Virus Name: Marburg	Abbreviation: MBGV

Status
Probably not Arbovirus

Select Agent
Yes

SALS Level
4

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

Other Information
DOC Permit Required

Antigenic Group
Marburg

SECTION I - Full Virus Name and Prototype Number

Prototype Strain Number / Designation
M.1/2 (1, 3)

Accession Number

Original Date Submitted
8/16/1984

Family
Not listed

Genus
Not listed

Information From
R. Siegert and D.I.H. Simpson

Address
Hygiene-Institut de Universitat, 355 Marburg/L, Pilgrimstein 2, and Queen's Univ. of Belfast, N. Ireland

Information Footnote
Reviewed by editor

Section II - Original Source

Isolated By (name)
R. Siegert

Isolated at Institute
Hygiene-Institut, Marburg

Host Genus
Man

Species

Host Age/Stage
40 years

Sex
Male

Isolated From	Isolation Details
Whole Blood	

Signs and Symptoms of Illness
Several, see XI (3) and XI (4)

Arthropod

Time Held Alive before Inoculation

Collection Method
Venepuncture

Collection Date
8/22/1967

Place Collected (Minimum of City, State, Country)
Marburg/L, Med. Klinik d. Universitat

Latitude
50° 50' N

Longitude
8° 45' E

Macrohabitat

Microhabitat

Method of Storage until Inoculated
No storage

Footnotes

Section III - Method of Isolation

Inoculation Date
8/22/1967

Animal (Details will be in Section 6)
guinea pig

Route Inoculated
Intraperitoneal

Reisolation
Yes

Other Reasons
Electron microscopy(1,7); repeated isolations in other laboratories (11,21)

Homologous Antibody Formation by Source Animal
Yes

Test(s) Used
CF, NT, IF (1,4,5,6)

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 **0 dex**	Control Titer **6.0 dex**
Lipid Solvent (chloroform) **Also used (4)**	After Treatment Titer	Control Titer
Lipid Solvent (deoxycholate) **1:1000**	After Treatment Titer **0 dex**	Control Titer **6.0 dex**

Other (formalin, radiation)

Virion Morphology

Shape **Rhabdovirus-like morphology**	Dimensions **70 x 665 nm**	
Mean nm	Range nm	
Measurement Method **Electron microscopy (7)**	Surface Projections/Envelope **Envelope observed**	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)
No	**Cell culture fluid; infected guinea pig liver, spleen.**	**Several****
pH Range	pH Optimum	
Temperature Range	Temperature Optimum	

Remarks
CF antigen prepared from "chronically" infected Vero carrier cultures (9, 10) (All organ extracts were nonspecific.) ** Chicken, guinea pig, goose, mouse, man

Serologic Methods Recommended
NT, CF

Footnotes
CF antigen prepared from "chronically" infected Vero carrier cultures (9, 10) (All organ extracts were nonspecific.) ** Chicken, guinea pig, goose, mouse, man

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

Marburg virus is an antigenically distinct virus, unrelated to any of almost 200 viruses with which it has been compared [10] .

Human convalescent and guinea pig immune sera showed negative results when tested by HI or CF against a large number of arbovirus and non-arbovirus antigens, including rhabdoviruses, Tacaribe group agents, and viruses causing hemorrhagic disease manifestations in man, monkeys or deer [10] .
Marburg virus was shown to be distantly related, by IFA, to the subsequently isolated Ebola virus. See Ebola virus registration card.

Section VI - Biologic Characteristics

Virus Source (all VERTEBRATE isolates)
Blood (M)(LV), CNS (LV), liver (M), spleen (M), nasopharyngeal (M), salivary gland (M) (from saliva swab)

Lab Methods of Virus Recovery (ALL ISOLATIONS)
Newborn mice and suckling hamsters; WI-26 human diploid embryo fibroblast

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)	

Marburg virus infects and replicates in a variety of mammalian cell cultures, including primary and continuous cell cultures, primary and continuous primate cell cultures, primary and continuous guinea pig cell cultures and BHK-21 cell cultures. In most instances, the development of CPE was variable or absent. One primary and one continuous primate cell culture, a continuous human cell culture and BHK-21 exhibited distinct CPE after infection with Marburg virus. Variable CPE was produced in Vero cell cultures, and CPE endpoints generally were 10-100 times lower than infective virus titrations. See Reference 14.

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	31/many		Marburg; Frankfurt, W. Germany
Man	3		Southern Africa (23, 24)
Man	4		Belgrade, Yugoslavia, West Germany
Cercopithecus aethiops *			No specific CF antibodies found in monkeys (9).Positive CF tests have been reported with sera from primate species as possible evidence of natural infection of primates in Uganda (22), but specificity of CF antibodies employing infected guinea pig crude liver antigens still questionable.
Man		22/22 CF	Marburg (6)
Man		1%/>400 IFA	Liberia (26)
Vervet monkeys		2 IFA	Kenya (25)
Baboons		3 IFA	

* No isolations from naturally infected animals.

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)		ic	Inapparent infection (15)		
Mice (nb)		ip	Inapparent infection (15)		
Mice (nb)		sc			
Mice (wn)		ic	Inapparent infection (15)		
Mice (wn)		ip	Inapparent infection (15)		
guinea pigs (ad)	Original human	ic 0.1	Febrile illness only (1,4,8)		
guinea pigs		ip 0.1	Febrile illness only (1,4,8)		
guinea pigs		sc 0.1	Febrile illness only (1,4,8)		
guinea pigs (ad)	GP 1	ic 0.1	Sickness and death	13-15	
guinea pigs		ip 0.1	Sickness and death		
guinea pigs		sc 0.1	Sickness and death		
monkeys (ad)	Original human	sc	Sickness and death (11,12)	6-10	
(rhesus, vervet	+GP passage	ip	Sickness and death (11,12)	6-10	
squirrel)		ic	Sickness and death (11,12)		
hamster (nb)	GP 9	ic 0.02	Death (16)	8-15	
hamster (nb)	hamster 9	ip 0.02	Death (16)		

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
Marburg virus found to replicate in Aedes aegypti but not in Anopheles maculipennis mosquitoes following intrathoracic inoculation. Virus did not multiply in experimentally inoculated Ixodes ricinus ticks (17).									

Section X - Histopathology

Character of lesions (specify host)
In man, see references 18,19.

Inclusion Bodies
Man

Intranuclear

Organs/Tissues Affected
Brain (M), spinal cord (M), lungs (M,LV), liver (M,LV), spleen (M,LV) kidney (M,LV) heart (M), blood vessels (M, LV), marrow (M), skeletal muscles (M), secretory glands (M)

Category of tropism

Section XI - Human Disease

In Nature
Significant

Residual

Death
Significant

Subclinical

Overt Disease
Significant

Clinical Manifestations
Fever, headache, prostration, conjunctival inflammation, myalgia, arthralgia, CNS signs, hemorrhagic signs, leukopenia, rash, lymphademopathy, vomiting, hepatitis and diarrhea.

Number of Cases
31 (7 deaths)

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

Section XII - Geographic Distribution

Known (Virus detected)
W. Germany , Yugoslavia, and Southern Africa (23)

Suspected (Antibody only detected)
Unknown

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Remarks