

Virus Name: Benfica		Abbreviation: BENV
Status Arbovirus	Select Agent No	SALS Level 2
SALS Basis Placed at this biosafety level based on close antigenic or genetic relationship to other viruses in a group of 3 or more viruses, all of which are classified at this level.		
Other Information		
Antigenic Group Capim		

SECTION I - Full Virus Name and Prototype Number

Prototype Strain Number / Designation BeAn 84381	Accession Number	Original Date Submitted 9/29/1984
Family Bunyaviridae	Genus Bunyavirus	
Information From F.P. Pinheiro and Amelia P.A. Rosa	Address Inst. Evandro Chagas, FSESP, Brazilian Ministry of Health, CP 621, 66.000 Belem, Para, Brazil	
Information Footnote Revised		

Section II - Original Source

Isolated By (name) Belem Virus Laboratory	Isolated at Institute Instituto Evandro Chagas, Belem, Brazil	
Host Genus Mouse, sentinel	Species	Host Age/Stage Newborn
Sex Not Answered		
<u>Isolated From</u>	<u>Isolation Details</u>	
Organs/Tissues	Brain and liver	
Signs and Symptoms of Illness	Arthropod	
Time Held Alive before Inoculation		
Collection Method Unknown	Collection Date 4/9/1965	
Place Collected (Minimum of City, State, Country) Utinga Forest, Belem, Para, Brazil		
Latitude 1° 28' S	Longitude 48° 27' W	
Macrohabitat Watershed forest	Microhabitat Ground level	Method of Storage until Inoculated -60dC
Footnotes		

Section III - Method of Isolation

Inoculation Date
4/9/1965

Animal (Details will be in Section 6)
nb mice

Route Inoculated Intercerebral	Reisolation No
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Other Reasons
Other strains of the virus isolated in the same area.

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)	After Treatment Titer	Control Titer
Lipid Solvent (chloroform)	After Treatment Titer	Control Titer
Lipid Solvent (deoxycholate) 1:1000	After Treatment Titer <0.5 dex	Control Titer 7.8 dex
Other (formalin, radiation)		

Virion Morphology

Shape	Dimensions	
Mean nm	Range nm	
Measurement Method	Surface Projections/Envelope	Nucleocapsid Dimensions, Symmetry

Morphogenesis

Site of Constituent Formation in Cell

Site of Virion Assembly

Site of Virion Accumulation

Inclusion Bodies

Other

HemagglutinationHemagglutination
YesAntigen Source
SM serum treated by acetoneErythrocytes (species used)
GoosepH Range
5.8-6.0pH Optimum
5.8Temperature Range
RT and 37dCTemperature Optimum
Room temperature

Remarks

Serologic Methods Recommended
CF, HI, NT

Footnotes

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

Benfica virus has been shown to fall in the Capim group. Cross CF, HI, and neutralization tests gave the following results:

Sera	CF ANTIGENS						
	Capim	Guajara	Bushbush	Moriche	Acara	Benfica	Benevides
Capim	64/>256*	8/16	0	0	0	0	0
Guajara	0	32/16	0	0	0	0	0
Bushbush (BeAn 20076)	0	8/16	32/16	32/>256	0	0	0
Moriche	0	32/16	>256/16	>256/>256	0	0	0
Acara	0	0	0	0	16/>256	8/64	16/>256
Benfica	0	0	0	0	16/>256	32/64	32/>256
Benevides	0	0	0	0	16/>256	8/64	32/>256

* Antibody/antigen titers; 0 = <4/<4

HI

ANTIGENS (4 Units)

Sera	Capim	Guajara	Bushbush	Moriche	Acara	Benfica	Benevides
Capim	80	0	0	0	0	0	0
Guajara	0	80	0	0	0	0	0
Bushbush	0	0	80	0	0	20	0
Moriche	0	0	0	160	40	0	0
Acara	0	0	0	0	40	0	0
Benfica	0	0	20	0	0	80	0
Benevides	0	0	0	0	0	0	40

NEUTRALIZATION (Infant mice, ic route)

Sera	Virus		
	Acara	Benfica	Benevides
Acara	> 6.2**	0.1	0.1
Benfica (An 84381)	<1.2	> 5.1	0.1
Benevides (An 153564)	<1.2	0.1	>5.1

** LNI in dex

Section VI - Biologic Characteristics

Virus Source (all VERTEBRATE isolates)
Brain and liver (LV), 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 +/- (g)
		Day (c)	Extent (d)	Titer TCD50/ml (e)	Day (c)	Size (f)	Titer PFU/ml (e)	
Vero (CL)	SM 12	3-4	4+	6.5(a)				
BHK-21 (CL)					5	1-2 mm	6.6(a)	

(a) Expressed in dex

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
Sentinel mouse (brain and liver)	11		Utinga and APEG, Belem, Para, Brazil
Nectomys s. amazonicus (blood)	1	4/16 NT	Utinga, Belem, Para, Brazil
Culex spp. no. 11	1		APEG, Belem, Para, Brazil
Proechimys sp.		3/116 NT	APEG, Belem, Para, Brazil (2)
Proechimys sp.		0/89 HI	Santarem-Cuiaba, km.84, Para, Brazil
Oryzomys sp.		0/70 HI	
Dasyprocta sp.		2/8 HI	
Nectomys sp.		0/36 HI	
Rattus rattus		0/5 HI	
Didelphis m. marsupialis		0/18 HI	

Marmosa cinerea	0/3 HI	
Monodelphis sp.	0/7 HI	
Metachirus nudicaudatus	0/2 HI	
Proechimys sp.	0/45 HI	Santarem-Cuiaba, km.212, Para, Brazil
Oryzomys sp.	0/25 HI	
Nectomys s. amazonicus	0/4 HI	
Agouti paca	0/2 HI	
Didelphis m. marsupialis	0/2 HI	
Marmosa cinerea	0/8 HI	
Monodelphis brevicaudata	0/23 HI	
Philander o. opossum	0/7 HI	
Dasyprocta	0/2 HI	
Oxymycterus sp.	0/6 HI	
Neacomys sp.	0/1 HI	
Marmosa murina	0/6 HI	
Water buffalo	1/416 HI	Maicuru, Santarem, Para, Brazil (3)

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
					log ₁₀ /ml
Mice (nb)	SM 4	ic 0.02	Death	5.0	
Mice (nb)		ip 0.02	Death	5.5	
Mice (nb)		sc			
Mice (wn)		ic 0.03	Antibody		
Mice (wn)		ip 0.03	Antibody		
"" (nb)		SM 7	ic 0.02	Death	
"" (nb)	SM 13	ic 0.02	Viremia, death		9.5 (serum)

Section IX - Experimental Arthropod Infection and Transmission

Arthropod species & virus source(a)	Method of Infection log ₁₀ /ml (b)		Incubation period (c)		Transmission by bite (d)		Assay of arthropod, log ₁₀ /ml (e)		
	Feeding	Injected	Days	°C	Host	Ratio	Whole	Organ	System
Culex sp. (feral)(2)	Natural infection		Ambient	Inf. mice (lab)				Mouse isolate BeAn 98033	

Section X - Histopathology

Character of lesions (specify host)

Infant mice: hepatocytic necrosis, without any zonal distribution Adult mice: isolated hyaline hepatocytes or groups of necrosed hepatocytes surrounded by mono- nuclear infiltration (1)

Inclusion Bodies

Intranuclear

Organs/Tissues Affected

Category of tropism

Section XI - Human Disease

In Nature

Residual

Death

Subclinical

Overt Disease

Clinical Manifestations

Number of Cases

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

Section XII - Geographic Distribution

Known (Virus detected)

Brazil

Suspected (Antibody only detected)

Section XIII - References

1. Dias, L.B. Personal communication. 1967.
2. Director, Belem Virus Laboratory. Personal communication. 1966.
3. Director, Belem Virus Laboratory. Personal communication. 1969.

Remarks