

| Virus Name: Hughes | | Abbreviation: HUGV |
|--|---------------------------|------------------------|
| Status Probable Arbovirus | Select Agent No | SALS Level 2 |
| SALS Basis Results of SALS surveys and information from the Catalogue. | | |
| Other Information | | |
| Antigenic Group Hughes | | |

SECTION I - Full Virus Name and Prototype Number

| | | |
|---|--|--------------------------------------|
| Prototype Strain Number / Designation | Accession Number | Original Date Submitted 2/12/1985 |
| Family Bunyaviridae | Genus Nairovirus | |
| Information From Dr. C.M. Clifford | Address Rocky Mountain Lab., Hanilton, Montana | |
| Information Footnote Reviewed by editor | | |

Section II - Original Source

| | | |
|---|--|--|
| Isolated By (name) L.E. Hughes (1,9) | Isolated at Institute | |
| Host Genus Ornithodoros capensis group (2), pool of 12 ticks | Species | Host Age/Stage Adults |
| Sex Not Answered | | |
| <u>Isolated From</u> | <u>Isolation Details</u> | |
| Signs and Symptoms of Illness | Arthropod | |
| Time Held Alive before Inoculation | | |
| Collection Method Beating limbs of dead bay cedar and white mangrove | Collection Date 1/1/1962 | |
| Place Collected (Minimum of City, State, Country) Bush Key, Dry Tortugas Island, Florida, USA | | |
| Latitude 24° 40' N | Longitude 82° 90' W | |
| Macrohabitat Coral reef, with subclimax type of plant communities | Microhabitat Dead limbs of bay cedar; white mangrove, abandoned nests and litter | Method of Storage until Inoculated Humidity jars, room temp. 75-80% RH |
| Footnotes | | |

Section III - Method of Isolation

Inoculation Date

2/3/1962

Animal (Details will be in Section 6)

wn mice

Route Inoculated

Intracerebral

Reisolation

Other Reasons

Reisolated from ticks collected at same time

Homologous Antibody Formation by Source Animal

Test(s) Used

Footnotes

Section IV - Virus Properties

Physicochemical

Pieces (number of genome segments)

Infectivity

Sedimentation Coefficients(s)
(S)

Percentage wt, of Virion Protein

Lipid

Carbohydrate

Virion Polypeptides: Number

Details

Non-virion Polypeptides: Number

Details

Virion Density

Sedimentation Coefficients(s)
(S)

Nucleocapsid Density

Sedimentation Coefficients(s)
(S)

Stability of Infectivity (effects)

pH (infective range)

Lipid Solvent (ether - % used to test)

After Treatment Titer
0 dex

Control Titer
5.0 dex

Lipid Solvent (chloroform)

After Treatment Titer

Control Titer

Lipid Solvent (deoxycholate)

After Treatment Titer
0 dex

Control Titer
5.0 dex

Other (formalin, radiation)

Virion Morphology

Shape

Dimensions
About 100 nm

Mean
nm

Range
nm

Measurement Method

**Virus passed 150 nm gradacol membrane,
not 100**

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

| | | |
|---|---|-----------------------------|
| Hemagglutination No | Antigen Source SMB; serum ext. by sucrose- acetone; acetone-ether | Erythrocytes (species used) |
| pH Range | pH Optimum | |
| Temperature Range | Temperature Optimum | |
| Remarks | | |
| Serologic Methods Recommended CF, NT | | |
| Footnotes | | |

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

Hemagglutination-inhibition. Acetone-ether and sucrose-acetone extracted mouse brain and serum antigens were prepared and tested for hemagglutination properties according to the method of Clarke and Casals, with negative results.

Complement-fixation. The acetone-ether extracted brain was used as a complement-fixing antigen in a screen test (1:8 dilution of antigen tested against 1:4 dilution of serum in the presence of 2 exact units of complement) against about 70 hyperimmune mouse serum. No positive reactions were found except with homologous systems [1].

Neutralization. None of about 70 specific immune sera available at the RML (see [1]) gave any demonstrable protection, whereas, the homologous sera neutralized at least 3 dex of virus.

In CF tests by Jordi Casals at the Rockefeller Foundation Laboratories, negative results were obtained in tests with Hughes antigen against immune sera of 15 strains representing 10 different tick agents, including Ganjam, Bhanja, Wanowrie, and Silverwater [1].

Later studies at YARU have shown a relationship by CF test of Hughes virus with Soldado and with other viruses including CalAr 913, Farallon, Zirqa and Punta Salinas [4].

Puffin Island virus, presently unregistered, is antigenically related to but distinct from Hughes virus and other members of HUG serogroup [10].

Section VI - Biologic Characteristics

Virus Source (all VERTEBRATE isolates)
Blood (LV)

Lab Methods of Virus Recovery (ALL ISOLATIONS)
Newborn and weanling 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) | | |
| Vero (CL) | P-17 | | | | 6 | 1 mm | 7.5* (7) | | |
| LLC-MK2 (CL) | | | | | 6 | 2 mm | >7.7 (7) | | |
| XTC-2 (CL) | | | | | | Plaques (10) | | | |

* 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 |
|--|---------------------------|---|---|
| O. denmarki ticks | 3 | | Dry Tortugas, Florida, USA; 1962 |
| Ornithodoros sp. | 1 | | Farallon Islands, CA; FL, USA and Mexico(3) |
| Ornithodoros denmarki | 1 | | Raza Island, Gulf of California, Mexico(5) |
| O. capensis group | 7 | | Soldado Rock, Trinidad (6) |
| Sterna fuscata (sooty tern; blood) | 8/33 | | |

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 log ₁₀ /ml |
|-------------------------------------|----------------------------|------------------------|---|------------|-----------------------------|
| Mice (nb) | P-2 | ic .02 | Paralysis and death | 5-7 | |
| Mice (nb) | P-4 | ip 0.1 | Paralysis and death | 5-7 | 4.25 |
| Mice (nb) | | sc | | | |
| Mice (wn) | | ic .03 | Tremors convulsions | 8-10 | 3.75 |
| Mice (wn) | | ip | Antibody | | |
| Mice (nb) | P-24 | ic .02 | Paralysis and death | 6 | 5.15 |
| Mice (nb) | P-41 | ic .02 | Death | 5-6 | 6.15 |
| house mice(10 day) | P-4 | ic and ip .02 | Paralysis and death | 9-10 | |
| house mice (ad) | | ic .03 | Paralysis and death | 11 | 4.75 |
| hamsters (9 day) | P-3 | ic .05 | Paralysis and death | 9 | |
| hamsters (ad) | | ip .25 | Antibody | | |
| Peromyscus sp.(ad) P-9 | | ic .03 | None | 9 | |
| guinea pigs (yg) | P-1, P-3 | ic 0.25 | Tremors, temp. and convulsions | | |
| rhesus monkey (ad) | P-4 | ic | 6 days fever after 14 day incubation period | | |
| embryonated eggs (6 day) | | ys 0.25 | Death | 5-6 | |
| chicks (1-2 day) | | ic .02 | Paralysis and death | 5-8 | |
| chicks (1-2 day) | | ip 0.1 | None, no antibody prod. | | |
| sooty terns (juv.) (caught wild) | P-5 | sc 0.1 | Viremia (8) | | <3.40 |
| noddy terns (juv.) (caught wild) | | sc 0.1 | Viermia (8) | | <3.40 |

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 |
| Ornithodoros denmarki: Nymphs fed virus; virus recovered up to 840 days after feeding (8). | | | | | | | | | |
| | | | | | | | | | |

Section X - Histopathology

Character of lesions (specify host)

See paper by Hughes, et al. 1964 (1). Lesions in mice and hamsters inoculated ic limited to CNS

Inclusion Bodies

Intranuclear

Organs/Tissues Affected

Brain (LV), spinal cord (LV)

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)

Trinidad; Dry Tortugas Island, Florida; California, USA; Raza Island, Gulf of California, Mexico

Suspected (Antibody only detected)

Section XIII - References

1. Hughes, L.E., et al. 1964. Am. J. Trop. Med. Hyg. 13:118-122.
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3. Radovsky, F.J., et al. 1967. J. Parasitol. 53:890-892.
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5. Clifford, C.M., et al. 1968. Am. J. Trop. Med. Hyg. 17:881-885.
6. Aitken, T.H.G., et al. 1968. J. Med. Ent. 5:501-503.
7. Stim, T.B. 1969. J. Gen. Virol. 5:329-338.
8. Clifford, C.M. and Yunker, C.E. Unpublished observations.
9. Philip, C.B. 1965. J. Parasitol. 51:252.
10. Gould, E.A., et al. 1983. J. Gen. Virol. 64:739-742.

Remarks