

Virus Name: Inkoo		Abbreviation: INKV
Status Possible Arbovirus	Select Agent No	SALS Level 2
SALS Basis Results of SALS surveys and information from the Catalogue.		
Other Information		
Antigenic Group California		

SECTION I - Full Virus Name and Prototype Number

Prototype Strain Number / Designation KN3641	Accession Number	Original Date Submitted 11/15/1984
Family Bunyaviridae	Genus Bunyavirus	
Information From N. Oker-Blom and M. Brummer-Korvenkontio	Address Department of Virology, University of Helsinki, Finland SF-00290	
Information Footnote Reviewed by editor		

Section II - Original Source

Isolated By (name) M. Brummer-Korvenkontio, et al.	Isolated at Institute Helsinki (1,2)	
Host Genus Aedes communis/punctor, pool of 34 mosquitoes	Species	Host Age/Stage Adults
Sex Not Answered		
<u>Isolated From</u>	<u>Isolation Details</u>	
Signs and Symptoms of Illness	Arthropod Depleted	
Time Held Alive before Inoculation		
Collection Method Aspiration while biting man	Collection Date 7/27/1964	
Place Collected (Minimum of City, State, Country) Inko, Southern Finland		
Latitude 60° 2' N	Longitude 24° 7' E	
Macrohabitat Swampy deciduous forest	Microhabitat	Method of Storage until Inoculated Alive at 4dC
Footnotes		

Section III - Method of Isolation

Inoculation Date
8/1/1964

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

Route Inoculated Intracerebral	Reisolation Yes
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Other Reasons

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) (S)
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Percentage wt, of Virion Protein	Lipid	Carbohydrate
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Virion Polypeptides: Number	Details At least two RNAs (about 28 and 33 S) obtained from virions by SDS-treatment.
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Non-virion Polypeptides: Number	Details
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Virion Density	Sedimentation Coefficients(s) (S)
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Nucleocapsid Density	Sedimentation Coefficients(s) (S)
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Stability of Infectivity (effects)

pH (infective range)

Lipid Solvent (ether - % used to test) 1:5	After Treatment Titer 4.5 dex	Control Titer 6.6 dex
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Lipid Solvent (chloroform)	After Treatment Titer	Control Titer
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Lipid Solvent (deoxycholate) 1:1000	After Treatment Titer <3.0 dex	Control Titer 7.3 dex
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Other (formalin, radiation)

Virion Morphology

Shape Spherical	Dimensions 90-100 nm
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Mean nm	Range nm
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Measurement Method	Surface Projections/Envelope	Nucleocapsid Dimensions
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Measurement method
Electron microscopy (3)

Surface Projections/Envelope
Envelope observed; numerous 15 nm spikes

Nucleocapsid Dimensions,
Symmetry
**Capsid:>1nm(4);Nucleoprotein
density=1.31(CsCl)**

Morphogenesis

Site of Constituent Formation in Cell

Site of Virion Assembly

Site of Virion Accumulation

Inclusion Bodies

Other

Hemagglutination

Hemagglutination
Yes

Antigen Source
**BHK-21, continuous human amnion cell cult. fl.,
serum-free; tween-ether tr.**

Erythrocytes (species used)
Goose

pH Range
5.8-6.8

pH Optimum
6.0

Temperature Range

Temperature Optimum

Remarks

Hemagglutinin separable from nucleoprotein in density gradient centrifugation.

Serologic Methods Recommended
CF, NT, HI

Footnotes

Hemagglutinin separable from nucleoprotein in density gradient centrifugation.

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

In preliminary tests Inkoo showed a relationship to the Tahyna virus of the California group [2] :

Mouse Immune Ascitic Fluid	Viruses/Antigens									
	Mouse		Cell culture		Complement-fixation			Hemagglutination-inhibition		
	NT		NT		INK	TAH	CVO	INK	TAH	CVO
Inko(INK)	3.9 *	3.4	160	10	160/80 **	40/160	0/0	320	160	0
Tahyna(TAH)	3.4	> 5.9	40	5120	40/40	80/80	NT	320	1280	NT
Calovo(CVO)	NT	NT	NT	NT	0/0	NT	1280/640	0	NT	10240

* Logs neutralized in dex

** Antibody titer/antigen titer

HI: 0 = <10

NT = not tested

In Yale Arbovirus Research Unit, Dr. J. Casals (in letter, 1970) found Inkoo to be an agent in the California group, distinguishable (by CF) from those whose name appear in the following table:

Antigen	Serum or Ascitic Fluid					
	Inkoo Sera		Tahyna	Calif. enceph.	Triv.	Melao
	1	2				
Inkoo	32/256	512+/256 ^a	<8	8/256	<4	256/128
Tahyna, lot a	8/256	NT	32/256	64/256	<4	NT
Tahyna, lot b	8/256	256/256+	32/128	128/128	<4	256/256
Calif. enceph.	16/128+	256/256	8/256	128/256	NT	256/128
Trivittatus	<8	128/256	<8	32/16	16/128	128/128
Melao	NT	128/128	NT	<16	NT	512+/256

1:one injection (others multiple)

^a Antibody titer/antigen titer

No fixation with following antigens and Inkoo serum sample No. 2: WEE, Sindbis, chikungunya, Semliki Forest virus, VEE, West Nile, Central European tick-borne, Zika, Anopheles A, Bunyamwera, Batai, Guaroa, Wyeomyia, Akabane, Manzanilla, Sathuperi, Simbu, Marituba, and Caraparau.

Section VI - Biologic Characteristics

Virus Source (all VERTEBRATE isolates)

Lab Methods of Virus Recovery (ALL ISOLATIONS)
Newborn mice, BS-C-1 cell cultures

Cell system (a)	Virus passage history (b)	Evidence of Infection						
		CPE			PLAQUES			Growth Without CPE +/- (g)
		Day (c)	Extent (d)	Titer TCD50/ml (e)	Day (c)	Size (f)	Titer PFU/ml (e)	
BHK-21 (CL)	SMB 3	1-2	CPE	6.1 ^b				
BHK-21 (CL)	SMB 4				3-4	Plaques	4.6 ^b	
BHK-21 (CL)	TC 5	1-2	CPE	7.1				
BHK-21 (CL)	TC 10				3-4	Plaques	8.2	
BHK-21 (CL)	TC 11	1	CPE	8.3				
HeLa (CL)	TC 5	1-2	CPE	7.1				
BS-C-1 (CL)	TC 10		CPE	3.9				
Human amnion (Utrecht)(CL)	TC 10		CPE	5.2				
Chick embryo(CL)			No CPE	4.7 PFU				+
Aedes aegypti(CL) (vesicles)			No CPE	4.2 PFU				+
Ae albopictus(CL)			No CPE	6.4 PFU				+

^b 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		1/53 NT	SW Archipelago, Finland (1, 5)

Man		135/829 NT	South Finland (1, 5)
Man		105/238 NT	North Finland (1, 5)
Man		42/61 NT	Finnish Lapland (1,5)
Cow		10/59 NT	SW Archipelago, Finland (1, 5)
Cow		144/386 NT	South Finland (1, 5)
Cow		145/224 NT	North Finland (1, 5)
Cow		84/95 NT	Finnish Lapland (1,5)
Reindeer		351/431 NT	
Chicken		0/63 NT	South Finland (1, 5)
Bats		0/27 NT	South Finland (5)
Snow hare (<i>Lepus timidus</i>)		48/909 NT	Whole Finland (5)
Brown hare (<i>L. europaeus</i>)		0/100 NT	South Finland (5)
Small rodents (5 species)		0/133 NT	
Red fox (<i>Vulpes vulpes</i>)		21/68 NT	Finland (5)
Moose (<i>Alces alces</i>)		389/604 NT	
Capercaillie (<i>Tetrao urogallus</i>)		0/407 NT	
Black grouse (<i>Lyrurus tetrix</i>)		0/492 NT	
Hazel grouse (<i>Tetrastes bonasia</i>)		2/230 NT	
Passerine birds (13 species)		0/35 NT	South Finland (5)
Mosquitoes	3/8,075		Mainly South Finland(1, 2)
Other blood-sucking arthropods	0/10,171		Mainly South Finland (2)

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	Death	3	8.2
Mice (nb)		ip 0.03	Death	7	4.5
Mice (nb)		sc			
Mice (wn)		ic 0.03	Death	6	5.5
Mice (wn)		ip 0.1	No symptoms		<2.0
Mice (nb)		TC 5	ic 0.01	Death	3

Section IX - Experimental Arthropod Infection and Transmission

Arthropod species & virus source(a)	Method of Infection log10/ml (b)		Incubation period (c)		Transmission 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 Reported	Residual	Death
Subclinical	Overt Disease	
Clinical Manifestations		
Number of Cases	Category (i.e. febrile illness, etc.) Febrile illness	

Section XII - Geographic Distribution

Known (Virus detected) Finland
Suspected (Antibody only detected)

Section XIII - References

1. Brummer-Korvenkontio, M.: In "Arboviruses of the California Complex and the Bunyamwera Group", Proceedings of a symposium held in Smolenice near Bratislava, 1966. V. Bardos, et al., eds. House Slovak Acad. Sci., Bratislava. 1969. pp. 131-13
2. Brummer-Korvenkontio, M., et al. 1973. Am. J. Trop. Med. and Hyg. 22:404-413.
3. Bonsdorff, C.-H., et al. 1969. Virology 39:342-344.
4. Saikku, P., et al. 1971. J. Gen. Virol. 13:335-337.
5. Brummer-Korvenkontio, M. 1973. Am. J. Trop. Med. and Hyg. 22:654-661.

Remarks
