Virus Name: Calovo	Abbreviation: CVOV

Status
Probable Arbovirus

Select Agent
No

SALS Level
2

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

Other Information

Antigenic Group
Bunyamwera

SECTION I - Full Virus Name and Prototype Number

Prototype Strain Number / Designation
184

Accession Number

Original Date Submitted
7/27/1984

Family
Bunyaviridae

Genus
Bunyavirus

Information From
V. Bardos

Address
Inst. of Parasitology, Czechoslovak Acad. Sci., 16632 Praha 6, Czechoslovakia

Information Footnote
Revised

Section II - Original Source

Isolated By (name)
V. Bardos and V. Danielova (1,2)

Isolated at Institute
Inst. Epidem. and Microbiol., Bratislava

Host Genus
Anopheles maculipennis

Species

Host Age/Stage
Adult

Sex
Female

Isolated From

Isolation Details

Signs and Symptoms of Illness

Arthropod
Engorged

Time Held Alive before Inoculation

Collection Method

Collection Date
8/5/1960

Place Collected (Minimum of City, State, Country)
Village Baka, District Calovo, Czechoslovakia

Latitude
47° 50' N

Longitude
17° 46' E

Macrohabitat
Lowland

Microhabitat
Domestic animal sheds

Method of Storage until Inoculated
16 hours at -60dC

Footnotes

Section III - Method of Isolation

Inoculation Date
8/6/1960

Animal (Details will be in Section 6)
nb mice

Route Inoculated
ic and sc

Reisolation
Yes

Other Reasons
No virus of this type in the laboratory before.

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) **1:5**	After Treatment Titer **4.3 dex**	Control Titer **7.0 dex**
Lipid Solvent (chloroform)	After Treatment Titer	Control Titer
Lipid Solvent (deoxycholate) **1:1000**	After Treatment Titer **4.7 dex**	Control Titer **7.0 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	

Hemagglutination

Hemaggiutination	Antigen Source	Erythrocytes (species used)
Yes	**SMB extracted with sucrose-acetone**	**Goose**
pH Range	pH Optimum	
6.0-6.6	**6.3**	
Temperature Range	Temperature Optimum	
4-22dC	**4dC**	

Remarks

Serologic Methods Recommended
HI, CF, NT

Footnotes

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

Calovo virus belongs in the Bunyamwera group. Antigenic reaction between Calovo and several other viruses is shown in the following tables:

Hemagglutination-Inhibition

Antigen 8 units

Serum	Calovo	Homologous
Calovo	40	
Bunyamwera	20	80
Cache Valley	160	160
Germiston	10	2560
Ilesha	160	2560
Batai	1280	1280
Kairi	80	No antigen
Wyeomyia	20	No antigen

First dilution of serum = 1:10

Hemagglutination-Inhibition Tests

Calovo System

Antigens

Serum	Calovo	Batai	CV	Ilesha	Bunyam	Germiston
Calovo	40	40	0	0	0	0
Batai	1280	1280				
Batai	80	80				
Cache Valley			160			

First dilution of serum = 1:10

Relationship between Calovo and Chittoor Viruses by Complement-Fixation

Serum	Antigen: Calovo	Batai	Bunyamwera
Calovo	256 *	128	32
Batai	64	64	8
Bunyamwera	64	64	64

* Maximal titer of serum in checkerboard titration.

Above results from J. Casals, personal communication, 1961.

Ed. Note: The SIRACA considers the Calovo virus to be a strain of Batai virus on the basis of serological studies.

Section VI - Biologic Characteristics

Virus Source (all VERTEBRATE isolates)

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)	
Chick embryo (PC)	SM 6 to > P 35	2-3	4+ (2)						
Hamster kidney (PC)		2-3	4+						
PK (15) (CL)		2-4	4+	6.7**	2-3	1-1.5 mm (3)			
Duck embryo (PC)					4-5	Plaques (5)			
Citellus citellus kidney (CL)			4+ (6)						
Glis glis kidney (CL)			4+ (6)						
BHK-21 (CL)		2-4	4+	9.5 (7)					
BHK-21 (CL)		5	4+	6.5 (8)					
HeLa (CL)		5-6	4+	6.5 (4)					
Aedes aegypti (CL)								- (10)	
Anopheles stephensi (CL)								- (9)	
Ae albopictus (CL)								+ (11)	
An gambiae (CL)								- (12)	

** 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
Anopheles maculipennis	17/>18,000		Czechoslovakia (2, 7, 13-15)
Anopheles maculipennis	71/37,000		Austria (16, 17)
Coquillettidia (Coq) richiardii	1/50		
Anopheles maculipennis	1/10,320		Yugoslavia (18)
Anopheles maculipennis	1/193		USSR (19)
Aedes punctor	1/576		

ANTIBODY - MAN: 235/585, 0/297, 0/84, 0/396 HI, 11/400 NT, Czechoslovakia; 1/232 HI, Austria; 5/200HI, Hungary; 10/3,226, HI, Yugoslavia; 1/1,018 NT, Federal Rep. Germany; 1/793, NT Finland (4,7,20-27). HORSES: 13/91 NT, 17/61 HI, Czechoslovakia; 2/2 NT, Austria (28-30). CATTLE: 12/93, 77/305 HI Czechoslovakia; 438/641 NT, Austria; 97/226 HI, Hungary; 46/605, Finland; 46% HI Roumania; 27/1,165 HI Portugal (4,26,29,31-34). PIGS: 19/109 HI Czechoslovakia; 0/17 NT, Austria (29,30). SHEEP: 0/129 HI, Portugal; 41% HI Roumania (33,34). ROE DEER: 1/1 NT, Czechoslovakia; 7/10 NT, Austria (30,35). ELK: 1/2 NT, Finland (4). WILD BOAR: 1/2 NT, Austria. HARES: 0/70 NT, Czechoslovakia, 0/17 NT, Austria; 0/5 NT, Finland. HEDGEHOG: 0/7 NT, Czechoslovakia; 0/197 NT, Austria. FOXES: 0/2 NT, Czechoslovakia; 0/7 NT, Austria. GROUND SQUIRREL: 0/29 NT, Austria. HAMSTER: 0/40 NT, Austria. SMALL MAMMALS: 0/298 NT, Czechoslovakia, 0/89 NT, Austria. SAND LIZARD: 0/59 NT, Austria. RINGED SNAKE: 0/6 NT, Austria. BIRDS: 0/44 NT, 0/280 (29 species) HI, Czechoslovakia; 0/77 NT, Finland; 0/400 (39 species) HI, Portugal. HENS: 1/104 HI, Czechoslovakia. DUCKS: 0/47, 1/53 HI Czechoslovakia. ANSERIFORMES: 16/144 NT, Czechoslovakia (4,29,30,35-41). SENTINEL RABBITS: 20/90 NT, Austria (42).

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)	"184"	ic 0.01	Death (2)	3	8.1
Mice (nb)	SM 5 to SM 8	ip 0.01	Death	8	7.5
Mice (nb)		sc			
Mice (wn)		ic 0.03	Death	6	6.7
Mice (wn)		ip 0.03	Survived, antibody		
Wistar rats (nb)		ic 0.03	Death	4	
Wistar rats (nb)		sc 0.03	Death	7	
Wistar rats (ad)		ic 0.06	Viremia, antibody		
Syrian hamsters		ic 0.06	Death	9-14	
guinea pigs		ic 0.15	Survived, antibody		
rabbits		ic 0.2	Survived, antibody		
horses (1-2 yr)		sc	Viremia, antibody (28)		
		resp.			
calves (3 day)		sc	Viremia, antibody		
pigs		sc	Viremia, antibody		
hare (3 mo)	Pos. mosq. pool	sc	No viremia, no antibody (44)		
foxes (14 wk)		sc	Viremia, antibody (45)		
badgers (14 wk)		sc	Viremia, antibody (45)		
embryonated eggs (6 day)	"184", SM 8	ys 0.1	Death (2)	4	

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
An maculipennis	Viremic SM				SM	4+			
Aedes australis		Intrathoracic	4	25			4.9 PFU		Duck embryo (5)
		1.7-2.9 PFU	11-12	25			4.9 PFU		
Aedes australis		"	6	25				Sal. gl., 1.6-4.3 PFU	
Aedes australis		"	6	25				Intestine, 0-3.7 PFU	
An maculipennis		"6.0	5	22			4.9		
			53	4			3.9		
			155	4			1.9		

Section X - Histopathology

Character of lesions (specify host)

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)
Czechoslovakia, Austria, Yugoslavia, USSR (4,7,26,33,34), Sri Lanka (47)

Suspected (Antibody only detected)
Hungary, Federal Rep. Germany, Finland, Roumania, Portugal (4,7,26,33,34)

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Remarks