Virus Name: Kunjin		Abbreviation: KUNV
Status **Arbovirus**	Select Agent **No**	SALS Level **2**

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

Other Information

Antigenic Group
B

SECTION I - Full Virus Name and Prototype Number

Prototype Strain Number / Designation	Accession Number	Original Date Submitted
MRM16		1/5/1985

Family	Genus
Flaviviridae	**Flavivirus**

Information From	Address
R.L. Doherty	**Queensland Institute of Medical Research, Herston Rd., Herston, Brisbane**

Information Footnote
Reviewed by editor

Section II - Original Source

Isolated By (name)	Isolated at Institute	
Doherty, et al. (1)	**Brisbane**	
Host Genus **Culex annulirostris Skuse**	Species	Host Age/Stage **Adult**

Sex
Female

Isolated From	Isolation Details
Signs and Symptoms of Illness	Arthropod
Time Held Alive before Inoculation	
Collection Method **Aspirated from horses or man**	Collection Date **4/2/1960**

Place Collected (Minimum of City, State, Country)
Mitchell River Mission, Queensland, AS

Latitude	Longitude	
15° 30' S	**141° 40' E**	
Macrohabitat **Low-lying plain bordering Gulf of Carpentaria; open forest-grassland**	Microhabitat **On bank of creek at edge of aboriginal mission**	Method of Storage until Inoculated **Dry ice (-70dC) and Revco at -60dC**

Footnotes

Section III - Method of Isolation

Inoculation Date
4/26/1960

Animal (Details will be in Section 6)
nb mice

Route Inoculated
Intracerebral

Reisolation
Yes

Other Reasons
Subsequent isolations and demonstration of antibody in 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 **Electrophoresis on polyacrylamide gel showed four proteins in virion and at least three other virus-coded proteins in infected cells (15).**	
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

Hemaggiutination	Antigen Source	Erythrocytes (species used)
Yes	**SMB ext. by sucrose-acetone or acetone-ether**	**Goose**
pH Range	pH Optimum	
6.4-7.3	**6.6**	
Temperature Range	Temperature Optimum	
	37dC used routinely	

Remarks

Serologic Methods Recommended
CF, NT

Footnotes

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

	MRM16 Antigen				MRM16 Mouse Antiserum		
	HI	CF	NT		HIT	CF	NT
Immune Sera (mouse)	Ht/Ho	Ht/Ho	Ht/Ho	Antigens	Ht/Ho	Ht/Ho	Ht/Ho
Studies in Brisbane [1]							
MVE	320/640	32/128	<2.0/3.0	MVE	640/320	64/64	2.8/>6.0
Kokobera (MRM32)	40/640	<8/32	<1.5/>5.0	Kokobera	320/320	<8/64	2.2/>6.0
Edge Hill (C281)	40/320	<8/128	<1.5/>3.2	Edge Hill	640/320	128/64	1.7/>6.0
Stratford (C338)	80/320	8/64	3.0/3.0	Stratford	640/320	64/64	2.0/>6.0
Studies at RFVL in New York [2]							
Dengue 4		16/>128		RSSE		0/256	
RSSE	20/320	<4/32		Tembusu		0/128	
Tembusu		4/32		SLE		32/128	
Rio Bravo	320/5120			West Nile		16/128	
Bussuguara	20/160			JBE		8/128	

Modoc	640/5120			Rio Bravo	0/320		
Usutu	320/1280			Bussuquara	10/320		
Israel Turkey Men.	0/640			Modoc	0/320		
Wesselsbron	10/40			Usutu	0/320		
Spondweni	20/320			IT	80/320		
YF	320/5120			Wesselsbron	0/320		
Banzi	160/640			Spondweni	0/320		
Zika	160/2560			YF	0/320		
Ilheus	1280/5120			Banzi	0/320		
JBE	80/2560			Zika	20/320		
SLE	320/2560			Ilheus	0/320		

NT: LNI given in dex

Studies by plaque reduction (PR) and plaque inhibition (PI) which suggest that Kunjin and West Nile are closely related [3] .

	MRM61 Virus			MRM61 Rabbit Antiserum	
Sera (rabbit antisera)	PR	PI	Viruses	PR	PI
MVE	0.73/1.55	8-10/18-19	MVE	0.83/2.76	+/25-26
Edge Hill (C281)	0.32/1.91	0/18-20	Edge Hill	0.47/2.76	0/25-26
West Nile	1.24/3.31	10-13-20/22	West Nile	2.70/2.76	14-16/25-26

PR: LNI given in dex.

PI: Given as zone(s) of inhibition

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)	
Chick embryo (PC)	MRM 61 SMB 4	3	CPE		3-4	Plaques	8.1*(3)		
PS (CL)	MRM 61 SMB 5	3	4+	8.0*	4	3-4 mm	8.7 (11)		
BHK-21 (CL)	MRM 16 SMB 2	3,4	4+	8.3 (12)					
Vero (CL)	SMB 7				2	12 mm	8.1 (13)		
LLC-MK2 (CL)					2	2 mm	8.3 (13)		
Aedes albopictus(CL)								+ (17)	
Ae aegypti(CL)								+ (14)	

* 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	One isolation from laboratory infection		Brisbane, Australia (4)
Domestic fowl		14/73	NW Queensland, AS; 1959 survey (5)
Cattle		6/419 HI	Queensland, AS; 1965 (10)
Cx annulirostris	9/6703		Mitchell River, Mission, AS; 1960
Cx annulirostris	0/2260		Mitchell River, Mission, AS; 1961
Cx annulirostris	5/914		Mitchell River, Mission, AS; 1963
Cx squamosus	1/48		
Cx pseudovishnui group	3/73 pools		Sarawak; 1966 (9) Mitchell River, AS; 1966 (18)
Oriolus flavocinctus	1		
Horses	1/2 *		Australia (19)

* Virus isolated from cervical spinal cord of 1 of 2 horses both ill with encephalomyelitis; both were euthanized (19).

Cross-reaction between group B viruses makes it difficult to interpret serum surveys in North Queensland. However six human sera reacting to Kunjin only have been found in Cape York Peninsula (5).

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)	MRM16, SMB 3	ic 0.01	Death	4	10.0
Mice (nb)		ip 0.03	Death	5	9.5
Mice (nb)		sc			
Mice (wn)		ic 0.03	Death	5	8.5
Mice (wn)		ip 0.03	Few deaths only	10-14	
mice (nb)	MRM61, SMB 4	ic 0.01	Death	4	8.4
embryonated egg (7 day)	MRM16, SMB 3	ys 0.1	Death	<3	9.3(lesions)
"" (11 day)		CAM 0.05	Death and pocks		3.5(death)
rabbit (ad)		ip 0.2	Antibody formation		
guinea pig (ad)		ip 0.2	Antibody formation		
calf (2 mo)	SMB 7, 8	various	Clinical, pathol. and antibody (8)		

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
Culex quinquefasciatus	Adult females intrathoracically inoculated and membrane fed; virus multiplication demonstrated by titration in mice; 6.8/mosquito at 8 days; 5.5/mosquito at 25 days. Aedes aegypti infected by feeding transmitted virus by bite at 15-25 days (20). Exp. transovarial transmission demonstrated with Aedes albopictus (21).								

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

Subclinical
Reported

Overt Disease
Reported

Clinical Manifestations
Fever (R), rash (R), lymphadenopathy (R)

Number of Cases
1 (22)

Category (i.e. febrile illness, etc.)
Encephalitis (22)

Section XII - Geographic Distribution

Known (Virus detected)
Australia; Borneo, Indonesia; Sarawak, Malaysia.

Suspected (Antibody only detected)
Northern West Australia (7); Sepik District, New Guinea (16)

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Remarks