

Virus Name: Kyasanur Forest Disease		Abbreviation: KFDV
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 W371	Accession Number	Original Date Submitted 12/7/1984
Family flavivirus	Genus	
Information From Telford H. Work	Address Virology Section, Communicable Disease Center, Atlanta, Georgia 30333	
Information Footnote Reviewed by editor		

Section II - Original Source

Isolated By (name) T. Work, et al. (1,2)	Isolated at Institute Virus Research Centre, Poona, India	
Host Genus Presbytis entellus	Species	Host Age/Stage adult
Sex Not Answered		
<u>Isolated From</u>	<u>Isolation Details</u>	
Whole Blood		
Clot		
Serum/Plasma		
Organs/Tissues	heart , serum, brain, liver, spleen, heart musc	
Signs and Symptoms of Illness weakness, thirst, (fever), headache, inability to walk or climb, prostration, moribund	Arthropod	
Time Held Alive before Inoculation		
Collection Method post mortem collection of organs, tissues (4)	Collection Date 3/27/1957	
Place Collected (Minimum of City, State, Country) Kyasanur Forest near Baragi Village		
Latitude 14° 50' N	Longitude 75° 10' E	
Macrohabitat Shimoga District, Mysore, India; mixed tropical deciduous and evergreen forest	Microhabitat Tropical deciduous forest	Method of Storage until Inoculated blood clot and serum, tissues in 20 vols 100% glycerine on wet ice
Footnotes		

Section III - Method of Isolation

Inoculation Date 3/28/1957		
Animal (Details will be in Section 6) mice*		
Route Inoculated intracerebral	Reisolation Yes	
Other Reasons additional isolations of identical virus from other dead monkeys found in same area		
Homologous Antibody Formation by <u>Source Animal</u> Not tested		
Test(s) Used		
Footnotes * nb, and wn mice		

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)

Lipid Solvent (ether - % used to test)	After Treatment Titer	Control Titer
Lipid Solvent (chloroform)	After Treatment Titer	Control Titer
Lipid Solvent (deoxycholate)	After Treatment Titer	Control Titer
Other (formalin, radiation)		

Virion Morphology

Shape	Dimensions	
Mean nm	Range nm	
Measurement Method	Surface Projections/Envelope	Nucleocapsid Dimensions, Symmetry

Morphogenesis

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

Hemagglutination

Hemagglutination Yes	Antigen Source SMB ext. by sucrose-acetone; acetone-ether; alk. aqueous ext.	Erythrocytes (species used) goose
pH Range 6.2-6.8	pH Optimum 6.4-6.6	
Temperature Range 24d-37d	Temperature Optimum 37dC	

Remarks

Serologic Methods Recommended

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

A member of the Russian Spring Summer complex of Group B

Distinct from:

Louping ill

Central European encephalitis

Omsk Hemorrhagic fever

Far Eastern Russian spring summer encephalitis

Langat

Negishi

As demonstrated now by numerous investigators and most specifically by agar gell diffusion tests by Clark [12] .

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 +/- (g)
		Day (c)	Extent (d)	Titer TCD50/ml (e)	Day (c)	Size (f)	Titer PFU/ml (e)	
HeLa (CL)			CPE				Plaques (14)	
Chick embryo (PC)			CPE				Plaques (15)	
Hamster kidney (PC)			CPE				Plaques (9)	
Monkey kidney (PC)			CPE				Plaques (9)	

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	>200	>1000 HI, NT	Shimoga District, India (9, 13)
Monkeys: Presbytis entellus, Macaca radiata	>100	>100 HI, NT	Mysore, India (9, 13)
Other wild animals:			
Rattus rattus wroughtoni	1	>100 NT	Shimoga District, Mysore, India (9, 13)
Rattus blanfordi	3	>100 NT	
Sancus murinus	2	>100 NT	
Funambulus t. tristriatus	0	>100 NT	
Tatera indica hardwickei	0	+	
Mus booduga	0	+	

Rhinolophus rouxi	4	Shimoga District, Mysore, India (16)	
Domestic mammals:			
Cattle	0	>100	Shimoga District, Mysore, India (9, 13)
Avian (numerous) Gallus sonnerati Pycnonotus jocosus fuscicaudatus Megalaima viridis	0		
Ticks:			
Haemaphysalis spinigera	>200*		
H. turturis	>100		
H. papuana kinneari	+		
H. kysanurensis	+		
H. minuta	+		
H. wellingtoni	+		
H. bispinosa	+		
Ixodes sp.	>2		
Ornithodoros (adult)	1		Shimoga District, Mysore, India (16)

* Most isolates from nymphs, others from adults, only two from larvae (13).

Experimental host and age	Passage history and strain	Inoculation Route-Dose	Evidence of infection	AST (days)	Titer log ₁₀ /ml	
mice (nb)	P9605	ic .02	Prostration, paralysis, death	3-5	>10.7	
mice (nb)		ip .02		4-6		
mice (nb)		sc				
mice (wn)		ic .03	5-7	>10.0		
mice (wn)		ip .03	5-8			
hamster (nb)	ic		Virus isol. in nb mice			
Rattus r. wroughtoni (ad)			Virus isol. in nb mice			
Suncus murinus (ad)			Virus isol. in nb mice			
Mus booduga (ad)			Virus isol. in nb mice			
domestic cattle (calf)			Virus isol. in nb mice			
leghorn chicken (chick)			Virus isol. in nb mice			
Gallus sonnerati			ic, ip, sc	Viremia		
Macaque monkeys (adult)						
palm squirrels				High viremia, death (17)		>6.0
Mus platythrix			ip 2.6-3.6 LD ₅₀	Viremia		3.6

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
Transmission by bite and transovarian passage demonstrated in H. spinigera (10).									

Section X - Histopathology

Character of lesions (specify host)
primates: non-specific changes in parenchymatous area (foca necrosis), focal hemorrhages, hemorrhagic exudations, (lung, enteron) interstitial leakage of RBC, erythrophagocytosis, reticuloendothelial elements in liver, spleen, kidney. Rare abnormality in CNS (4, 8).

Inclusion Bodies Intranuclear
Lower Vertebrates

Organs/Tissues Affected
brain (M)(LV), lungs (M)(LV), liver (M)(LV), spleen (M)(LV), kidney (M)(LV), heart (M)(LV)

Category of tropism
viscerotropic

Section XI - Human Disease

In Nature Significant	Residual Reported	Death Significant
Subclinical Significant	Overt Disease Significant	

Clinical Manifestations
fever (S), headache (S), prostration (S), conjunctival inflammation (S), stiff neck (S), myalgia (S), arthralgia (R), CNS signs (including encephalitis) (R), hemorrhagic signs (S), respiratory involvement (R), leukopenia (S), CNS pleocytosis (R), lymphadenopathy (R), vomiting (S).

Number of Cases
more than two hundred

Category (i.e. febrile illness, etc.)

Section XII - Geographic Distribution

Known (Virus detected)

Suspected (Antibody only detected)

Section XIII - References

1. Work, T.H. and Trapido, H. 1957. Indian J. Med. Sci. 11:1-2.
2. Work, T.H., et al. 1957. Indian J. Med. Sci. 11:619-645.
3. Murthy, D.P.N. 1958. J. Indian Med. Assn 31:125-127.
4. Iyer, C.G.S., et al. 1959. Indian J. Med. Sci. 13:1011-1022.
5. Trapido, H., et al. 1959. Indian J. Med. Res. 47:133-138.
6. Work, T.H., et al. 1959. Am. J. Publ. Hlth. 49:869-874.
7. Shah, K.V. and Murthy, D.P. N. 1960. Acta Virol. 4:329-334.
8. Iyer, C.G.S., et al. 1960. Indian J. Med. Res. 48:276-286.
9. Work, T.H. 1958. Prog. Med, Virol. 1:248-279.
10. Varma, M.G.R., et al. 1960. Trans. Roy. Soc. Trop. Med. Hyg. 54:509-516.
11. Webb, H.E. and Rao, R.L. 1961. Trans. Roy. Soc. Trop. Med. Hyg. 55:284-298.
12. Clarke, D.H. 1962. Proc. Sym. Biol. Vir. Tickborne Encephal. Complex Czech Acad. Sci., Prague. p. 67-75.
13. Indian Council of Medical Research, VRC, New Delhi, India. 1964. pp. 1-30.
14. Buckley, S.M. 1962. Proceedings XI Congress of Entomology (Vienna, 1960) 2:762.
15. Bhatt, P.N. 1962. Proc. Sym. Biol. Vir. Tickborne Encephal. Complex Czech. Acad. Sci., Prague. p. 195.
16. Rajagopalan, P.K., et al. 1969. Indian J. Med. Res. 57:805-808.
17. Webb, H.E. 1965. Trans. Roy. Soc. Trop. Med. Hyg. 59:205-211.
18. Goverdhan, M.K. and Anderson, C.R. 1972. Indian J. Med. Res. 60:1002-1006.
19. Bhat, U.K.M. and Goverdhan, J.K. 1973. Acta Virol. 17:337-342.

Remarks

The important experience with preparation and attempts at application of vaccines for this new and classic arbovirus public health problem - what to do about a new arbovirus disease affecting an indigenous rural population in a tropical region - is not given herein. This is in Reference 13, titled "Kyasanur Forest Disease 1957-1964", which summarized the continuing virological, ecological and public health investigations which have followed lines and hypothesis initiated seven years ago. The report (13) is obtainable from the Indian Council of Medical Research, Medical Enclave, New Delhi, India.