Virus Name: **Thogoto** **Abbreviation:** **THOV**

Status: Probable Arbovirus **Select Agent:**
SALS Level: 3 **SALS Basis:** S **HEPA Filtration:**
Antigenic Group: Thogoto
Taxonomic status: *Not listed*
Other Information: None.

Section I - Full Virus Name and Prototype Number

Full Virus Name: **Prototype Number:**
Thogoto IIA
Information from: J.P. Woodall **Date:**
* 2/18/1985
Address: YARU, Yale University Sch. Med., New Haven, Connecticut 06510
*
Reviewed by editor

Section II - Original Source

Isolated by: D.A. Haig and D. Danskin (1) **at:** Veterinary Research Lab., Kabete, Kenya
Genus and species: Boophilus and Rhipicephalus ticks **Sentinel** X
Age/Stage: Adult **Sex:**

Isolated From	Isolation detail

Signs and symptoms of illness:
Arthropod engorged **depleted** **gravid**
Time held alive before inoculation:
Collection date: 9/6/1960 **Method:** Manual removal from cattle
Place collected: Thogoto forest, near Nairobi, Kenya
Latitude: 1° 15’ ” S **Longitude:** 36° 40’ ” E
Macrohabitat: Forest ca. 5600 feet A.S.L.
Microhabitat: Sentinel cattle
Method of storage until inoculated: Held alive
Footnotes:

Section III - Method of Isolation and Validity

Inoculation Date: 9/9/1960
Animal: nb mice **Embryonated egg:** **Tissue Culture:**
(Details in Section VI - Biologic Char.)
Route inoculated: Intracerebral **Reisolation:** No
Other reasons: Unrelated to any other virus in laboratory
Homologous antibody formation by ***source animal*** **(See Section II):**
Test used: HI **CF** **NT**
Other:
Footnotes:

Section IV - Virus Properties

Physicochemical:
RNA: **DNA:** **Single Strand:** **Double Strand:**
Pieces: **Infectivity:** **Sedimentation coefficient(s): /strong>**
Percentage wt. of virion protein **, lipid** **carbohydrate**
Virion polypeptides:
Number: **Details:** Morphologically, morphogenetically and structurally resemble Orthomyxoviridae (18.
Non-virion polypeptides:
Number: **Details:**
Virion density:
Sedimentation coefficient:
Nucleocapsid density **Sedimentation coefficient:**

Stability of infectivity **(effects) pH**
Lipid solvent:
(ether) 1:1 **After treatment titer** <1.5 dex **Control titer** 5.3 dex
(chloroform) **After treatment titer** **Control titer**
Detergent:
(deoxycholate) **After treatment titer** **Control titer**
Other (formalin, radiation):

Virion morphology:
Shape **Dimensions** <250 nm
Mean (nm) **range (nm)** **how meansured** Gradocol filtration
Surface projections, envelope
Nucleocapsid dimensions, symmetry

Morphogenesis:
Site of constituent formation in cell
Site of virion assembly
Inclusion bodies
Other

Hemaggiutination:
HemaggiutinationYes **Antigen source** SM liver ext. by sucrose-acetone; acetone-ether; flourocarbon
Erthrocytes Goose **pH range** 5.8-5.9 **pH optimum**
Temperature optimum 4dC **range**
Remarks HA antigens also prepared by PEG precipitation of infective BHK-21 cell cult. fluids (19)
Serologic methods recommended HI, CF, NT
Footnotes: HA antigens also prepared by PEG precipitation of infective BHK-21 cell cult. fluids (19)

Section V - Antigenic Relationship And Lack of Relationship To Other Viruses

No reaction with antigen (A), immune serum (I), or both (X) of viruses listed:

	HI	CF	PT		HI	CF	PT		HI	CF	PT
Group A				**Group B (cont)**				**Others (cont)**			
Aura	A			Entebbe bat	I		I	Lagos bat		I	
Bebaru	A			**Group C**				Mossuril		I	
Chikungunya	X		I	Apeu			I	Nyando		640/256	I
EEE	A	A		Caraparu	A			RVF			I
Getah	A			Marituba	A			SF Sicilian	A		
Mayaro	A			Oriboca	A		I	Witwatersrand	A	I	I
Middelburg	X		I	**Bunyamwera gr**				Wad Medani		256/64	
Ndumu	I			Bunyamwera	X		I	Chenuda		64/64	
O'Nyong-Nyong	I		I	Germiston	X		I	CTF		64/128	
Semliki	X		I	Ilesha	X		I	Dalcairnie		256/512	
Sindbis	X		I	**California gr**				Hughes		256/256	
VEE	A			California	A			Ganjam		256/64	
WEE	A			Lumbo		I		Bhanja		512/256	
Group B				Tahyna	A	A		Wanowrie		512/256	
Dengue 1	I		I	**Simbu group**				Kaisodi		512/512	
Dengue 2	A		I	Akabane	A			Kemerovo		I	
Dengue 4		A		Ingwavuma	X	I		NSD		I	I
Banzi	X			Manzanilla	A			Nyamanini		256/512	
Dakar bat	I			Sathuperi	A			Quaranfil		512/16	
JBE	A			Simbu		I	I	Semunya (Cong)		A	I
MVE	A			**Bwamba group**				Silverwater		512/512	
Ntaya	X		I	Bwamba	A	I	I	Thogoto		128/32	
SLE	A			Pongola		I	I	**Mouse viruses**			
Spondweni	X		I	**Bakau group**				EMC		A	I
Uganda S	I		I	Bakau	A			GD 7		A	I
Usutu	I			Ketapang	A			LCM		A	
Wesselsbron	X		I	**Others**				Reovirus type 3		I	
West Nile	X		I	AHS		I		Theiler's FA			I
Yellow fever	X		I	Bluetongue		I					
Zika	X		I	Koongol	A						
Powassan	A			SF Naples	A						
RSSE	A										

HI = Haemagglutination-inhibition, 4-8 units of antigen, antiserum diluted 1:20.

CF = Complement fixation; first dilutions of antigens and antisera 1:4; where reciprocal cross tests were done, homologous antiserum/antigen titres are stated.

PT = Protection test; challenge dose was 160 ic LD50.

Many of the HI and CF tests were done at the Rockefeller Foundation Virus Labs., New York.

Section VI - Biologic Characteristics

Virus source (all VERTEBRATE isolates): Blood (M)(LV)
Lab Methods of Virus Recovery (ALL ISOLATIONS): Newborn mice
Susceptibility of Cell Culture Systems:

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)	P-15					Plaques	2.3*	
Lamb testis (PC)			CPE					
LLC-MK2 (CL)						Plaques (6)		
BHK-21(CL)	MB 5	2-3	4+	5.5* (7)				
BSC-1(CL), Vero(CL)			Replication (8)					
Vero (CL)	P5SM3				4-6	4 mm	6.3 (16)	
LLC-MK2 (CL)	P5SM3				4-6	4 mm	6.2 (16)	

* Expressed in dex

Section VII - Natural Host Range

Vertebrate (species and organ) and arthropod	No. isolations/No. tested	No. with antibody/No. tested Test used	Country and region
Man	2		Nigeria (3)
Man		0/48 NT	Rift Valley, Kenya
Cattle	17		Nigeria (2, 3, 4)
Cattle		12/53 NT	Rift Valley, Kenya
Camel	1		Kano, Nigeria (5)
Sheep		3/47 NT	Rift Valley, Kenya
Goats		1/15 NT	
Cattle		15/15 NT	Entebbe, Uganda
Pool of Boophilus decoloratus(95), Rhipicephalus simus(14), Rh appendiculatus(14), Rh evertsi(4)	1/10 pools		Kenya (1)
Pool of Bo decoloratus (50)	1/17		Kenya (1)
Pools of Amblyomma variegatum, Bo decoloratus, Bo annulatus	20		Central African Republic (15)
Rh bursa	2		Sicily (9)
Rh evertsi	1		Ethiopia (20)
Bo decoloratus	103		Nigeria (3, 4)
Bo decoloratus	19/869		Nigeria (10)
Am variegatum	3		Nigeria (3, 4)
Am variegatum	1/850		Nigeria (10)
Hyalomma truncatum	1		Nigeria (3, 4)

Hy anatolicum	2		Iran (17)
Hy anatolicum	1		Egypt (11)
Rh sanguineus	2		Portugal (22)
Am variegatum	1		Uganda (23)

Section VIII - Susceptibility To Experimental Infection (Record Viremia)

Experimental host and age	Passage history and strain	Inoculation Route-Dose	Evidence of infection	AST (days)	Titer log10/ml
Mice (nb)	P-15	ic 0.01	Death	3	7.7
Mice (nb)		ip 0.01	Death	3	7.7
Mice (nb)		sc			
Mice (wn)	P-2	ic	Sporadic deaths	4-8	
Mice (wn)		ip	Same	4-8	
hamster (wn)	P-3	ip 1.0	Death	3	
hamster (wn)	hamster spleen	ip 1.0	Death	2-3	7.7
guinea pigs (wn)		ip	No reaction		
rabbits (wn)		ip	No reaction		
sheep (ad)	P-2	iv 5.0	Fever	Survived	

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

Section X - Histopathology

Character of lesions: In hamsters: hyperaemia of brain, liver and small intestine; degeneration of neurons of cerebellum, necrosis of Purkinje cells, pronounced oedema of brain with distension of Virchow-Robin spaces. No perivascular cuffing.
Inclusion bodies:
Cytoplasmic:(M) **(LV)** **Intranuclear: (M)** **(LV)**
Organs-tissues affected: Brain (LV), liver (LV)
Category of tropism: Pantropic

Section XI - Human Disease

Human disease:	**In nature:**	**(S)** X	
	Death:	**(S)**	**(R)** X
	Residua:	**(S)**	**(R)**
Laboratory infections:	**Subclinical:**	**(S)**	**(R)**
	Overt Disease:	**(S)**	**(R)**

Clinical manifestations: CNS signs (including encephalitis)(R). Other siginificant symptoms: optic neuritis, meningoencephalitis
Category: **No. of cases:** 2 (12)

Section XII - Geographic Distribution

Known (virus):

Egypt (11), Kenya, Nigeria, Central African Republic (15), Sicily (9), Iran (17), Ethiopia (20), Cameroun (21), Portugal (22), Uganda (23)

Suspected (antibody):

Uganda

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Section XIV - Remarks

Thogoto is antigenically related to a virus isolated in Sicily which is presently unregistered. It has not been finally determined that the Sicilian isolate represents a distinct serotype or another strain of Thogoto.