

Virus Name: Nodamura		Abbreviation: NODV
Status Probably not Arbovirus	Select Agent No	SALS Level 3
SALS Basis Insufficient experience with virus; i.e., experience factor from SALS surveys was less than 500 in laboratory facilities with low biocontainment.		
Other Information		
Antigenic Group Ungrouped		

SECTION I - Full Virus Name and Prototype Number

Prototype Strain Number / Designation Mag 115	Accession Number	Original Date Submitted 8/2/1984
Family Nodaviridae	Genus Nodavirus	
Information From William F. Scherer	Address Cornell University Medical College, New York, New York 10021	
Information Footnote Revised		

Section II - Original Source

Isolated By (name) Personnel 406 MGL (1)	Isolated at Institute Zama, Japan	
Host Genus Culex tritaeniorhynchus (pool of 500)	Species	Host Age/Stage
Sex Female		
<u>Isolated From</u>	<u>Isolation Details</u>	
Signs and Symptoms of Illness	Arthropod Engorged	
Time Held Alive before Inoculation		
Collection Method Pig-baited Magoon trap	Collection Date 7/22/1956	
Place Collected (Minimum of City, State, Country) Sagiyama heronry 20 miles north of Tokyo, Japan		
Latitude 35° 0' N	Longitude 140° 0' E	
Macrohabitat Heronry	Microhabitat	Method of Storage until Inoculated Mosquitoes frozen on dry ice
Footnotes		

Section III - Method of Isolation

Inoculation Date
10/4/1956

Animal (Details will be in Section 6)
nb mice

Route Inoculated ic and sc	Reisolation Yes
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Other Reasons

Homologous Antibody Formation by Source Animal

Test(s) Used

Footnotes

Section IV - Virus Properties

Physicochemical
RNA, Single Strand

Pieces (number of genome segments) 2	Infectivity Yes	Sedimentation Coefficients(s) 22 and 15 s(S)
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Percentage wt, of Virion Protein	Lipid	Carbohydrate
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Virion Polypeptides: Number	Details
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Non-virion Polypeptides: Number	Details
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Virion Density 1.34 gm/ml in cesium chloride	Sedimentation Coefficients(s) (S)
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Nucleocapsid Density	Sedimentation Coefficients(s) (S)
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Stability of Infectivity (effects)

pH (infective range)
Stable at pH 3.0

Lipid Solvent (ether - % used to test) 1:5	After Treatment Titer >5.3 dex	Control Titer 4.7 dex
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Lipid Solvent (chloroform) 1:2	After Treatment Titer 5.4 dex	Control Titer 5.4 dex
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Lipid Solvent (deoxycholate) 1:200	After Treatment Titer 6.5 dex	Control Titer 6.0 dex
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Other (formalin, radiation)

Virion Morphology

Shape Spherical	Dimensions 28-29 nm
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Mean 29 nm	Range nm
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Measurement Method 28 nm thin sections; 20 nm negative	Surface Projections/Envelope None	Nucleocapsid Dimensions, Symmetry Nucleocapsid 28-29nm diameter probably
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28 nm thin sections, 29 nm negative contrast

None

Nucleocapsid 28-29nm diameter, probably icosahedral

Morphogenesis

Site of Constituent Formation in Cell	Site of Virion Assembly	Site of Virion Accumulation
Inclusion Bodies	Other	

Hemagglutination

Hemagglutination No	Antigen Source SMB ext. by sucrose-acetone + protamine tr.	Erythrocytes (species used) Goose
pH Range 6.0-6.6	pH Optimum	
Temperature Range	Temperature Optimum Room temperature	

Remarks

Nodamura resembles picornaviruses in morphology, stability at pH 3.0 and buoyant density in cesium chloride. Its pathology in baby mice resembles Coxsackie virus and it multiplies in arthropods. Virions contain two species of RNA

Serologic Methods Recommended

NT and CF

Footnotes

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

Unrelated by NT test to JBE (Nakayama), Sagiya, Akabane, EE, Sindbis, WE, Bebaru, chikungunya, Getah, Semliki, dengue 1, dengue 2, Ilheus, Murray Valley encephalitis, Ntaya, Russian Spring-summer encephalitis, Tembusu, Uganda, West Nile, yellow fever, Zika, Bunyamwera, Batai, Wyeomyia, Oriboca, California, Guama, Bwamba, Anopheles A, Ketapang, Corripata, Coxsackie A 1-19, B1-5, ECHO, 4, 6, 8, 9, 11, 15-21 and 24, EMC, Mengo, LCM, GDVII, mumps, herpes simplex, hog cholera, Teschen disease.

Unrelated by CF test to JE (M5/596), Sagiya, Akabane, EE, Pixuna, Sindbis, WE, dengue 1, SLE, Murutucu, Oriboca, Bunyamwera, Cache Valley, Guaroa and Ilesha, California, Tahyna, Guama, Bwamba, Pongola, Anopheles A, Lukuni, Anopheles B, Colorado tick fever, Naples and Sicilian sandfly fever and adenovirus type 4, herpes simplex, mumps, reovirus (Lang), mouse hepatitis, (polyvalent serum), polioviruses types 1-3, Coxsackie A 1-19, B 2-4, ECHO 1, 3, 5, 6, 7, 8, 12-14, 16, 20-25.

Unrelated by HI test to Akabane, Pixuna, Sindbis, WE, Murutucu, Oriboca, Bunyamwera, Cache Valley, Guaroa, Tahyna, Guama, Ketapang, Sicilian sandfly fever.

Dr. Robert Shope found no relation by CF and HI between Nodamura virus antiserum and Quarantil, Sathuperi, Simbu, Ingwavuma, Turlock, Wongal, Icoraci, Chagres, Wad Medani, Indiana vesicular stomatitis, Cocal, Navarro, Manzanilla, Hart Park, Piry, Tacaiuma, Tete, Lebombo, Ndumu, Mossuril, Nyamanini, Wanowrie, Tacaribe, Witwatersrand, Wongal, Piry, Pacui, Acara, Irituia, Timbo, An 42217, An 46852, Marco, Jurona, Ourem, Candiru, Kern Canyon, Hilo, Indian mosquito Ichampadi, Palyam, Minnal, Nyando, and Congo, lymphocytic choriomeningitis, New Jersey vesicular stomatitis.

Section VI - Biologic Characteristics

Virus Source (all VERTEBRATE isolates)
Blood (LV), organs (LV)

Lab Methods of Virus Recovery (ALL ISOLATIONS)
Newborn mice

Cell system (a)	Virus passage history (b)	Evidence of Infection							Growth Without CPE +/- (g)
		CPE			PLAQUES				
		Day (c)	Extent (d)	Titer TCD50/ml (e)	Day (c)	Size (f)	Titer PFU/ml (e)		
<p>No effect produced in porcine kidney, chick embryo, monkey kidney, HeLa, human amnion, human-Chang liver, human conjunctiva, mouse L strain, calf kidney, rabbit kidney, rabbit 56-8-8 papilloma, rabbit 56-8-6 fibroblast, Westwood strain ERK-1 cell cultures.</p> <p>NOD virus multiplied in cell cultures of <i>Aedes albopictus</i>, <i>Ae aegypti</i> and BHK-21 cells without CPE (7).</p>									

Vertebrate (species and organ) and arthropod	No. isolations/No. tested	No. with antibody/No. tested Test used	Country and region
Man		0/29 NT	Rural near Tokyo, Japan
Man		0/13 NT	Urban near Tokyo, Japan
Pigs		13/16 NT	Near Tokyo, Japan; 1956
Pigs		14/27 NT	Near Tokyo, Japan; 1957
Nestling and juvenile herons and egrets		0/22 NT	Sagiyama, Japan; 1956
Nestling and juvenile herons and egrets		1/31 NT	Sagiyama, Japan; 1957
Culex tritaeniorhynchus	1/798 (121,844 mosq.)		Sagiyama heronry, Japan

Experimental host and age	Passage history and strain	Inoculation Route-Dose	Evidence of infection	AST (days)	Titer log ₁₀ /ml
Mice (nb)	SM 6-14	ic 0.01	CNS symptoms and paralysis	5-15	5.0-7.5
Mice (nb)		ip 0.01	CNS symptoms and paralysis	5-15	
Mice (nb)		sc			
Mice (wn)		ic 0.03	None		
Mice (wn)		ip	Not tested		
rabbit (wn)		ic 0.1	No illness, no fever		
guinea pig (wn)		ic 0.1	No illness, no fever		
guinea pig (wn)		im 0.2	No illness, no fever		
guinea pig (wn)		ip 0.3	No illness, no fever		
hamster (wn)		ic 0.1	No illness, no fever		
hamster (wn)		im 0.3	No illness, no fever		
hamster (wn)		ip 0.3	No illness, no fever		
BALB mouse (wn)		ic 0.03	No illness		
chicks (1 day)		ic 0.05	No illness		
chicks (1 day)		im 0.1	No illness		
eggs (9 day)		CAM 0.2	No illness		
™ (9 day)		ys 0.1	No illness		
™ (10 day)		am.s. 0.1	No illness		
pig (4 mo)		sc 2.0	No illness: NT antibody prod.		

Section IX - Experimental Arthropod Infection and Transmission

Arthropod species & virus source(a)	Method of Infection log10/ml (b)		Incubation period (c)		Transmission by bite (d)		Assay of arthropod, log10/ml (e)		
	Feeding	Injected	Days	°C	Host	Ratio	Whole	Organ	System

Dr. H. Hurlbut has passed Mag 115 virus serially by inoculation of mosquitoes (*Culex tarsalis*), ticks (*Ornithodoros savignii*), moth larvae (*Plodia interpunctella*) and beetle larvae (*Attagenus piceus*). Virus did not pass in bed bugs (*Cimex lectularius*) or cockroaches (*Blattella germanica*). Virus multiplies in bodies of *Ae aegypti*; no growth in heads. Virus transmitted to suckling mice by *Ae aegypti* 1-11 days after feeding on viremia mice.

NOD virus kills ad honey bees by 7 days at 30-35C; recover 33 nm virus particles. Kills wax moth larvae 7-14 days 30C (5). NOD virus mult., caused paralysis, death following intrathoracic inoc. into ad *Ae albopictus* and *Toxorhynchites amboinensis* mosquitoes. Mult. poorly or not at all in similarly injected *Cx quinquefasciatus* mosquitoes. Virus mult. in but did not kill *Ae albopictus* mosquitoes infected by feeding or immersion. Indirect IFA showed NOD antigen in brains. *Ae pseudoscutellaris* (AP61) cell cultures more sensitive than intracranial inoc. of nb mice for detection of NOD virus (10).

Section X - Histopathology

Character of lesions (specify host)

In suckling mouse: myositis of limb and paravertebral muscles, necrosis of brown fat and degeneration of spinal cord neurons.

Inclusion Bodies

Intranuclear

Organs/Tissues Affected

Skeletal muscle, brown fat, spinal cord neurons of mice

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)

Japan

Suspected (Antibody only detected)

Section XIII - References

1. Scherer, W.F. and Hurlbut, H.S. 1967. *Am. J. Epidem.* 86:271-285.
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4. Murphy, F.A., et al. 1970. *Virology* 40:1008-1021.
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6. Newman, J.F.E. and Brown, F. 1973. *J. Gen. Virol.* 21:371-384.
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Remarks