

|  |                           |                            |
|--|---------------------------|----------------------------|
| <b>Virus Name: Apoi</b>  |                           | <b>Abbreviation: APOIV</b> |
| Status<br><b>Possible Arbovirus</b>  | Select Agent<br><b>No</b> | SALS Level<br><b>2</b>     |
| SALS Basis<br><b>Results of SALS surveys and information from the Catalogue.</b> |                           |                            |
| Other Information  |                           |                            |
| Antigenic Group<br><b>B</b>  |                           |                            |

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

|  |   |   |
|--|---|---|
| Prototype Strain Number / Designation<br><b>Ezo encephalitis virus</b> | Accession Number  | Original Date Submitted<br><b>11/7/1984</b> |
| Family   | Genus<br><b>Flavivirus</b>  |   |
| Information From<br><b>M. Kitaoka</b>                                  | Address<br><b>National Institute of Health, 2-10-35 Kamiosaki Shinagawa-ku, Tokyo</b> |   |
| Information Footnote<br><b>Reviewed by editor</b>                      |   |   |

**Section II - Original Source**

|   |   |   |
|---|---|---|
| Isolated By (name)<br><b>Study group on Ezo fever (2,3)</b>                                     | Isolated at Institute<br><b>Foothills of Mt. Apoi, Hokkaido</b> |   |
| Host Genus<br><b>Apodemus spp. and Clethrionomys sp. Rodents</b>                                | Species   | Host Age/Stage<br><b>Adult</b>  |
| Sex<br><b>Not Answered</b>  |   |   |
| <u>Isolated From</u>  | <u>Isolation Details</u>  |   |
| <b>Organs/Tissues</b>   | <b>Pooled spleens of 7 rodents</b>                              |   |
| Signs and Symptoms of Illness<br><b>Apparently healthy</b>                                      | Arthropod   |   |
| Time Held Alive before Inoculation  |   |   |
| Collection Method<br><b>By trapping rodents in the field</b>                                    | Collection Date<br><b>10/9/1954</b>                             |   |
| Place Collected (Minimum of City, State, Country)<br><b>At the foothills of Mt. Apoi, Japan</b> |   |   |
| Latitude<br><b>42° 1' N</b>   | Longitude<br><b>143° 4' E</b>                                   |   |
| Macrohabitat<br><b>In the forest along the path</b>   | Microhabitat  | Method of Storage until Inoculated<br><b>In the morning immediately after the collection of rodents</b> |
| Footnotes   |   |   |

**Section III - Method of Isolation**

Inoculation Date  
**10/9/1954**

Animal (Details will be in Section 6)  
**wn mice**

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

Test(s) Used

Footnotes

**Section IV - Virus Properties**

Physicochemical

|                                    |                                      |                                      |
|------------------------------------|--------------------------------------|--------------------------------------|
| Pieces (number of genome segments) | Infectivity                          | Sedimentation Coefficients(s)<br>(S) |
| Percentage wt, of Virion Protein   | Lipid                                | Carbohydrate                         |
| Virion Polypeptides: Number        | Details                              |                                      |
| Non-virion Polypeptides: Number    | Details                              |                                      |
| Virion Density                     | Sedimentation Coefficients(s)<br>(S) |                                      |
| Nucleocapsid Density               | Sedimentation Coefficients(s)<br>(S) |                                      |

**Stability of Infectivity (effects)**

pH (infective range)

|  |   |                                 |
|--|---|---------------------------------|
| Lipid Solvent (ether - % used to test) | After Treatment Titer<br><b>1.2 dex</b>     | Control Titer<br><b>5.5 dex</b> |
| Lipid Solvent (chloroform)             | After Treatment Titer                       | Control Titer                   |
| Lipid Solvent (deoxycholate)           | After Treatment Titer<br><b>&lt;2.0 dex</b> | Control Titer<br><b>6.0 dex</b> |

Other (formalin, radiation)  
**Chloroform-sensitive**

**Virion Morphology**

|                    |                              |                                   |
|--------------------|------------------------------|-----------------------------------|
| Shape              | Dimensions                   |                                   |
| Mean<br>nm         | Range<br>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

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**Hemagglutination**

Hemagglutination                      Antigen Source                      Erythrocytes (species used)  
**Yes**                      **SMB ext. by sucrose-acetone**                      **goose**

pH Range                      pH Optimum  
**6.0 - 6.8**

Temperature Range                      Temperature Optimum  
**37dC**

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**

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.

| Antigen  | CF Test (1)  |        |         |         |         |          |         |
|----------|--------------|--------|---------|---------|---------|----------|---------|
|          | Immune Serum |        |         |         |         |          |         |
|          | 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     |

| Antigen          | CF Test (2)        |              |            |           |
|------------------|--------------------|--------------|------------|-----------|
|                  | Immune Serum       |              |            |           |
|                  | Apoi               | Yellow Fever | Bussuquara | Rio Bravo |
| Apoi             | 64/64 <sup>a</sup> | 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       |

<sup>a</sup> 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

| Cell system (a)     | Virus passage history (b) | Evidence of Infection |            |                    |         |          |                  |                               |
|---------------------|---------------------------|-----------------------|------------|--------------------|---------|----------|------------------|-------------------------------|
|                     |                           | CPE                   |            |                    | PLAQUES |          |                  | Growth Without CPE<br>+/- (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 (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     |
|--|---------------------------|--|------------------------|
| 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                   |

| Experimental host and age | Passage history and strain | Inoculation Route-Dose | Evidence of infection   | AST (days) | Titer log <sub>10</sub> /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 <sub>10</sub> /ml (b)                        |          | Incubation period (c) |    | Transmission by bite (d) |       | Assay of arthropod, log <sub>10</sub> /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 (specify host)

**White mice: Encephalitis in mice**

Inclusion Bodies

Intranuclear

Organs/Tissues Affected

**Brain (LV), heart (LV), skeletal muscles (LV)**

Category of tropism

**Section XI - Human Disease**

In Nature

Residual

Death

Subclinical

Overt Disease

Clinical Manifestations

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

Number of Cases

Category (i.e. febrile illness, etc.)

**One laboratory infection**

**Encephalitis**

**Section XII - Geographic Distribution**

Known (Virus detected)

**Japan**

Suspected (Antibody only detected)

**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).

**Remarks**