

<b>Virus Name: Highlands J</b>		<b>Abbreviation: HJV</b>
Status <b>Arbovirus</b>	Select Agent <b>No</b>	SALS Level <b>2</b>
SALS Basis <b>Results of SALS surveys and information from the Catalogue.</b>		
Other Information		
Antigenic Group <b>A</b>		

**SECTION I - Full Virus Name and Prototype Number**

Prototype Strain Number / Designation <b>B-230</b>	Accession Number	Original Date Submitted <b>9/6/1984</b>
Family <b>Togaviridae</b>	Genus <b>Alphavirus</b>	
Information From <b>N. Karabatsos</b>	Address <b>Vector-Borne Diseases Division, CDC, P.O. Box 2087, Fort Collins, CO 80522</b>	
Information Footnote		

**Section II - Original Source**

Isolated By (name) <b>J.R. Henderson, et al. (1)</b>	Isolated at Institute <b>New Haven, CT</b>	
Host Genus <b>Cyanocitta cristata</b>	Species	Host Age/Stage <b>Adult</b>
Sex <b>Not Answered</b>		
<u>Isolated From</u>	<u>Isolation Details</u>	
<b>Serum/Plasma</b>		
Signs and Symptoms of Illness <b>None</b>	Arthropod	
Time Held Alive before Inoculation		
Collection Method <b>Bird nets</b>	Collection Date <b>6/17/1960</b>	
Place Collected (Minimum of City, State, Country) <b>Archbold Biol. Sta., south-central FL, USA</b>		
Latitude <b>27° 11' N</b>	Longitude <b>81° 37' W</b>	
Macrohabitat <b>Lawn area adjacent to Station laboratory</b>	Microhabitat	Method of Storage until Inoculated <b>Dry ice and -65dC Revco freezer</b>
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) <b>1</b>	Infectivity <b>Yes</b>	Sedimentation Coefficients(s) <b>42 s.(S)</b>
Percentage wt, of Virion Protein	Lipid	Carbohydrate
Virion Polypeptides: Number <b>3</b>	Details <b>Two membrane glycoproteins of molecular weight 50,000 (E1) and 49,000 (E2), respectively, and a nucleocapsid of 32,000 daltons(2)</b>	
Non-virion Polypeptides: Number	Details	
Virion Density <b>1.201 gms/ml in potassium tartrate</b>	Sedimentation Coefficients(s) (S)	
Nucleocapsid Density	Sedimentation Coefficients(s) (S)	

---

**Stability of Infectivity (effects)**

pH (infective range)

Lipid Solvent (ether - % used to test) <b>50%</b>	After Treatment Titer <b>2.5 dex</b>	Control Titer <b>7.6 dex (3)</b>
Lipid Solvent (chloroform)	After Treatment Titer	Control Titer
Lipid Solvent (deoxycholate) <b>1:1000</b>	After Treatment Titer <b>2.1 dex</b>	Control Titer <b>6.4 dex (3)</b>
Other (formalin, radiation)		

---

**Virion Morphology**

Shape	Dimensions
Mean	Range

nm	nm	
Measurement Method	Surface Projections/Envelope	Nucleocapsid Dimensions, Symmetry
<b>Morphogenesis</b>		
Site of Constituent Formation in Cell	Site of Virion Assembly	Site of Virion Accumulation
Inclusion Bodies	Other	
<b>Hemagglutination</b>		
Hemagglutination <b>Yes</b>	Antigen Source <b>SMB ext. by sucrose-acetone</b>	Erythrocytes (species used) <b>1-day chick</b>
pH Range <b>5.8-7.0</b>	pH Optimum <b>6.2</b>	
Temperature Range	Temperature Optimum <b>Room temperature</b>	
Remarks <b>* The B-213 strain of Highlands J virus was the first isolate obtained; however, it is no longer available. ** Reisolated in</b>		
Serologic Methods Recommended <b>HI, CF, NT</b>		
Footnotes <b>* The B-213 strain of Highlands J virus was the first isolate obtained; however, it is no longer available. ** Reisolated in</b>		

**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).

Viruses or Antigens	Results of CF Tests					
	Antibody to:					
	WEE	HI	Y62-33	SIN	WHA	AURA
WEE	128/128 <sup>a</sup>	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

<sup>a</sup> Serum titer/antigen titer; 0 = <8/<8.

**Results of HI Tests**

Viruses or Antigens	HI titer of antibody to:					
	WEE	HJ	Y62-33	SIN	WHA	AURA
WEE	2560	80	320	40	10	0 <sup>b</sup>
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

<sup>b</sup> 0 = <10.

**RESULTS OF PRNT [4]**

50% PRNT titer of antibody to:

Viruses	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 +/- (g)
		Day (c)	Extent (d)	Titer TCD50/ml (e)	Day (c)	Size (f)	Titer PFU/ml (e)	
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

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.

Experimental host and age	Passage history and strain	Inoculation Route-Dose	Evidence of infection	AST (days)	Titer log <sub>10</sub> /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 XIII - References

1. Henderson, J.R., et al. 1962. *Am. J. Trop. Med. Hyg.* 11:800-810.
2. Trent, D.W. and Grant, J.A. 1980. *J. Gen. Virol.* 47:261-282.
3. Taylor, R.M., et al. Unpublished data. 1960.
4. Karabatsos, N. 1975. *Am. J. Trop. Med. Hyg.* 24:527-532.
5. Karabatsos, N., et al. 1963. *Am. J. Trop. Med. Hyg.* 12:408-412.
6. Henderson, J.R. 1964. *J. Immunol.* 93:452-461.
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.
11. Goldfield, M., et al. 1970. *Proc. NJ Mosq. Exter. Assoc.* 57:11-15.

### Remarks