Virus Name: West Nile		Abbreviation: WNV
Status **Arbovirus**	Select Agent **No**	SALS Level **3**

SALS Basis

Other Information

Antigenic Group
B

SECTION I - Full Virus Name and Prototype Number

Prototype Strain Number / Designation
B 956

Accession Number

Original Date Submitted
7/16/1985

Family
Flaviviridae

Genus
Flavivirus

Information From

Address

Information Footnote
Reviewed by editor

Section II - Original Source

Isolated By (name)
Smithburn, et.al. (1)

Isolated at Institute
Yellow Fever Res. Inst., Entebbe, Uganda

Host Genus
Man

Species

Host Age/Stage
Adult

Sex
Female

Isolated From	Isolation Details
Serum/Plasma	

Signs and Symptoms of Illness
Fever only (100.6d F). Patient denied feeling ill.

Arthropod

Time Held Alive before Inoculation

Collection Method
Vacuum syringe

Collection Date
12/1/1937

Place Collected (Minimum of City, State, Country)
Omogo, West Nile District, Uganda

Latitude
3° 17' N

Longitude
31° 7' E

Macrohabitat
Tropical plateau savannah

Microhabitat

Method of Storage until Inoculated
In syringe, air temperature

Footnotes

Section III - Method of Isolation

Inoculation Date
12/1/1937

Animal (Details will be in Section 6)
wn mice

Route Inoculated
Intracerebral

Reisolation
Not tried

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 **<1.0 dex**	Control Titer **3.5 dex (2)**
Lipid Solvent (chloroform)	After Treatment Titer	Control Titer
Lipid Solvent (deoxycholate) **1:2000**	After Treatment Titer **<1.0 dex**	Control Titer **3.5 dex (2)**

Other (formalin, radiation)
Sensative to formalin, heat; inact. by trypsin, papain

Virion Morphology

Shape	Dimensions **21-35nm**	
Mean nm	Range nm	
Measurement Method **Filtration (1); EM (3)**	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

Hemaggiutination	Antigen Source	Erythrocytes (species used)
Yes	**SMB; cell culture; ext. by alk. Aqueous; sucrose-acetone; fluorocarbon**	

pH Range	pH Optimum
6.0-7.3	**6.6**

Temperature Range	Temperature Optimum
4-37dC	**37dC**

Remarks
Lypholizes well (1)

Serologic Methods Recommended
CF, HI, NT

Footnotes
Lypholizes well (1)

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

Member of Casal's Group B [9] . As far as is known, WN is not antigenically related to any viruses not in Group B.

Cross-reactive to a certain extent also in CF, NT and protection challenge with Japanese B and St. Louis viruses, but differentiable from them [5] ; however, cross-absorption studies have shown that WN is no more different from JBW and MVE than are African and American strains of yellow fever. Strains of WN from Africa and India can only be distinguished by very sensitive modification of HI test.
Spider monkeys inoculated with 17D are protected against West Nile challenge. Rhesus monkey inoculated with SLE followed by Ilheus produced high titered antibodies against WN [11] . Mice immunized with JBE are protected against WN challenge. 2/6 WN convalescent human sera also protected against yellow fever virus [15] .

Two independent cross-neutralization studies, employing 42 and 65 flaviviruses, respectively, have confirmed that West Nile is a member of the JBE-MVE-SLE complex within serogroup B [3] , [4] .

Section VI - Biologic Characteristics

Virus Source (all VERTEBRATE isolates)
Blood (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	
		Day (c)	Extent (d)	Titer TCD50/ml (e)	Day (c)	Size (f)	Titer PFU/ml (e)	+/- (g)	

Infects wide variety of human and primate tissues, rodents and wwine kidney, chick embryo (23). Multiplies in Ae aegypti cells, CPE in Ae albopictus line (30,31).

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
Arvicanthis niloticus (grass mouse)	2		Nigeria (32)
Camel	2		
Bats	1		India
Bats		4/48 NT	Egypt
Sentinal chickens	51	25/120 HI	S. Africa
Sentinal mice	12		Nigeria (32)
Horses	2	183/375 NT	Egypt
Horses	1		France
Horses		163/1,019 NT	S. Africa
Chimpanzee		up to 53% NT	Congo (Leo)
Monkeys (Cercopithecus)		57/189 NT	S. Africa

Man ISOLATIONS:1 to many from Uganda (1), S. Africa, Congo (Leo), Egypt (24), Israel, France, India, and Nigeria (36). ANTIBODIES: By NT, Africa up to 70% (24), Albania 2/112, Philippines 62/208; Malaya, Thailand 62/150 (14), Israel 81/246 (27), India 134/751 (12).

Wild Birds ISOLATIONS: Many in Egypt, 3 in Israel, 1 S. Africa, 1 Borneo,1 Cyprus (20), 2 Nigeria (28), 3 W. Slovakia (23).

Mosquitoes: Culex univittatus 5 Israel, 12 Egypt, 20 S. Africa. Cx antennatus 5 Egypt. Cx modestus 2 France. Cx vishnui 5. Cx quinquefasciatus 2 India (8). Cx weschei 1 Cent. Afr. Rep. (29). Cx molestus 1. Anopeheles coustani Israel. Cq metallica 1 Uganda. An subpictus 1 India (8). Aedes cantans 1 W. Slovakia (23). An maculopennis 1 Portugal (35).

Ticks: Argas hermanni 3 Egypt. Hyalomma plumbeum* 2 USSR.

Rodent antibodies: By HI, Rattus r. frugivoras 2/80, R. norwegicus 6/124, Acomys cahirinus 1/36 (all in Egypt) (33).

* Hyalomma plumbeum = Hyaloma m. marginatum of Hoogstraal.

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 36	ic 0.02	Death	2-5	11.0
mice (nb)		ip 0.03	Death	4-5	10.0
mice (nb)		sc			
mice (wn)	P<36	ic 0.03	Death (1)	3-5	9.8
mice (wn)		ip 0.06	Death (1)	3-10	3.2
rabbits (ad)	P 29	ic, corneal	Antibody (1)		
guinea pigs (ad, juv)		ic, ip, in	Antibody (1)		
hamsters (ad)		ic, ip	Death (transmit to young in milk)		
wild rodents			Fatal to gerbils after 1 blind passage; viremia and anti-body in Arvicanthus		
rhesus monkey (ad)	P 29+	ic, iv, in	Fever, encephalitis, occ. death (1)		
Cercopithecus monkey (ad)	P 20+	ic 0.2	Fever (1)		
man		im, iv, ip	Fever, occ. encephalitis (18)		
man, monkey, mouse, hamster			Have been infected by aerosol		
chicks, pigeons, wild birds		peripheral	Viremia, paralysis, occ. death		
chick embryo (6-12 day)	P 134	various	Death (13)		
domestic animals			Viremia, antibody; horse: encephalitis		

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
Arthropods: Can infect various spp. of Aedes, Anopheles, Culex, and ornithodoros and be transmitted by many. Bird-mosquito cycles succesful. Larvae pf Ae aegypti and various insects, and adult Argas ticks, can be infected but do not transmit.									
Ornithodoros moubata orally infected on viremic nb mice; trans. virus through tick bite and via coxal fluids (10).									

Section X - Histopathology

Character of lesions (specify host)
Man: post-mortem, diffuse encephalitis. Monkeys, mice guinea pigs, gerbils and chicks: lesions, typical of viral encephalitis (1); Horse: posterior spinal cord ventral horn poliomyelitis, menigieal edema.

Inclusion Bodies
Lower Vertabrates

Intranuclear
Lower Vertabrates

Organs/Tissues Affected
Brain (LV), spinal cord (LV), heart (LV), blood vessel (LV), marrow (LV), skeletal muscle (LV) secretory glands (LV), (adrenal cortex).

Category of tropism
Neurotropic (1), but blood vessel wall could be a primary site.

Section XI - Human Disease

In Nature
Significant

Residual
Reported

Death
Reported

Subclinical

Overt Disease
Reported

Clinical Manifestations
Fever (S), headache (S), conjunctival inflammation (R), myalgia (R), arthralgia (R), CNS signs (including encephaltis)(R), respiratory involvement (R), CNS pleocytosis (R), rash (S), lymphadenopathy (S), and myocarditis.

Number of Cases
hundreds

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

Section XII - Geographic Distribution

Known (Virus detected)
Egypt, Uganda, Congo (Leo), Central African Republic, Mozambique (34), Nigeria, India, Malaysia (Borneo), USSR, Israel, France, Cyprus, Portugal (36).

Suspected (Antibody only detected)
Africa; throughout Asia, Malaysia, Thailand, Philippines, Turkey, Albania, Corsica

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Remarks

The prototype strain is in the American Type Culture Collection. Enhances action of carcinogens in mice (19). Causes regression or oncolysis of various tumors (21).