Parasitol. 19:4.
29. SAMOILOVA, T. et al. 1973. Vopr. Virusol. 18:111.
30. CHUMAKOV, M.P. et al. 1973. Zh. Mikrobiol. Epidem. Immunobiol. 5:83-87.
31. THOMAS, L.A. et al. 1973. J. Med. Entomol. 10:165.
32. TRAAVIK, T. and MEHL, R. 1977. Arch. Virol. 54:317-332.
33. BONSDORFF, C.-H. von and PETTERSSON, R. 1975. J. Virol. 16:1296-1307.
34. PETTERSSON, R. et al. 1977. Cell 11:51-63.
35. SAMOILOVA, T.I. and DANILOVA, G.M. In: Ecology of Viruses Associated with Birds. V.I. Votyakov and D.K. Lvov, editors. Minsk Mater. Resp. Simp. Kamenyuki "Belovezh Puschuchu". 1974. pp. 18-19.

Remarks

First strains were isolated in Finland from ticks collected in June 1959 (Uukuniemi I 1 and Jomala A 21) (1,9). In many experiments Czech. strains (prototype Potepli PO 63) (19) and the Russian geographical variant "Shumakh" (10) have been used.