

Virus Name: Zika		Abbreviation: ZIKAV
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 MR 766	Accession Number	Original Date Submitted 2/3/1985
Family Flaviviridae	Genus Flavivirus	
Information From J.P. Woodall	Address YARU, Yale University School of Medicine, New Haven, Connecticut 06510, USA	
Information Footnote Reviewed by editor		

Section II - Original Source

Isolated By (name) Dick, Kitchen and Haddow (1)	Isolated at Institute Entebbe, Uganda	
Host Genus Rhesus monkey; sentinel (MR 766)	Species	Host Age/Stage Young adult
Sex Female		
<u>Isolated From</u>	<u>Isolation Details</u>	
Serum/Plasma		
Signs and Symptoms of Illness Fever (40C)	Arthropod	
Time Held Alive before Inoculation		
Collection Method Venepuncture	Collection Date 4/20/1947	
Place Collected (Minimum of City, State, Country) Zika Forest, near Entebbe, Uganda		
Latitude 0° 8' N	Longitude 32° 32' E	
Macrohabitat Tropical rain forest, on lake shore	Microhabitat Forest canopy	Method of Storage until Inoculated None
Footnotes		

Section III - Method of Isolation

Inoculation Date 4/20/1947	
Animal (Details will be in Section 6) wn mice	
Route Inoculated Intracerebral	Reisolation Not tried
Other Reasons Rhesus monkey MR 771 subinoculated with serum of MR 766 developed N antibody	
Homologous Antibody Formation by <u>Source Animal</u> Yes	
Test(s) Used NT	
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 Lyophilizes well.	
Non-virion Polypeptides: Number	Details	
Virion Density	Sedimentation Coefficients(s) (S)	
Nucleocapsid Density	Sedimentation Coefficients(s) (S)	
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<u>Stability of Infectivity (effects)</u>		
pH (infective range)		
Lipid Solvent (ether - % used to test) 1:1	After Treatment Titer 0/5 died	Control Titer 6/6 died (3)
Lipid Solvent (chloroform)	After Treatment Titer	Control Titer
Lipid Solvent (deoxycholate) 1:1000	After Treatment Titer 3.7 dex inact.(5)	Control Titer
Other (formalin, radiation) Viable up to six months at 4C in 50% glycerol (3).		
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<u>Virion Morphology</u>		
Shape	Dimensions 18-45 nm	
Mean nm	Range nm	
Measurement Method Membrane filtration (3,4)	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 acetone-ether; sucrose-acetone; fluorocarbon (14)	Erythrocytes (species used) Goose
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pH Range 5.8-6.7	pH Optimum 6.4-6.5
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Temperature Range 4-37dC	Temperature Optimum 37dC
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Remarks
HA inactivated by trypsin, chymotrypsin and papain (21). Sensitized erythrocyte agglutination test available (14).

Serologic Methods Recommended
NT, HI, CF

Footnotes
HA inactivated by trypsin, chymotrypsin and papain (21). Sensitized erythrocyte agglutination test available (14).

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

Cross-reactive in HI tests with other viruses of Casals' Group B [7].

Sometimes cross-reactive in NT with West Nile and dengue 1 [8], but easily differentiated from them [3].

Immunologically closer to Uganda S and yellow fever than to several other Group B viruses [6].

People with pre-existing Zika CF antibody do not respond to 17D yellow fever scratch vaccine in the same way as those without [22].

In an extensive cross-neutralization study involving 42 flaviviruses, Zika virus was placed in a subgroup or complex with Spondweni and "Chuku" viruses [14]. In a subsequent cross-neutralization study involving 65 viruses, Zika virus could not be placed in any complex [32].

Section VI - Biologic Characteristics

Virus Source (all VERTEBRATE isolates)
Blood (LV)(M)

Lab Methods of Virus Recovery (ALL ISOLATIONS)
Newborn and weanling mice; young monkeys

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)	
Chick embryo (PC)						Plaques		
Duck embryo (PC)			CPE			Plaques		
Rhesus monkey kidney(PC)						Plaques		
HeLa cells(CL)			CPE (25)					
Vero (CL)	P-149					No plaques (33)		
LLC-MK2 (CL)					4	6 mm	7.1* (33)	

* 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		Uganda (laboratory infection)(12)
Man		38/360 NT	Uganda (1, 9)
Man		6/36 NT	Tanzania (9)
Man	3	50%/304 NT	Nigeria (13, 26)
Man (blood)	1		Senegal (febrile mosq. Catcher)(12)
Man		up to 6% NT	Mozambique

Man		1/180 NT	Egypt (24)
Man		33%/440 NT	Senegal (23)
Man		33/196 NT	India (10)
Man		90/179 NT	Malaya (11, 19)
Man		9/50 NT	Borneo (11)
Man		12%/153 NT	Phillippines (15)
Man		5/100 NT	N. Vietnam and, Thailand (19)
Man	1		Portugal (laboratory infection)(30)
Wild monkeys		1/15 NT	Senegal(34);, Uganda(3)
Sentinel rhesus monkey	1	3/16 NT	Uganda (1)
<i>Aedes africanus</i>	2		Central African Republic (27)
<i>Ae luteocephalus</i>	2		Nigeria (28)
<i>Aedes</i> spp.	1		Nigeria (26)
<i>Ae aegypti</i>	1		Malaysia (29)
<i>Ae africanus</i>	15		Uganda (1, 2, 20)

4 of the *Ae africanus* isolates came from mosquitoes caught on human bait on a tower at and above the canopy level of the forest (20).

Experimental host and age	Passage history and strain	Inoculation Route-Dose	Evidence of infection	AST (days)	Titer log ₁₀ /ml
Mice (nb)	P-4	ic 0.02	Paralysis, death(2)		8.2
Mice (nb)		ip			
Mice (nb)		sc			
Mice (wn)	P-10	ic 0.03	Paralysis, death(3)	11-12	5.9
Mice (wn)	P-99	ip 0.06	Paralysis, death(1)	10	<2.2
Mice (5-6 wk)		ic 0.03	Paralysis, death(1)		8.3
Mice (7 day)		ip 0.06	Paralysis, death(3)		7.2
Mice (14 day)		ip 0.06	Paralysis, death(3)		<2.7
rhesus monkey (ad)	P-107+	ic,sc	Viremia, antibody (1,3)		
wild monkeys (ad)	P-34+	ic,sc	Viremia, antibody (3)		
rabbits (ad)		ic	Antibody (3)		
cotton rats (ad)		P-123	ic	Resistant to challenge (3)	
guinea pigs	P-3	ic	Died, but no virus recovered. Pass 10-115 gave no reaction (3)		
guinea pigs (ad)	P-1 (MP 1429)	ip 1.0	Antibody (after repeated inoc)		
chick embryo (6-12 day)	P-144	various	Virus multiplication, occasional death (17)		
Occasional survivors found at low dilutions in MR 766 and E/1 strains up to 50-59th adult mouse brain passage (3)					

Section IX - Experimental Arthropod Infection and Transmission

Arthropod species & virus source(a)	Method of Infection log ₁₀ /ml (b)		Incubation period (c)		Transmission by bite (d)		Assay of arthropod, log ₁₀ /ml (e)		
	Feeding	Injected	Days	°C	Host	Ratio	Whole	Organ	System

Section X - Histopathology

Character of lesions (specify host)
Mice: cellular degeneration in CNS (3) myocarditis and skeletal myositis (2). Cowdry type A inclusion bodies in CNS (2).

Inclusion Bodies Intranuclear
Lower Vertebrates

Organs/Tissues Affected
Brain (LV), spinal cord (LV), heart (LV), skeletal muscles (LV)

Category of tropism
Neurotropic (in mice)

Section XI - Human Disease

In Nature Reported	Residual	Death
Subclinical	Overt Disease Reported	
Clinical Manifestations Fever (R), headache (R), rash (R)		
Number of Cases 2 (lab. infections) (12,30); 11 (12,26,31)	Category (i.e. febrile illness, etc.) Febrile illness; with rash	

Section XII - Geographic Distribution

Known (Virus detected)

Uganda, Nigeria, Central African Republic, Malaysia, Senegal, Ivory Coast (34)

Suspected (Antibody only detected)

India, Thailand, N. Vietnam, Philippines, Egypt

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Remarks

The virus reported as Zika (MacNamara, F.N. 1954. *Trans. R. Soc. Trop. Med. Hyg.* 48:139 and Bearcroft, W.G.C. 1956. *Trans. R. Soc. Trop. Med. Hyg.* 50:442) on subsequent study by Dr. Delphine Clarke was found to be more closely related, if not identical, to Spondweni virus. It was referred to by the strain name of "CHUKU".