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|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|--------------------------|
| <b>Virus Name: Virgin River</b>                                                                                                                                                                   |                           | <b>Abbreviation: VRV</b> |
| Status<br><b>Possible Arbovirus</b>                                                                                                                                                               | Select Agent<br><b>No</b> | SALS Level<br><b>2</b>   |
| SALS Basis<br><b>Placed at this biosafety level based on close antigenic or genetic relationship to other viruses in a group of 3 or more viruses, all of which are classified at this level.</b> |                           |                          |
| Other Information                                                                                                                                                                                 |                           |                          |
| Antigenic Group<br><b>Anopheles A</b>                                                                                                                                                             |                           |                          |

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

|                                                         |                                                                               |                                             |
|---------------------------------------------------------|-------------------------------------------------------------------------------|---------------------------------------------|
| Prototype Strain Number / Designation<br><b>743-366</b> | Accession Number                                                              | Original Date Submitted<br><b>8/31/1984</b> |
| Family<br><b>Bunyaviridae</b>                           | Genus<br><b>Bunyavirus</b>                                                    |                                             |
| Information From<br><b>C.H. Calisher</b>                | Address<br><b>Vector-Borne Diseases Division, CDC, Fort Collins, CO 80522</b> |                                             |
| Information Footnote<br><b>Reviewed by editor</b>       |                                                                               |                                             |

**Section II - Original Source**

|                                                                                                       |                                                                                                                             |                                                                          |
|-------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| Isolated By (name)<br><b>G. Crane and R. Elbel</b>                                                    | Isolated at Institute<br><b>Dugway, Utah</b>                                                                                |                                                                          |
| Host Genus<br><b>Anopheles freeborni</b>                                                              | Species                                                                                                                     | Host Age/Stage<br><b>40 Adults</b>                                       |
| Sex<br><b>Female</b>                                                                                  |                                                                                                                             |                                                                          |
| <u>Isolated From</u>                                                                                  | <u>Isolation Details</u>                                                                                                    |                                                                          |
| Signs and Symptoms of Illness                                                                         | Arthropod<br><b>Depleted</b>                                                                                                |                                                                          |
| Time Held Alive before Inoculation                                                                    |                                                                                                                             |                                                                          |
| Collection Method<br><b>CDC light trap</b>                                                            | Collection Date<br><b>9/12/1974</b>                                                                                         |                                                                          |
| Place Collected (Minimum of City, State, Country)<br><b>Beaver Dam Wash, at Virgin River, Arizona</b> |                                                                                                                             |                                                                          |
| Latitude<br><b>36° 54' N</b>                                                                          | Longitude<br><b>113° 56' W</b>                                                                                              |                                                                          |
| Macrohabitat<br><b>571.5 meters elevation. Lower Sonoran Life Zone</b>                                | Microhabitat<br><b>Tamarix pentandra, Salix gooddingi, Typha latifolia, Prosopis juliflora, Populus fremonti, Salsola k</b> | Method of Storage until Inoculated<br><b>Mechanical freezer at -60dC</b> |
| Footnotes                                                                                             |                                                                                                                             |                                                                          |

**Section III - Method of Isolation**

Inoculation Date  
**10/15/1974**

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

|                                          |                           |
|------------------------------------------|---------------------------|
| Route Inoculated<br><b>Intracerebral</b> | Reisolation<br><b>Yes</b> |
|------------------------------------------|---------------------------|

Other Reasons  
**No other related virus in this laboratory at time of isolation or reisolation.**

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) |                                      |

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**Stability of Infectivity (effects)**

pH (infective range)

|                                               |                                             |                                 |
|-----------------------------------------------|---------------------------------------------|---------------------------------|
| Lipid Solvent (ether - % used to test)        | After Treatment Titer                       | Control Titer                   |
| Lipid Solvent (chloroform)                    | After Treatment Titer                       | Control Titer                   |
| Lipid Solvent (deoxycholate)<br><b>1:1000</b> | After Treatment Titer<br><b>&lt;2.0 dex</b> | Control Titer<br><b>5.4 dex</b> |

Other (formalin, radiation)  
**Loss of 1.2 dex and 0.4 dex when held at 37C, 1 hr and 4C, 22 hr respectively**

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**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)

**No**

**SMB ext. by sucrose-acetone**

**Goose**

pH Range

pH Optimum

**5.75-7.0**

Temperature Range

Temperature Optimum

**4dC - 37dC**

Remarks

Serologic Methods Recommended

**CF, NT**

Footnotes

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

743-366 antigen (titer = 256) was tested by complement-fixation with grouping immune ascitic fluids including: NIH Polyvalent grouping fluids 1 through 10 and 12, QRF, BWA, VSV, CAL, CON, SAK, SIM, TCR, GMA, BUN, B, PAL, PAT, PHL, CAP, KEM, Rabies, and Polyvalent Anopheles A as well as immune preparations to Anopheles A (original), Lukuni (TRVL 10076), Tacaiuma (BeAn 73), Anopheles B (original), Boraceia (SPAr 395) and Turlock (847-32) viruses. Reactivity was noted only with Polyvalent Anopheles A and Tacaiuma.

743-366 antibody (titer = 256) was tested by complement-fixation with Anopheles A (original), Lukuni (TRVL 10076), Tacaiuma (BeAn 73), Anopheles B (original), Boraceia (SPAr395) and Turlock (847-32). Reactivity was noted only with Tacaiuma antigen. Results of cross-testing strain 743-366 with eight Anopheles A serogroup viruses by neutralization tests in Vero cells [2] .

**ANTIBODY TITER TO:**

| <b>Virus or Strain</b> | <b>743-366</b> | <b>SPAr 2317</b> | <b>H-32580</b> | <b>TCM</b> | <b>CoAr 1071</b> | <b>CoAr 3624</b> | <b>LUK</b> | <b>ColAn 57389</b> | <b>ANA</b> |
|------------------------|----------------|------------------|----------------|------------|------------------|------------------|------------|--------------------|------------|
| 743-366                | 40960          | 1280             | 80             | 2560       | -                | 80               | 80         | 10                 | 20         |
| SPAr 2317              | 1280           | 1280             | 20480          |            |                  |                  |            |                    |            |
| H-32580 *              | 10240          | 10240            | 20480          | 81920      | 80               | 10               | 320        | 10                 | 80         |
| Tacaiuma               | 5120           |                  | 80             | 40960      |                  |                  |            |                    |            |
| CoAr 1071              | 80             |                  | 80             |            | 80               |                  |            |                    |            |
| CoAr 3624              | -              |                  | -              |            |                  | 160              |            |                    |            |
| Lukuni                 | -              |                  | -              |            |                  |                  | 640        |                    |            |
| ColAn 57389            | -              |                  | -              |            |                  |                  |            | 2560               |            |
| Anopheles A            | 80             |                  | -              |            |                  |                  |            |                    | 320        |

Antibody titer: reciprocal of highest dilution producing >90% plaque reduction

- indicates <10; blank indicates not tested

\* See XIV. (1) Remarks, bottom of page 4

Virus Source (all VERTEBRATE isolates)

Lab Methods of Virus Recovery (ALL ISOLATIONS)  
Newborn mice

| Cell system<br>(a)  | Virus passage<br>history (b) | Evidence of Infection |               |                       |            |               |                     |                                  |
|---------------------|------------------------------|-----------------------|---------------|-----------------------|------------|---------------|---------------------|----------------------------------|
|                     |                              | CPE                   |               |                       | PLAQUES    |               |                     | Growth<br>Without CPE<br>+/- (g) |
|                     |                              | Day<br>(c)            | Extent<br>(d) | Titer<br>TCD50/ml (e) | Day<br>(c) | Size (f)      | Titer<br>PFU/ml (e) |                                  |
| Vero (CL)           | SM4                          |                       |               |                       | 12         | 3 mm          | 5.0 **              |                                  |
| PS (CL)             |                              |                       |               |                       | 6          | 2 mm          | 5.8                 |                                  |
| PK-15 (CL)          |                              |                       |               |                       | 6          | 3 mm          | 4.7                 |                                  |
| L-929 (CL)          |                              |                       |               |                       |            | No<br>plaques | <3.0                |                                  |
| Duck embryo<br>(PC) |                              |                       |               |                       |            | No<br>plaques | <3.0                |                                  |

\*\* Expressed in dex

| Vertebrate (species and organ) and arthropod                                                                          | No. isolations/No. tested | No. with antibody/No. tested<br>Test used | Country and region           |
|-----------------------------------------------------------------------------------------------------------------------|---------------------------|-------------------------------------------|------------------------------|
| Anopheles freeborni                                                                                                   | 1/2041                    |                                           | Beaver Dam Wash, Arizona (1) |
| Anopheles franciscanus                                                                                                | 0/1862                    |                                           |                              |
| Culex tarsalis                                                                                                        | 0/849                     |                                           |                              |
| Culex thriambus                                                                                                       | 0/552                     |                                           |                              |
| Culiseta inornata                                                                                                     | 0/279                     |                                           |                              |
| Other (including Cx erythrothorax, Cs incidens, Aedes vexans, Ae dorsalis, Culicoides hieroglyphiens, Culicoides sp.) |                           |                                           |                              |

**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 <sub>10</sub> /ml |
|---------------------------|----------------------------|------------------------|-----------------------|------------|-----------------------------|
|                           |                            |                        |                       |            |                             |
| Mice (nb)                 | SM 0                       | ic                     | Death                 | 9-10       |                             |
| Mice (nb)                 |                            | ip                     |                       |            |                             |
| Mice (nb)                 |                            | sc                     |                       |            |                             |
| Mice (wn)                 | SM 4                       | ic                     | Death                 | 8          | 6.4                         |
| Mice (wn)                 |                            | ip                     |                       |            |                             |
| Mice (nb)                 |                            | ic                     |                       |            |                             |

**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 |
|                                     |                                               |          |                       |    |                          |       |                                               |       |        |
|                                     |                                               |          |                       |    |                          |       |                                               |       |        |

**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)<br><b>Arizona, USA</b> |
| Suspected (Antibody only detected)            |

**Section XIII - References**

|                                                                                                                   |
|-------------------------------------------------------------------------------------------------------------------|
| 1. Elbel, R.E., et al. 1977. Mosquito News. 37:497-507.<br>2. Calisher, C.H., et al. 1980. Bull. PAHO 14:386-391. |
|-------------------------------------------------------------------------------------------------------------------|

**Remarks**

|                                                                                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Virgin River virus is distinct from Brazilian isolate H-32580 which is a variant of both Tacaiuma virus and of its subtype, SPAr 2317 virus.</b> |
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