

Virus Name: Apoi

Abbreviation: APOIV

Status: Possible Arbovirus
SALS Level: 2
Antigenic Group: B
Taxonomic status: *Flavivirus*
Other Information: None.

Select Agent:
SALS Basis: S

HEPA Filtration:

Section I - Full Virus Name and Prototype Number

Full Virus Name: Apoi
Information from: M. Kitaoka
*
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*
Reviewed by editor

Prototype Number: Ezo encephalitis virus
Date: 11/7/1984

Section II - Original Source

Isolated by: Study group on Ezo fever (2,3) **at:** Foothills of Mt. Apoi, Hokkaido
Genus and species: Apodemus spp. and Clethrionomys sp. Rodents **Sentinel** X
Age/Stage: Adult **Sex:**

Isolated From	Isolation detail
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Signs and symptoms of illness: Apparently healthy
Arthropod engorged **depleted** **gravid**
Time held alive before inoculation:
Collection date: 10/9/1954 **Method:** By trapping rodents in the field
Place collected: At the foothills of Mt. Apoi, Japan
Latitude: 42° 1' " N **Longitude:** 143° 4' " E
Macrohabitat: In the forest along the path
Microhabitat:
Method of storage until inoculated: In the morning immediately after the collection of rodents
Footnotes:

Section III - Method of Isolation and Validity

Inoculation Date: 10/9/1954
Animal: wn mice **Embryonated egg:** **Tissue Culture:**
(Details in Section VI - Biologic Char.)
Route inoculated: Intraperitoneal **Reisolation:**
Other reasons: . Positive HI antibodyin sera of rodents trapped there. A second isolation from Apodemus argenteus hokkaidi, 1956.
Homologous antibody formation by source animal (See Section II):
Test used: HI **CF** **NT**
Other:
Footnotes:

Section IV - Virus Properties

Physicochemical:

RNA: DNA: Single Strand: Double Strand:
Pieces: Infectivity: Sedimentation coefficient(s): /strong>
Percentage wt. of virion protein, lipid carbohydrate
Virion polypeptides:
Number: Details:
Non-virion polypeptides:
Number: Details:
Virion density: Sedimentation coefficient:
Nucleocapsid density Sedimentation coefficient:

Stability of infectivity (effects) pH

Lipid solvent:
(ether) After treatment titer 1.2 dex Control titer 5.5 dex
(chloroform) After treatment titer Control titer
Detergent:
(deoxycholate) After treatment titer <2.0 dex Control titer 6.0 dex
Other (formalin, radiation): Chloroform-sensitive

Virion morphology:

Shape Dimensions
Mean (nm) range (nm) how measured
Surface projections, envelope
Nucleocapsid dimensions, symmetry

Morphogenesis:

Site of constituent formation in cell
Site of virion assembly
Inclusion bodies
Other

Hemagglutination:

Hemagglutination Yes Antigen source SMB ext. by sucrose-acetone
Erythrocytes goose pH range 6.0 - 6.8 pH optimum
Temperature optimum 37dC range
Remarks Okubo, et al. (3) reported no HA activity of virus
Serologic methods recommended CF, HI, NT
Footnotes: Okubo, et al. (3) reported no HA activity of virus

Section V - Antigenic Relationship And Lack of Relationship To Other Viruses

Eight HA units of Apoi antigen (homologous HI = 640) were tested against antibody to viruses of Group A: WEE, EEE; Group B: JE, SLE, MVE, WN, RSSE, POW, NEG, DEN-1, MOD, RB, BSQ; Group C: MTB, ORI, APEU ; Bunyamwera Group: BAT, BUN, CV; Others: AKA, CE, KET, NOD, WIT. Only antibody to viruses of Group B inhibited the HA of Apoi antigen.

CF Test (1)							
Immune Serum							
Antigen	Nakayama	SLE	Modoc	RSSE	Negishi	Powassan	Apoi
Nakayama	64/32a	64/8	0/0	0/0	0/0	0/0	8/4
SLE	16/16	256/64	8/8	0/0	4/4	0/0	16/8
Modoc	0/0	0/0	128/128	0/0	0/0	0/0	0/0
RSSE	0/0	0/0	0/0	128/128	32/64	32/16	0/0
Negishi	0/0	0/0	0/0	32/64	16/32	16/8	0/0
Powassan	0/0	0/0	0/0	64/32	32/16	128/128	0/0
Apoi	0/0	0/0	4/4	0/0	0/0	0/0	128/128
Normal	0/0	0/0	0/0	0/0	0/0	0/0	0/0

CF Test (2)				
Immune Serum				
Antigen	Apoi	Yellow Fever	Bussuquara	Rio Bravo
Apoi	64/64 ^a	4/4	0/0	8/4
Yellow fever 17D	0/0	128/32	0/0	4/4
Bussuquara	0/0	0/0	16/32	0/0
Rio Bravo	0/0	0/0	0/0	32/64
Normal	0/0	0/0	0/0	0/0

^a Antibody titer/antigen titer; 0/0 = <4/<4

Section VI - Biologic Characteristics

Virus source (all VERTEBRATE isolates): Spleen(LV)

Lab Methods of Virus Recovery (ALL ISOLATIONS): Newborn and weanling mice

Susceptibility of Cell Culture Systems:

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)	
BHK-21 (CL)		2-3		9.3 *				
Hamster kidney (PC)		2		9.5				
Vero (PC)		6		8.5				
FL (PC)		3		6.5				
HeLa (PC)		3-4		4.5				
Chick embryo (PC)					4		8.4 *	

* Expressed in dex

Section VII - Natural Host Range

Vertebrate (species and organ) and arthropod	No. isolations/No. tested	No. with antibody/No. tested Test used	Country and region
Apodemus speciosus ainu (1), Clethrionomys ruf. bedfordiae (1) and Ap argenteus hokkaidi (5)	1		Hokkaido, Japan
Ap. sp. ainu	0/292		Hokkaido, Japan
Ap. arg. hokkaidi	1/283		Teshio Nakagawa, Japan
Cleth. ruf. bed.	0/762		
Rattus norv. ohto .	0/6		
Ixodes persulcatus	0/75		
Rodents	0/5,096		Honshu, Shikoku, Kyushu, Japan
Man		1/1,000 HI	Hokkaido
		HI	
		JE Apoi	
Horses		0/12 7/12	Wakkanai, Hokkaido
Horses		2/20 4/20	Haboro, Hokkaido
Horses		5/20 3/20	Tomakomai, Hokkaido
Horses		4/20 1/20	Shosanbetsu, Hokkaido
Horses		2/20 1/20	Odaira, Hokkaido
Horses		3/20 2/20	Rumoi, Hokkaido
Horses		0/20 0/20	Mashike, Hokkaido
Horses		7/10 3/10	Urakawa, Hokkaido
Rodents		N/A 2/9	Apoi, Hokkaido
Oxen		NA 0/9	Urakawa, Hokkaido

Horses

N/A 0/29

Tokyo, Japan

Section VIII - Susceptibility To Experimental Infection (Record Viremia)

Experimental host and age	Passage history and strain	Inoculation Route-Dose	Evidence of infection	AST (days)	Titer log ₁₀ /ml		
Mice (nb)	SMB 4	ic 0.02	Encephalitis	3-4	10.3		
Mice (nb)		ip 0.05	Encephalitis	4-5	9.3		
Mice (nb)		sc					
Mice (wn)		ic 0.03	Encephalitis			9.4	
Mice (wn)		ip 0.2	Encephalitis			7.9	
Mice (wn)		oral route	Encephalitis; some death, some surviving with HI antibody prod.				

Section IX - Experimental Arthropod Infection And Transmission

Arthropod species & virus source(a)	Method of Infection log ₁₀ /ml (b)		Incubation period (c)		Transmission by bite (d)		Assay of arthropod, log ₁₀ /ml (e)		
	Feeding	Injected	Days	°C	Host	Ratio	Whole	Organ	System
C. tritaeniorhynchus	Infection attempted by feeding. Virus does not grow in mosquito body								
	-	-	-	-	-	-	-	-	-

Section X - Histopathology

Character of lesions: White mice: Encephalitis in mice

Inclusion bodies:

Cytoplasmic:(M) (LV) **Intranuclear:** (M) (LV)

Organs-tissues affected: Brain (LV), heart (LV), skeletal muscles (LV)

Category of tropism:

Section XI - Human Disease

Human disease:

In nature:

(S)

(R)

Death:

(S)

(R)

Residua:

(S)

(R)

Laboratory infections:

Subclinical:

(S)

(R)

Overt Disease:

(S)

(R)

Clinical manifestations: Fever (R), headache (R), prostration (R), stiff neck (R), myalgia (R), arthralgia (R) CNS signs (including encephalitis) (R), sequela: paralysis in legs

Category: Encephalitis

No. of cases: One laboratory infection

Section XII - Geographic Distribution

Known (virus):

Japan

Section XIII - References

1. Kitaoka, M., et al. 1967. Report of the 19th General Meeting of the Eastern Part of Japan. Jap. Assoc. Of Sanit. Zool. (in Japanese).
2. Saiki, K. 1955. Nihon Iji Shimpo. No. 1611. 1247 (in Japanese).
3. Okubo, K., et al. 1955. Ibid., 1247-1248 (in Japanese).

Section XIV - Remarks