Virus Name: Ganjam		Abbreviation: GANV
Status **Possible Arbovirus**	Select Agent **No**	SALS Level
SALS Basis		
Other Information **USDA Restricted**		
Antigenic Group **Nairobi Sheep Disease**		

SECTION I - Full Virus Name and Prototype Number

Prototype Strain Number / Designation	Accession Number	Original Date Submitted
IG 619		6/6/1984
Family **Bunyaviridae**	Genus **Nairovirus**	
Information From **Virus Research Centre, Poona**	Address **20A Wellesley Road, P.O. Box No. 11, Poona 1, India**	
Information Footnote		

Section II - Original Source

Isolated By (name)	Isolated at Institute	
VRC (1,4)	**Poona, India**	
Host Genus **Haemaphysalis intermedia Warburton and Nuttall, 1909**	Species	Host Age/Stage **Adult**
Sex **Male**		

Isolated From	Isolation Details
Signs and Symptoms of Illness	Arthropod
Time Held Alive before Inoculation	
Collection Method **Ectoparasites removed from healthy goats**	Collection Date **11/6/1954**
Place Collected (Minimum of City, State, Country) **Bhanjanager, Ganjam District, Orissa, India**	
Latitude **20° N**	Longitude **86° E**

Macrohabitat	Microhabitat	Method of Storage until Inoculated
		Kept alive until processed
Footnotes		

Section III - Method of Isolation

Inoculation Date
11/12/1954

Animal (Details will be in Section 6)
nb mice

Route Inoculated
Intracerebral

Reisolation
No

Other Reasons
This strain does not resemble any other virus strain handled at VRC at that time.

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 **<0.8 dex**	Control Titer **6.6 dex**

Other (formalin, radiation)

Virion Morphology

Shape	Dimensions **<220 nm**	
Mean nm	Range nm	
Measurement Method **Millipore filtration**	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 ext. by sucrose-acetone**	**Goose**
pH Range	pH Optimum	
5.7-7.6	**6.4**	
Temperature Range	Temperature Optimum	
37dC, 27dC, 25dC	**27dC**	

Remarks
Prototype strain failed to produce hemagglutinin, but strain 6234 yielded a low-titered HA.

Serologic Methods Recommended
CF, NT, IFA

Footnotes
Prototype strain failed to produce hemagglutinin, but strain 6234 yielded a low-titered HA.

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

Related to IG 3159 by CF tests. By CF, a serum to Ganjam virus (homol.>512) did not react with Farallon, Chenuda, Colorado tick fever, Hughes, Dugbe, Bhanja, Wanowrie, Kaisodi, Kemerovo, Johnston Atoll, Lanjan, Nyamanini, Manawa, Quaranfil, Silverwater, Soldado, Thogoto, Lipovnik, Uukuniemi, Wad Medani, NDV.
BY CF Ganjam virus antigen did not react with (homol. titer in parenthesis) Farallon (256), Chenuda (256), Colorado tick fever (64), Hughes (512), Bhanja (512), Wanowrie (512), Soldado (256). Thogoto (128), Uukuniemi(256), Wad Medani (128), Piry (>128), Acara (64), Pacui (64), Irituia (64), Akabane (>16), Hart Park (8), Mossuril (32), Ingwavuma (>16), Palyam (32), Wongal (32), Mapputa(64), Witwatersrand (32), Tacaribe (>16), Tete (8), Junin (8), Tacaiuma (128), Anopheles B (64), Candiru (64), Navarro (64), Lebombo (64), Sicilian (>128), EHD-NJ(64), VSNJ (32), VS-Indiana (32), Bwamba (SE493) (64), Anopheles A (32), Lukuni (>128), Jurona (32), Nyando (32), Oropouche (256), and grouping sera for Bunyamwera, California, Simbu and Capim groups.
By HI a serum to Ganjam virus (homol. CF >512) did not inhibit Bhanja (IbAr 2709), 11 group A viruses, 13 group B viruses, Marituba, Oriboca, Caraparu, Bunyamwera, Germiston, Ilesha, Tahyna, California, Bwamba, Sathuperi, Ketapang, Bakau, Manzanilla, Witwatersrand, Naples, Sicilian, Koongol, Akabane, Ingwavuma, Tacaiuma, Umbre. (This information from the WHO International Reference Centre.)
Distantly related by CF test to Dugbe virus [10] .

Ed. Note: It has been found that a close relationship exists between Nairobi sheep disease and Ganjam viruses as demonstrated by IFA and CF tests (F.G. Davies and J. Casals, personal communication). Ganjam virus is now considered to be a strain of Nairobi sheep disease virus [18] .
A low-titered relationship by CF, IFA, and indirect HA demonstrated between CON and NSD viruses [12] , [13] . SIRACA has decided that these relationships are no greater than those used to establish the BUN. Supergroup. The CON and NSD antigenic groups should be kept as two distinct serogroups. Subsequently, intergroup antigenic relationships were demonstrated among viruses of CHF-CON, DGK, HUG, NSD, QYB, and SAK serogroups. Relationships were demonstrated by IFA, NT, and HI tests [19] . On the basis of these serologic findings as well as biochemical and molecular studies, these viruses were assigned genus status (Nairovirus) within the family Bunyaviridae [20] .

Section VI - Biologic Characteristics

Virus Source (all VERTEBRATE isolates)
Blood (M)

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)	
BHK-21 (CL)			CPE			Plaques			
Vero (CL)			CPE (6) (polykaryotosis)		6	1 mm	3.9* (9)		
LLC-MK2 (CL)						No plaques (9)			
Aedes albopictus (CL)			No CPE					+ (8)	
Ae aegypti (CL)			No CPE					- (8)	

* 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
Haemaphysalis intermedia	1		Bhanjanager, Orissa State, India
H. intermedia	18		Shimoga district, Mysore State, India
H. wellingtoni	2		Shimoga district, Mysore State, India(7)
Culex vishnui	1		Vellore, N.Arcot Dist. Tamil Nadu, India (3)
Man	1		Vellore, N.Arcot Dist. Tamil Nadu, India (5)
Sheep (febrile illness)	2		Andhira Pradesh, India(16)

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)	SM 6	ic 0.02	Death	2.6	9.0
Mice (nb)		ip 0.03	Death	2.2	8.7
Mice (nb)		sc			
Mice (wn)		ic 0.03	Death	3.3	7.4
Mice (wn)		ip 0.3	None		<1.0
guinea pig(ad)	SM 21	ip 1.0	No overt illness; CF antibodies		
chick embryo(7 day)		ys 0.1	Death	4	
Macaca radiata			No viremia, CF and NT antibodies (17)		
Langur monkey		sc	Viremia, day 8 (21)		
mice (nb)		ip	Viremia, days 2-6 (21)		
mice (wn)		ic	Viremia, days 1-3 (21)		
hamsters			No viremia, CF and NT antibodies (17)		
sheep			Viremia, CF and NT antibodies (17)		

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

Virus did not propagate by intrathoracic inoculation in Aedes albopictus, Ae aegypti, Culex quinquefasciatus, or Cx tritaeniorhynchus. However, after adaptation in Ae albopictus cell culture, Ganjam virus could be propagated in Ae albopictus and Ae aegypti mosquitoes by intrathoracic inoculation.

The related strain P 4081 did not propagate in Cx quinquefasciatus by intrathoracic inoculation, but replicated in Haemaphysalis spinigera after parenteral inoculation. Ganjam virus also replicated in H. turturis after parenteral inoculation.

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
Reported

Subclinical — Overt Disease
Significant

Clinical Manifestations
Fever (R), headache (R), arthralgia (R)

Number of Cases — Category (i.e. febrile illness, etc.)
Two (5) — **Febrile illness**

Section XII - Geographic Distribution

Known (Virus detected)
India

Suspected (Antibody only detected)

Section XIII - References

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Remarks

Two laboratory infections one resulting in mild febrile illness and the other subclinical, confirmed serologically, occurred after handling 6234 (one case) and IG619 or P4081 (one case).