

Virus Name: Langat		Abbreviation: LGTV
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 TP-21	Accession Number	Original Date Submitted 6/1/1984
Family Flaviviridae	Genus Flavivirus	
Information From C.E. Gordon Smith	Address London School of Hygiene and Tropical Medicine, Keppel Street, London, W.C.1	
Information Footnote		

Section II - Original Source

Isolated By (name) C.E. Gordon Smith (1)	Isolated at Institute Kuala Lumpur, Malaysia	
Host Genus Ixodes granulatus Supino	Species	Host Age/Stage Adult
Sex Female		
<u>Isolated From</u>	<u>Isolation Details</u>	
Signs and Symptoms of Illness Nil	Arthropod	
Time Held Alive before Inoculation		
Collection Method From trapped ground rats*	Collection Date 4/17/1956	
Place Collected (Minimum of City, State, Country) Ulu Langat Forest Reserve, Malaysia		
Latitude 3° 0' N	Longitude 101° 50' E	
Macrohabitat Forest	Microhabitat Forest floor	Method of Storage until Inoculated Live ticks
Footnotes		

Section III - Method of Isolation

Inoculation Date
4/18/1956

Animal (Details will be in Section 6)
nb mice

Route Inoculated Intracerebral	Reisolation Yes
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Other Reasons
No virus of Russian spring-summer group had ever been used in the laboratory.

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	
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) 1:2	After Treatment Titer 5.5 dex	Control Titer 8.0 dex
Lipid Solvent (chloroform)	After Treatment Titer	Control Titer
Lipid Solvent (deoxycholate) 0.1%	After Treatment Titer <5.0 dex	Control Titer 8.0 dex

Other (formalin, radiation)
Trypsin 0.05% After treatment: <2.7 dex Control titer: 8.0 dex

Virion Morphology

Shape Spherical particles	Dimensions About 33 nm; 35-42 nm	
Mean nm	Range nm	
Measurement Method Electron microscopy (negative stain; sections(8))	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	Erythrocytes (species used) Goose
pH Range 5.9-7.0	pH Optimum 6.5-6.7	
Temperature Range 4dC-37dC	Temperature Optimum 4dC	

Remarks
Also used centrifugation, protamine precipitation and calcium phosphate chromatography to purify HA (2,3) * Rattus mulleri validus, R.sabanus vociferans.

Serologic Methods Recommended
HI, CF, NT, agar gel precipitation (7)

Footnotes
Also used centrifugation, protamine precipitation and calcium phosphate chromatography to purify HA (2,3) * Rattus mulleri validus, R.sabanus vociferans.

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

Langat falls into Group B and as far as is known is not related to any viruses not in this group. It is more closely related to the tick-borne viruses than others in Group B.

Immune Sera	Langat Antigen			Antigens	Langat Antiserum	
	Ht/Ho	HI Index	NT Ht/Ho		Ht/Ho	HI Index
JE	40/320	0.125	0/3.4	JE	20/320	0.0625
Dengue 1	20/320	0.0625	0.5/2.4	Dengue 1	<20/320	<0.0625
Dengue 2	20/320	0.0625		Dengue 2	40/320	0.125
Yellow fever	<20/320	<0.0625		Yellow fever	20/320	0.125
Russian spring summer			2.9/3.8			

For information on relationship to other tick-borne viruses consult References [7] and [19].

Section VI - Biologic Characteristics

Virus Source (all VERTEBRATE isolates)
Blood (LV), spleen (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 +/- (g)
		Day (c)	Extent (d)	Titer TCD50/ml (e)	Day (c)	Size (f)	Titer PFU/ml (e)	
Chick embryo(PC)	P-8	2-4		Viral multiplication; peak titers = 6.4-8.4**		Plaques		+ (5,6)
Vero (CL)	P-4				9	1 mm	8.2** (14)	
LLC-MK2 (CL)					4	3-4 mm	9.4 (14)	
Rana temporaria tadpoles (PC)	P-10 TP64							+ (17)
Rhipicephalus appendiculatus(CL) (RA-243)								+ (18)
** Expressed in dex								

Vertebrate (species and organ) and arthropod	No. isolations/No. tested	No. with antibody/No. tested Test used	Country and region
<i>Ixodes granulatus</i>	7/15 pools		Ulu Langat, Malaysia
<i>Ixodes granulatus</i>	0/16 pools		Elsewhere, Malaysia
<i>Haemaphysalis papuana</i>	1		Central Thailand (15)
<i>Ixodes persulcatus</i>	7		Krasnoyarsk region, Central Siberia, USSR(20)
		HI NT	
<i>Rattus bowersi</i>		2/6	Ulu Langat Forest
<i>R. sabanus</i>		0/16 2/10	Reserve, Malaysia
<i>R. mulleri</i>		3/14 3/7	
<i>R. rajah</i>		2/22 2/15	
<i>R. jalorensis</i>		0/4 0/1	
<i>R. argentiventer</i>		0/15	Elsewhere, Malaysia
<i>R. bowersi</i>		0/5	
<i>R. mulleri</i>		1/17 0/4	
<i>R. sabanus</i>		0/47	
<i>R. rajah</i>		0/8 0/6	
<i>R. jalorensis</i>		0/44 0/5	
<i>R. annandeli</i>		1/27 1/27	
<i>R. whiteheadi</i>		0/6	
<i>R.r. diardi</i>		0/2	

Experimental host and age	Passage history and strain	Inoculation Route-Dose	Evidence of infection	AST (days)	Titer log ₁₀ /ml
Mice (nb)	P-2	ic 0.01	Paralysis, death	4	
Mice (nb)		ip 0.05	Paralysis, death	4-5	
Mice (nb)		sc			
Mice (wn)	P-5	ic 0.03	Paralysis, death	5	9.3
Mice (wn)		ip 0.1	Paralysis, death	14	9.0
albino rats (nb)	P-7	ip 0.05	Paralysis, death	9-10	
rhesus monkey (ad)		ic	Fever, viremia, antibody		
cynomologus monkey (ad)		sc	Viremia, antibody		
cynomologus monkey (ad)		oral	Viremia, antibody		
spider monkeys		feeding	Viremia, antibody		
man (ad)		sc	Fever, viremia, antibody		
chick (1 day)		sc	Viremia, antibody		

Adult rats sc; *R. bowersi* sc; guinea pig ip, ic; rabbits ip, ic; sheep, ic, sc; and *Microtus agrestis* given 7-9th passage all exhibited antibody formation only.

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	
Dermocentor marginatus larvae; MB-7,TP64	X									Virus multiplication; transtadial transmission. (Up to 6.3/0.03 in nymphs)(16).
Ixodes ricinus										Virus fed to larvae; virus multiplication, transmission by bite.
Haemaphysalis spinigera										Virus fed to larvae; trans-stadial transmission (4)

Section X - Histopathology

Character of lesions (specify host)

Mice: Perivascular cuffing and neuronal damage in cerebrum and anterior horns of thoracic and cervical cord. Man (experimental): Encephalitis in 2/27. Sheep, monkeys: Nil.

Inclusion Bodies

Intranuclear

Organs/Tissues Affected

Brain (LV), spinal cord (LV),

Category of tropism

Neurotropic

Section XI - Human Disease

In Nature

Residual

Death

Subclinical

Overt Disease

Clinical Manifestations

Fever (R), leukopenia (S); based on experimental infection of patients with malignant disease (9).

Number of Cases

No natural cases known

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

Encephalitis (9)

Section XII - Geographic Distribution

Known (Virus detected)

Malayasia; Thailand (15), Siberia, USSR (20)

Suspected (Antibody only detected)

Section XIII - References

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Remarks