Virus Name: Chikungunya	Abbreviation: CHIKV

Status
Arbovirus

Select Agent
No

SALS Level
3

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

Other Information
DOC Permit Required, Hepa Filtration, Vaccination Recommended

Antigenic Group
A

SECTION I - Full Virus Name and Prototype Number

Prototype Strain Number / Designation
S 27

Accession Number

Original Date Submitted
2/3/1985

Family
Togaviridae

Genus
Alphavirus

Information From
J.P. Woodall

Address
YARU, Yale University School of Medicine, New Haven, Connecticut, 06510, USAR.

Information Footnote
Reviewed by editor

Section II - Original Source

Isolated By (name)
W. Ross (1)

Isolated at Institute
Entebbe, Uganda

Host Genus
Man

Species

Host Age/Stage

Sex
Female

Isolated From	Isolation Details
Serum/Plasma	

Signs and Symptoms of Illness
Fever, joint pains

Arthropod

Time Held Alive before Inoculation

Collection Method
Venepuncture with vacuum venule

Collection Date
2/22/1953

Place Collected (Minimum of City, State, Country)
Liteho, Newala district, Tanzania

Latitude
10° 13' S

Longitude
39° 30' E

Macrohabitat
Cultivated plateau 2000 ft. A.S.L.

Microhabitat
Rural community

Method of Storage until Inoculated
On water ice

Footnotes

Section III - Method of Isolation

Inoculation Date
2/22/1953

Animal (Details will be in Section 6)
wn mice

Route Inoculated
Intracerebral

Reisolation
Yes

Other Reasons

Homologous Antibody Formation by Source Animal
Yes

Test(s) Used
NT

Footnotes

Section IV - Virus Properties

Physicochemical
RNA

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) **1:1**	After Treatment Titer **3.3 dex**	Control Titer **7.1 dex**
Lipid Solvent (chloroform)	After Treatment Titer	Control Titer
Lipid Solvent (deoxycholate)	After Treatment Titer	Control Titer

Other (formalin, radiation)
Unaffected by glycerine

Virion Morphology

Shape	Dimensions **42 - 59 nm**	
Mean nm	Range nm	
Measurement Method **Electron microscopy (17)**	Surface Projections/Envelope	Nucleocapsid Dimensions, Symmetry

Electron Microscopy (17) | 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; serum ext. by sucrose-acetone + prot.,fluorocarbon14); acetone-ether**	**Goose**
pH Range	pH Optimum	
5.8-6.3	**5.9-6.2**	
Temperature Range	Temperature Optimum	
	37dC	

Remarks
Low passage antiserum inhibits both high and low passage HA antigens, buthigh passage antiserum is not as good against low+(12-14) as against high(>170) passage antigen (26). Autointerference occurs (1); good interferon producer and interf. Sens.

Serologic Methods Recommended
HI, CF, NT, plaque-inhibition

Footnotes
Low passage antiserum inhibits both high and low passage HA antigens, buthigh passage antiserum is not as good against low+(12-14) as against high(>170) passage antigen (26). Autointerference occurs (1); good interferon producer and interf. Sens.

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

	Chikungunya Antigen					Chikungunya Immune Serum				
	HI		CF		NT	HI		CF		NT
	Ht/HO	Ratio	Ht/Ho	Ratio	ic	Ht/Ho	Ratio	Ht/Ho	Ratio	ic
ONN	20/2560	1/128	<8/128	>1/16	2.5*	160/320	1/2	64/256	1/4	4.4*
Mayaro	160/5120	1/32	8/32	1/4	2.2	80/2560	1/32	16/128	1/8	2.7
Semliki	40/5120	1/128	<4/256	>1/64	1.4	<10/2560	>1/256	16/128	1/8	2.0*
WEE	12/3870	1/320	<4/128	>1/32	0.6	16/2080	1/130	<4/128	>1/32	
EEE	15/5490	1/360	<4/512	>1/128	0.4	7/2080	1/300	<4/128	>1/32	
VEE	14/4780	1/340	<4/512	>1/128	0.8	7/2080	1/300	<4/128	>1/32	
Sindbis	8/968	1/120	<4/256	>1/64	0	8/2080	1/300	<4/128	>1/32	<1.8*
AMM2021	20/10240	1/512	8/256	1/32		49/2080	1/42	<4/128	>1/32	<1.3*

* NT done with the Th-35 strain (Thailand); NT results given as LNI in dex.

All immune sera were prepared in mice by repeated inoculations.

African strains appear to be antigenically more primitive than Asian strains [26] and can be clearly distinguished.

Plaque inhibition tests show (a) chikungunya and o'nyong-nyong can be distinguished only by using single-inoculation mouse antisera, not multiple- inoc. mouse, or rabbit, (b) African and Asian strains of chikungunya are not separable using mouse antisera only, (c) Semliki Forest antiserum inhibits chikungunya plaques, but not vice versa.
SIRACA has antigenically classified chikungunya virus and placed it in the Semliki Forest complex of serogroup A. In addition, ONN virus has been classified as a subtype of chikungunya virus [14] . For additional information on antigenic relationships, see References [17] , [39] - [42] .

Section VI - Biologic Characteristics

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

Lab Methods of Virus Recovery (ALL ISOLATIONS)
Newborn and weanling mice and primates

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)	

HeLa (CL): CPE (18); mouse (PC), duck (PC) and chick embryo (PC): Plaques or CPE (22); Ae aegypti, Ae w-albus, Ae vittatus, An stephensi, Ae albopictus and Cx quinquefasciatus lines: multiplication (36); Drosophila line: multiplication (33). Vero (CL)and LLC-MK2 (CL): plaques (37).

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	12/29		Tanzania (1, 4); Uganda (5, 6)
Man		79/357 NT	E. Africa (1, 4, 6)
Man		up to 37.5%	Mozambique (14)
Man	1	32/508 NT	S. Africa (8, 12)
Man	2	60/242 NT	Congo (Leo) (21)
Man	1		S. Zimbabwe
Man	56		Nigeria (32)
Man		up to 82% HI	W. Africa (29)
Man	1		Senegal (33)
Man		15%/83 HI	USSR
Man	8		Philippines
Man		up to 70% NT	SE Asia

Man	4		Cambodia
Man	Many		Thailand (9), India (20, 23)
Bats (Scotophilus)	2		Senegal (6, 29)
Bird (Auripasser)	1		Nigeria (34)
Sentinel mice	1;1		Nigeria (32);, Senegal (33)
Cercopithecus aethiops (blood)	1		Senegal (37)

Chimpanzee: HI positives in Liberia (26), 12/79 NT Congo (Leo)

Monkeys: HI positives in Ethiopia, Zimbabwe, S. Africa, Thailand

Domestic animals: 4/370 NT, S. Africa, 171/755 HI Thailand

Mosquitoes: Ae aegypti 1 Tanzania (1,2), 7 Thailand, 9 Nigeria (34),1 Senegal (33); Ae africanus Uganda(5,6), 1 Bangui (35); other Aedes 1 Nigeria (34),1 Senegal (33), 1 India (20); Mansonia spp. Uganda(6), 1 Nigeria (34); Culex quinquefasciatus 1 Tanzania (1,2) 1 Thailand, other Culex 1 Thailand.

Others: Ornithodoros erraticus sonrai 1 Senegal (44); Papio papio 1 Senegal (43).

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)	P-8 (S27)	ic 0.02	Death, hem. Enteritis	4	9.5
Mice (nb)	P-10 (S15)	ip 0.02	Death		7.8
Mice (nb)		sc			
Mice (wn)	P-8 (S27)	ic 0.03	Antibody, occasional death		
Mice (wn)		ip 0.03	Antibody		
Mice (wn)	P-160 (S27)	ic 0.03	Irregular deaths(4)	7-13	8.0
guinea pigs, hamsters (ad)	P-18 (TH3)	ic 0.1	Antibody, occ. death (24,25)		
rabbits (ad)	(S27)	ip 0.5	Antibody (1)		
wild rodents(ad)	Vereen.	ip	Viremia, antibody (13)		
rhesus monkey	Acute ser. or mosq.	ip,sc	Fever, viremia, antibody (1,5)		
wild monkeys			Viremia		
chicks			Viremia, antibody		

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
Mosquito transmission achieved with Aedes furcifer-taylori group (to man) (11), Ae aegypti (7), Ae calceatus, Ae triseriatus, Ae togoi, Ae pseudoscutellaris, Ae polynesiensis, Anopheles albimanus, Mansonia africana, Eretmapodites chrysogaster, Ae albopictus.									

Section X - Histopathology

Character of lesions (specify host)
SM: encephalitic type damage to Ammon's horn, skeletal myositis, myocarditis (5), intestinal and sc haemorrhage. Haemorrhagic lesions also found in infant hamsters and white rats.

Inclusion Bodies — Intranuclear

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

Category of tropism
Pantropic

Section XI - Human Disease

In Nature
Significant

Residual
Reported

Death

Subclinical

Overt Disease
Reported

Clinical Manifestations
Fever (S), headache (S), prostration (R), conjunctival inflammation (R), myalgia (R), arthralgia (S), hemorrhagic signs (R), respiratory involvement (R), leukopenia (R), rash (S), lymphadenopathy (S),temp. may be diphasic (3)

Number of Cases
Hundreds

Category (i.e. febrile illness, etc.)
Febrile illness with rash

Section XII - Geographic Distribution

Known (Virus detected)
Congo (Leo), S. Zimbabwe, Angola, Senegal, Nigeria, Thailand, India, Malayasia, Cambodia, Philippines

Suspected (Antibody only detected)
Mozambique, Ethiopia, Laos, Burma, S. Vietnam, USSR

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Remarks

***The patient Mbalolo described as a case of chikungunya by Osterrieth, et al. was, in fact, a case of yellow fever (see E. Afr. Virus Res. Inst. Rep. 1960-61. No. 11. p. 27).**