Virus Name: Highlands J	Abbreviation: HJV

Status
Arbovirus

Select Agent
No

SALS Level
2

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

Other Information

Antigenic Group
A

SECTION I - Full Virus Name and Prototype Number

Prototype Strain Number / Designation
B-230

Accession Number

Original Date Submitted
9/6/1984

Family
Togaviridae

Genus
Alphavirus

Information From
N. Karabatsos

Address
Vector-Borne Diseases Division, CDC, P.O. Box 2087, Fort Collins, CO 80522

Information Footnote

Section II - Original Source

Isolated By (name)
J.R. Henderson, et al. (1)

Isolated at Institute
New Haven, CT

Host Genus
Cyanocitta cristata

Species

Host Age/Stage
Adult

Sex
Not Answered

Isolated From	Isolation Details
Serum/Plasma	

Signs and Symptoms of Illness
None

Arthropod

Time Held Alive before Inoculation

Collection Method
Bird nets

Collection Date
6/17/1960

Place Collected (Minimum of City, State, Country)
Archbold Biol. Sta., south-central FL, USA

Latitude
27° 11' N

Longitude
81° 37' W

Macrohabitat
Lawn area adjacent to Station laboratory

Microhabitat

Method of Storage until Inoculated
Dry ice and -65dC Revco freezer

Footnotes

Section III - Method of Isolation

Inoculation Date
6/22/1960

Animal (Details will be in Section 6)
Tissue culture

Route Inoculated

Reisolation
Yes

Other Reasons
Different from all other viruses in laboratory.

Homologous Antibody Formation by Source Animal
Yes

Test(s) Used
HI, NT

Footnotes

Section IV - Virus Properties

Physicochemical
RNA, Single Strand

Pieces (number of genome segments) **1**	Infectivity **Yes**	Sedimentation Coefficients(s) **42 s.**(S)
Percentage wt, of Virion Protein	Lipid	Carbohydrate
Virion Polypeptides: Number **3**	Details **Two membrane glycoproteins of molecular weight 50,000 (E1) and 49,000 (E2), respectively, and a nucleocapsid of 32,000 daltons(2)**	
Non-virion Polypeptides: Number	Details	
Virion Density **1.201 gms/ml in potassium tartrate**	Sedimentation Coefficients(s) (S)	
Nucleocapsid Density	Sedimentation Coefficients(s) (S)	

Stability of Infectivity (effects)

pH (infective range)

Lipid Solvent (ether - % used to test) **50%**	After Treatment Titer **2.5 dex**	Control Titer **7.6 dex (3)**
Lipid Solvent (chloroform)	After Treatment Titer	Control Titer
Lipid Solvent (deoxycholate) **1:1000**	After Treatment Titer **2.1 dex**	Control Titer **6.4 dex (3)**

Other (formalin, radiation)

Virion Morphology

Shape	Dimensions
Mean	Range

nm	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 **Yes**	Antigen Source **SMB ext. by sucrose-acetone**	Erythrocytes (species used) **1-day chick**
pH Range **5.8-7.0**	pH Optimum **6.2**	
Temperature Range	Temperature Optimum **Room temperature**	

Remarks
*** The B-213 strain of Highlands J virus was the first isolate obtained; however, it is no longer available. ** Reisolated in**

Serologic Methods Recommended
HI, CF, NT

Footnotes
*** The B-213 strain of Highlands J virus was the first isolate obtained; however, it is no longer available. ** Reisolated in**

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

Screening HI tests indicated antigenic relationship of Highlands J virus with group A arboviruses, with closest relationship to members of the WEE complex [1] , [3] . The data below show the relationship of Highlands J virus to members of the WEE complex by HI, CF, and serum dilution plaque-reduction neutralization tests (PRNT).

Results of CF Tests

Viruses or Antigens	Antibody to: WEE	HI	Y62-33	SIN	WHA	AURA
WEE	128/128 [a]	32/32	256/>512	16/32	0	0
HJ	0	32/8	64/32	0	0	0
Y62-33	128/32	32/8	256/128	0	0	0
SIN	16/8	0	128/8	64/8	64/32	0
WHA	0	0	0	0	64/32	0
AURA	16/32	0	0	0	0	32/128

[a] Serum titer/antigen titer; 0 = <8/<8.

Results of HI Tests

Viruses or Antigens	HI titer of antibody to: WEE	HI	Y62-33	SIN	WHA	AURA
WEE	2560	80	320	40	10	0 [b]
HJ	1280	320	160	80	20	0
Y62-33	2560	80	1280	80	20	0
SIN	>5120	320	320	1280	320	0
WHA	1280	20	80	160	320	0
AURA	320	10	10	10	10	80

[b] 0 = <10.

RESULTS OF PRNT [4]

Viruses	50% PRNT titer of antibody to: WEE	HJ	Y62-33	SIN	WHA	AURA
WEE	700	70	80	0	0	0
HJ	440	2400	230	140	10	0
Y62-33	50	0	49000	0	0	0
SIN	150	0	0	770	65	0
WHA	120	0	0	50	100	0
AURA	0	0	0	0	0	30

0 = <10

Although Highlands J virus was readily distinguished from WEE strains by various serological tests initially, it was considered to be an antigenic variant of WEE [5] , [6] .
Recently, kinetic HI and neutralization tests have distinguished HJ virus from strains of WEE as well as other members of the WEE complex, including Fort Morgan virus and other alphaviruses [7] . Highlands J virus was indistinguishable from WEE-like viruses isolated in the eastern United States. Accordingly, it was specified that HJ and Fort Morgan viruses be accorded separate virus status in the WEE complex [7] . RNA oligonucleotide fingerprints and subunit antisera also distinguish HJ virus from strains of WEE and other alphaviruses [3] . In reevaluating antigenic relationships of alphaviruses, SIRACA has determined that Highlands J virus is a separate virus in the WEE complex [8] .

Section VI - Biologic Characteristics

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

Lab Methods of Virus Recovery (ALL ISOLATIONS)
Primary chick embryo and duck embryo cell cultures

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	Orig.bird plasma	2-3	4+		2-3	2 mm	1.5 (c)	(PC)	
Duck embryo (PC)		2-3	4+						
Hamster kidney (PC)	Orig. sentinel mouse brain	2-3	4+						
BHK-21 (CL)	SM 5	1-2	4+						
Vero (CL)	SM5BHK1				4-5		6.9		
Duck embryo (PC)	SM8				1-2		8.8		
PS Y-15 (CL)	SM4				3	5 mm	6.3 (9)		

(c) 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
Wild birds (plasmas)	2/563	33/420 HI,NT *	South-central Florida USA; 1960 (1)
Mosquito pools	0/449		
Tick pools	0/5		
Sentinel mice **	1/7		
Sentinel chicks (plasmas)	0/24	0/48 HI	
Rodents (tissues)	0/126		
Rodents (plasmas)	0/49	5/50 HI	
Reptiles (bloods)	0/9	0/9 HI	
Wild birds (plasmas)	0/148	5/148 HI	South-central Florida USA; 1961 (1)
Culiseta melanura	3		Louisiana, Maryland, Massachusetts (7)
Bats	pos. iso.		New Jersey, USA (11)

* HI positives reacting with Highlands J antigen only.

** 138 litters of mice exposed, but only 7 died or showed signs of illness.

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)	B-230 strain, SM2	ic	Paralysis, death	2	7.6 *
Mice (nb)	5.0 dex PFU/ml(3)	ip	Paralysis, death	2-3	
Mice (nb)		sc			
Mice (wn)		ic	Paralysis, death	8-10	7.3
Mice (wn)		ip	None		
hamsters (yg ad)			Paralysis, death	4-6	6.8
chick embryo (9-11 day)		al.c.	Hemorrhage, death	1-2	8.1
		am.s.	Hemorrhage, death	1-2	8.9
		ys	Hemorrhage, death	1-2	8.4
chick (1-3 day)		ic	Paralysis, death	2-4	7.4
		ip	Paralysis, death	2-4	
		oral	Paralysis, death	2-4	7.8

* Virus titer in brain tissues of infected animals; allantoic fluid from infected chick embryo eggs were titrated for virus content.

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
	Many successful mosquito transmission experiments achieved using Louisiana isolate of HJ virus (10).								

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)
Florida (1); Louisiana; Maryland; Massachusetts (7), USA

Suspected (Antibody only detected)

Section XIII - References

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7. Calisher, C.H., et al. 1981. Am J. Trop Med. Hyg. 29:1428-1440.
8. Calisher, C.H., et al. 1980. Intervirology 14:229-232.
9. Stim, T.B. and Henderson, J.R. 1969. Appl Microbiol. 17:246-249.
10. Chamberlain, R.W. Personal communication. 1980.
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Remarks