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DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Centers for Disease Control

June 1, 1987

From: B.R. Miller

Subject: Attached "Arthropod-Borne Virus Information Exchange"

Your copy of the most recent "Arthropod-Borne Virus Information Exhange" is attached.

The next deadline for submission of contributions is March 1, 1988.

Please address all communications to the undersigned.

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attachment

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GUIDE FOR CONTRIBUTORS

The Arthropod-Borne Virus Information Exchange is issued for the purpose of timely exchange of information among investigators of arthropod-borne viruses. It contains reports, summaries, observations, and comments submitted voluntarily by qualified investigators. The appearance of any information, data, opinions, or views in this exchange does not constitute formal publication. Any reference to or quotation of any part of the "Information Exchange" must be authorized directly by person or agency submitting the article. The editor of the "Information Exchange" cannot authorize references and quotations.

Deadlines for contributions are March 1 and September 1.

1. Heading

   The heading should be typed with capital letters, including name of laboratory and address. For example:

   REPORT FROM THE BIOLOGICAL PRODUCTS PRODUCTION BRANCH, CENTER FOR INFECTIOUS DISEASES, CENTERS FOR DISEASE CONTROL, ATLANTA, GA 30333

2. Body of Report

   The text of the report should be as brief as possible to convey the intended message and should make reference to tables and figures inluded in the report. The text should be single spaced with double spacing between paragraphs.

3. Authors' Names

   The names of authors should be in parentheses following the text.

4. Tables and Figures

   Tables and figures should be numbered and titled if appropriate. Tables and figures should not be submitted without some description or explanation.

5. Size of Pages

   Since there are specific space limitations, the typed material on each page should not exceed 7-1/8" x 9-1/4". The same dimensions apply to tables and figures. If tables and figures are larger than these dimensions, they have to be reduced before being printed. The block shown on this page represents the maximum space available for each page of your report.

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The AMERICAN COMMITTEE ON ARTHROPOD-BORNE VIRUSES

1986 ANNUAL REPORT ON THE CATALOGUE OF ATRHOPOD-BORNE AND SELECTED VERTEBRATE VIRUSES OF THE WORLD*

By

THE SUBCOMMITTEE ON ARTHROPOD-BORNE VIRUS INFORMATION EXCHANGE

SUBCOMMITTEE ON INFORMATION EXCHANGE

I. Objectives:

The objectives of the Catalogue are to register data concerning occurrence and characteristics of newly recognized arthropod-borne viruses and other viruses of vertebrates of demonstrated or potential zoonotic importance and to disseminate this information at quarterly intervals to participating scientists in all parts of the world; to collect, reproduce, collage, and distribute current information regarding registered viruses from published materials, laboratory reports and personal communications; and to prepare and distribute an annual summary of data extracted from catalogued virus registrations.

II. Materials and Methods:

Viruses are registered and information supplied on a voluntary basis, usually by scientists responsible for their isolation and identification. New registration cards, information concerning registered viruses and pertinent abstracts of published literature are distributed at quarterly intervals to participating laboratories. Abstracts of published articles dealing with catalogued viruses are reproduced by special arrangements with the editors of Biological Abstracts, Abstracts on Hygiene, and the Tropical Disease Bulletin.

Distribution of Catalogue Materials: At the start of 1986, 181 mailings of Catalogue material were being made. During the year, two addresses were dropped and nine new participants were added to the mailing list. At the end of the year, 188 mailings of Catalogue material were being made, including 59 within the U.S.A. and 129 to foreign addresses. Distribution by continent was: Africa 19, Asia 25, Australasia 9, Europe 45, North America 72, and South America 18.

Abstracts and Current Information: A total of 422 abstracts or references were coded by subject matter and distributed to participants during 1986. Of this total, 208 were obtained from Kelbry Enterprises and 214 from Abstracts on Hygiene and the Tropical Diseases Bulletin. A total of 16,099 references or units of information have been issued since the start of the program.

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*The Catalogue is supported by the Centers for Disease Control, Atlanta, Georgia.

Registration of new viruses. Two viruses were accepted for registration during the period January 1986 to December 1986. As of December 1985, the Catalogue contained 504 viruses. With the acceptance of 2 virus registrations, the total number of registered viruses is 506 as of December 1986. The 2 viruses registered between January 1986 and December 1986 are listed below.

Virus Name	Recommended Abbreviation	Country	Source	Antigenic Group
Corfou	CFU	Greece	*Phlebotomus* sp.	PHL
Omo	OMO	Ethiopia	Rodent	QYB

Omo virus was isolated in 1971, while Corfou virus was isolated in 1981. Both viruses have been evaluated as Possible Arbovirus by SEAS.

Neither virus has been implicated in human infections.

Antigenic grouping. There have been a number of changes during the past year in the antigenic classification of registered viruses. Two new serogroups have been formed. One serogroup includes Umatilla and Llano Seco viruses and an unregistered arbovirus named Netivot virus (1). The latter virus was isolated from mosquitoes collected in Israel. An antigenic relationship between Umatilla and Llano Seco virus was observed previously when Llano Seco virus was being characterized (see Llano Seco registration card). However, the two viruses were not grouped because there was some uncertainty concerning the antigenic relationship of Llano Seco virus to other established arboviruses. The formation of this serogroup is provisional until it is resolved that these three viruses are distinct by cross-neutralization tests. Nevertheless, all three viruses show biological differences and differ in the migration of their ds RNA segments in polyacrylamide gels (1).

A newly described virus, causing disease in humans, has been isolated from bats (*Rousettus aegyptiacus*) collected in Uganda and has been shown to be antigenically related to Yogue virus (2). Two virus isolates were obtained from bats and four additional isolates from humans infected in the laboratory. This new virus has been named Kasokero virus and, together with Yogue virus, they now comprise the Yogue serogroup.

There are now 65 serogroups represented among viruses registered in the Catalogue, excluding viruses placed in the Bunyamwera Supergroup but unassigned (SBU).

Zingilamo virus was shown to possess a hemagglutinin and subsequently was shown to be related to Semliki Forest virus (3,4). Provisionally, Zingilamo virus has been placed in serogroup A pending the determination of its precise relationship to Semliki Forest virus.

Keterah and Issyk-Kul viruses have been demonstrated to be identical by complement-fixation (CF) and neutralization tests (NT) (5).

Taxonomic status of registered viruses. Reported changes in the taxonomic classification of registered arboviruses are of a provisional nature, and in some instances, new taxonomic placements are based on very slight evidence.

The taxonomic status of seven registered viruses has changed as a result of observations made during 1986. Boteke, Gossas, Nkolbisson, and Rochambeau viruses have been found to possess rhabdovirus morphology (6). Studies have been undertaken in order to determine if these viruses are antigenically related to other known viruses. Boteke virus originally was considered to be related to Zingilamo virus. This is no longer the case. Zingilamo virus recently was shown to possess alphavirus morphology and to be related to Semliki Forest virus (3). In addition, the morphology of Malakal virus was found to resemble that of viruses of the family Togaviridae (7). Aside from its known relationship to Puchong virus, an antigenic relationship to other known viruses has not been found. Finally, Wanowrie virus has been shown to morphologically resemble viruses of the family Bunyaviridae (6). In addition, a hemagglutinin has been elaborated for Wanowrie virus, and the characteristics of this hemagglutinin have been described (8).

Both Issyk-Kul and Keterah viruses have been placed in the family Bunyaviridae taxon. Electron microscopic studies have shown that Issyk-Kul virus resembles viruses of the family Bunyaviridae (9). Since CF and NT studies have shown that both Issyk-Kul and Keterah are antigenically identical (5), they should be considered as a single virus.

SYNOPSIS OF INFORMATION IN THE CATALOGUE

This synopsis has been compiled primarily to provide a short review of the viruses included in the Catalogue. The following tabulations are designed to draw together groups of viruses showing certain common characteristics including taxonomic status, serological relationships, and, where appropriate, principal arthropod vector. Isolations from arthropod and animal hosts, continental distribution, involvement in human disease, and arthropod-borne status are indicated.

The recommended levels of laboratory practice and containment and the basis for assignment to these levels are shown. Most of this information was published previously by SALS (10). Several registered viruses listed in Tables 5.1 through 13.2.2 have not been rated by SALS. Appendices I and II, following Table 18.1, provide a description of recommended levels and an explanation of symbols used to define basis.

Other tables summarize the taxonomic status of registered viruses; the antigenic groups comprising a given taxon to which registered viruses have been assigned; the numbers of registered viruses assigned to presently recognized antigenic groups; chronology and areas of isolations of registered viruses; continental distribution by groups; numbers of viruses recovered from naturally infected arthropods and vertebrates; association with human disease; and evaluation of arthropod-borne status of members in various serogroups.

Appendices I and II are followed by a vector index and a host index. The vector index mostly shows registered viruses isolated from individual arthropod species collected in nature. The host index shows registered viruses isolated from vertebrate hosts collected in nature. Both Linnean taxonomic designations and common names of hosts are used depending upon information available from original sources. These indices were compiled primarily from information on virus registration cards. Other sources of information were employed as well, although these listings should not be considered as exhaustive. Because of the large number of virus names involved, official abbreviations for registered viruses were used. Please refer to Table 1.1 for the corresponding virus name.

1. Alphabetical and taxonomic listing of registered viruses. Table 1.1 presents a listing of the 506 viruses registered in the Catalogue as of December 1985. An official or provisional taxonomic classification is shown for each registered virus. If taxonomic status is not indicated, the registered virus is presently unclassified. Also, for each virus a recommended abbreviation is given, formulated according to the guidelines established by the ACAV (11). All too often, abbreviations of the author's choosing are employed in publications and do not conform to the recommended abbreviations. The use of unofficial abbreviations is confusing, is contrary to established guidelines, and erodes a portion of the effort of the Arbovirus Information Exchange program. All arbovirologists who plan to employ abbreviations in print should make every effort to use the recommended abbreviations.

Antigenic groups to which viruses have been assigned also are shown in Table 1.1. If no antigenic group is given, the virus is ungrouped and indicates that is has not been demonstrated to be related serologically to any other virus.

2. Antigenic groups of registered viruses. The originally described antigenic groups of arboviruses were designated by letters, A, B, and C; but in present practice, the first discovered virus of a newly recognized serogroup lends its name to the antigenic cluster. Before a virus can be assigned to any antigenic group, it must be shown to be serologically related to, but clearly distinguishable from a previously isolated virus.

Table 2.1 lists the serogroups comprising the various taxa to which registered viruses have been assigned. Sixty-five antigenic groups have been designated for viruses registered in the Catalogue, including the previously established rabies serogroup (12). The rabies serogroup is represented in the Catalogue because two members of that serogroup were registered in the Catalogue. Lagos bat virus was registered in 1961 and was described in the first published edition of the Catalogue (13). Kotonkan virus was registered more recently (in 1982); and had greater potential of being arthropod-borne since it was isolated from Culicoides insects. There are several instances in which only a single virus is shown in an antigenic group. That is so because one or more antigenic relatives of that virus are known but have not yet been registered.

The Bunyavirus genus comprises the Bunyamwera Supergroup to which several additional serogroups have been added. The most recent additions are the Anopheles B and Turlock serogroups (14). The Bunyamwera Supergroup originally was formulated to reflect low-level but reproducible intergroup relationships, usually by CF and/or HI reactions (15). A large number of these viruses were subsequently found to be identical morphologically and morphogenetically. The Bunyamwera Supergroup designation was thus replaced by the Bunyavirus genus in the Family Bunyaviridae (16,17). In a somewhat analogous situation, the Nairovirus genus was constructed to include six distinct serogroups which share low-level intergroup relationships among themselves (18,19). Registered viruses belonging in the Bunyavirus genus constitute slightly more than 25% of all registered viruses.

3. Initial isolations by decade and country of origin. Table 3.1 lists the initial isolation of registered viruses by the decade of discovery and according to the continent or zoogeographic region and country in which each was discovered. Because of the large number of virus names involved, abbreviations are employed. These abbreviations and the associated complete names of the respective viruses may be found in Table 1.1.

4. Initial isolation of viruses by continent, country, and chronological period. Periods or locations which show large numbers of virus isolations undoubtedly reflect the net effect of a number of contributing factors such as the change in emphasis of field programs from a search for viruses causing specific diseases to a systematic search for viruses, new or known, in their

natural ecological niche in a given geographical area; refinements in isolation and identification techniques; improved communication between arbovirus laboratories; more rapid dissemination of new information; or the presence in a given area of an arbovirus laboratory with highly active and effective field programs.

Tables 5.1 through 18.1 list registered viruses by serogroup; by recorded isolations from arthropod vectors and vertebrates; and by geographic distribution based on virus isolation. Data also are presented regarding human disease in nature or by laboratory infection, evaluation of arbovirus status, and proved or provisional taxonomic status. These tables also show the recommended laboratory practice and containment level assigned to each registered virus, and the basis for assignment to a level. Where possible, sets of viruses also were grouped according to their actual or suspected principal arthropod vector.

5. Alphaviruses. Alphaviruses clearly are mosquito associated, although a few have been isolated from other arthropods (Table 5.1). In addition, during 1985, Middelburg virus was isolated from *Amblyomma variegatum* ticks. About 50% of the alphaviruses are associated with avian hosts, whereas some, particularly those of the Venezuelan equine encephalitis complex, are associated with rodents. Sindbis virus has been recovered from the organs of insectivorous bats collected in Zimbabwe. Cabassou, chikungunya, eastern equine encephalitis, Highlands J, and Venezuelan equine encephalitis viruses represent the other alphaviruses which have been isolated from bats.

Eleven alphaviruses have been isolated from humans while 12 have been implicated in human disease either by infections acquired in nature or in the laboratory. Both Bebaru and Ross River viruses have been associated with clinically inapparent laboratory-acquired infections, although Ross River virus infections in nature have resulted in human disease. At least eight of these 13 alphaviruses have been responsible for epidemics: chikungunya, eastern equine encephalitis, Mayaro, o'nyong-nyong, Ross River, Sindbis, Venezuelan equine encephalitis, and western equine encephalitis. All of the 13 alphaviruses either are rated as Arbovirus (11 viruses), Probable Arbovirus (one virus) or Possible Arbovirus (1 virus).

Previously, Zingilamo virus was shown to morphologically resemble alphaviruses and subsequently was shown to be related to Semliki Forest (SF) virus by CF, HI, and NT (3,4). Upon reexamination, Boteke virus, which was registered as an antigenic relative of Zingilamo virus (see Boteke virus registration card), was found to be unrelated to SF virus both by CF and NT, but still showed a CF relationship to Zingilamo virus (4). However, Boteke virus subsequently was shown to possess rhabdovirus morphology (6) and provisionally is being listed as an ungrouped rhabdovirus separate from Zingilamo virus. Two questions must be answered in order to effect a final placement of these viruses. Firstly, is Zingilamo virus distinct from SF virus? Present evidence would indicate that both viruses differ in CF but that Zingilamo virus appears to be a subtype of SF virus by NT (4). Secondly, it must be established unequivocally whether Boteke virus is related or unrelated to Zingilamo virus.

6. Flaviviruses. Of the 66 registered flaviviruses, 47% have been placed in the mosquito-borne category (Table 6.1), 26% are considered to be tick-borne (Table 6.2), and 27% are categorized as not being associated with a proven arthropod vector (Table 6.3). Only St. Louis encephalitis, West Nile and yellow fever viruses in the mosquito-borne category (Table 6.1) and Powassan virus in the tick-borne catagory (Table 6.2) have been isolated from both mosquitoes and ticks. Israel turkey meningoencephalitis (IT) virus provisionally has been placed in the mosquito-associated category. Previously, it had been listed in the "no arthropod vector demonstrated" category (Table 6.3). Isolations of IT virus have been reported from *Culicoides*, mosquitoes (species not specified) and engorged *Culex pipiens* mosquitoes. Furthermore, experimentally infected *Cx. molestus* and *Aedes aegypti* mosquitoes have transmitted the virus by bite to suckling mice.

Twenty-seven of the 31 registered flaviviruses which are mosquito-borne (Table 6.1) are rated as Probable Arbovirus or Arbovirus. The tick-borne flaviviruses (Table 6.2) contain four registered viruses, Absettarov, Hanzalova, Hypr, and Kumlinge, which are very closely related or indistinguishable by conventional serological techniques, though they are purported to be clearly differentiated on the basis of clinical, epidemiological, and ecological markers from Russian spring-summer encephalitis virus and other members of that complex.

Twenty-nine (44%) registered flaviviruses have been isolated from humans; 19 of 31 (61%) mosquito-borne flaviviruses and nine of 17 (53%) tick-borne flaviviruses have been implicated in human disease. By contrast, only five of 18 (28%) flaviviruses not associated with a vector have been implicated in human disease. Modoc virus, listed in Table 6.3, was implicated in a clinically inapparent laboratory infection. Thus, a total of 33 flaviviruses have been associated with disease in humans.

With the exception of Koutango virus, none of the registered flaviviruses placed in the "no arthropod vector demonstrated" category are rated above Possible Arbovirus by SEAS. Seven members are rated as Probably Not or Not Arbovirus. Most of the flaviviruses listed in Table 6.3 have been isolated from rodents or bats. Cacipacore virus has been isolated from a wild bird and Aroa virus from a sentinel hamster. Only Dakar bat and Negishi viruses have been isolated from humans; Negishi virus has been recovered only from that source. While only 2 flaviviruses of this category have been isolated from humans, five have been implicated in human disease. These include Apoi, Dakar Bat, Koutango, Negishi, and Rio Bravo viruses.

Powassan virus was recovered in cell culture prepared from kidney tissue removed from an apparently healthy male spotted skunk (*Spilogale putorius*) captured in California (20). This is the first reported isolation of Powassan virus west of the Rocky Mountains.

7. Antigenically grouped and ungrouped viruses of families Togaviridae and Flaviviridae. Malakal and Puchong viruses, currently comprising the Malakal serogroup, have been placed here as possible members of the Togaviridae

family. Malakal virus was examined by electron microscopy (EM) and found to resemble viruses of the family Togaviridae (7). Thus far, Malakal virus has not shown an antigenic relationship to any of the other established or provisional togaviruses. Puchong virus has not been examined by EM and has been placed with Malakal virus because of their previously demonstrated antigenic relationship (see Malakal and Puchong virus registration cards).

Triniti virus was recovered in Trinidad from Trichoprosopon species mosquitoes. It was rated as Probable Arbovirus by SEAS (Table 7.1). This virus was shown to possess a ribonucleic acid (RNA) genome and morphologically it resembled viruses of the family Togaviridae (21).

Simian hemorrhagic fever virus has produced severe disease in rhesus monkeys imported from India. Other monkey species developed disease following contact with the recently imported sick rhesus monkeys. Simian hemorrhagic fever virus has been classified as Not Arbovirus by SEAS. This virus has been shown to resemble the flaviviruses morphologically and structurally, although an antigenic relationship has not been demonstrated.

8. Family Bunyaviridae.

8.1 Bunyaviruses. Sixteen antigenic sets of viruses plus Kaeng Khoi virus (SBU) comprise the bunyaviruses. A total of 123 registered viruses have been placed within the Bunyavirus genus.

8.1.1 Anopheles A and Anopheles B serogroup viruses. Members of the Anopheles A serogroup have been isolated either from anopheline or both culicine and anopheline mosquitoes. Of the five members of this serogroup, only Tacaiuma virus has been isolated from and reported to cause a febrile illness in humans. In addition, this virus has been isolated from a sentinel monkey. Members of this serogroup and of the ANB serogroup appear to be geographically localized.

Viruses of the Anopheles B serogroup have been isolated only from mosquitoes collected in South America. Neither virus has been associated with infections in humans.

8.1.2 Bunyamwera serogroup viruses. All members of the Bunyamwera serogroup have been isolated from culicine or anopheline mosquitoes or both. In addition, Lokern and Main Drain viruses have been isolated from Culicoides species. Anhembi, Germiston, Kairi, Macaua, Northway, Tensaw, and Shokwe viruses have been recovered from rodents, and Lokern, Main Drain, and Tensaw viruses from lagomorphs. Northway virus also was isolated from sentinel rabbits, Kairi virus from a monkey, Macaua virus from a bird, and Tensaw virus from a fox.

Bunyamwera, Germiston, Ilesha, Shokwe, and Wyeomyia viruses have been isolated from humans. These viruses plus Calovo and Tensaw viruses have been associated with human disease, either through infections acquired in nature or in the laboratory, or both. Furthermore, Maguari virus has been isolated from horses with encephalitis, Cache Valley from a caribou that died, a sick sheep, a cow and from an asymptomatic horse, and Main Drain virus has been isolated from brain tissue of a horse that died of encephalitis.

Fifteen of the 22 viruses registered in the Bunyamwera serogroup have been rated as Arbovirus or Probable Arbovirus. None are rated below Possible Arbovirus.

Members have been found most frequently in North America (8 viruses), South America (8 viruses) and Africa (5 viruses). Thus far, only one virus has been recovered in Asia, two in Europe, and none in Australasia.

8.1.3 Bwamba serogroup and serogroup C viruses. The group C viruses have been closely associated with mosquito vectors and small animals, particularly rodents. Eight group C viruses have been isolated from rodents, and three of these eight additionally have been isolated from marsupials. Two other viruses have been isolated from marsupials but not rodents. Ten of the twelve viruses have been isolated from humans. Only Gumbo Limbo and Vinces viruses have not been isolated from humans and, with the exception of those two viruses, all members have been associated with cases of human febrile illness. In addition, Apeu, Caraparu, Marituba, Murutucu, Oriboca and Ossa viruses have been reported to infect humans as a result of laboratory mishaps. Ten of these viruses have been classified as Arboviruses and two as Probable Arboviruses.

Both Bwamba and Pongola viruses (Bwamba serogroup) are mosquito-borne, and both viruses have been isolated from humans. Bwamba virus has been reported to produce a febrile illness in humans as a result of infections acquired in nature. During 1985, it was reported that Pongola virus was isolated in 1982 from acute-phase serum of a young adult human presenting with symptoms of at least fever and headache (22). Thus far, these two viruses have been found in Africa only. Pongola virus has been rated as Arbovirus while Bwamba virus has been rated as Probable Arbovirus.

8.1.4 California and Capim serogroup viruses. All California serogroup viruses are associated with mosquito vectors and four members have been recovered from rodents (Table 8.1.4). La Crosse, Guaroa, and Tahyna viruses have been isolated from humans and, along with California encephalitis, Jamestown Canyon, snowshoe hare and Inkoo viruses, have been associated with disease as a result of infections acquired in nature. In addition, Keystone virus has been implicated in an inapparent infection in a laboratory worker. Antibody to trivittatus virus has been demonstrated in humans although the virus has not been associated with the production of disease in humans. California group infections in humans have been documented serologically in China. Only Inkoo and Tahyna viruses have been isolated on continents other than North and South America. On the basis of virus isolation, the geographic distribution of Tahyna now includes Asia as well as Africa and Europe. Ten of the California serogroup viruses have been rated as Arbovirus, one other as Probable Arbovirus, and the remaining two as Possible Arbovirus.

Viruses of the Capim serogroup are associated with mosquito vectors, and four of the members have been isolated from rodents. None of these eight viruses have been associated with disease in humans. Capim serogroup members have been recovered only in North and South America. Six of the eight Capim serogroup viruses have been rated as Arbovirus (four viruses) or Probable Arbovirus (two viruses).

8.1.5 Gamboa, Guama and Koongol serogroup viruses. In addition to Gamboa virus, the serogroup contains Pueblo Viejo and San Juan viruses (Table 8.1.5). All virus members have been isolated exclusively from *Aedeomyia squamipennis* mosquitoes. The viruses appear to have a limited geographic distribution, and they have not been implicated in human infections.

Guama serogroup viruses have been found only in the western hemisphere. Catu and Guama viruses have been isolated from humans and have been associated with disease in humans. Nine of the 12 Guama group viruses have been rated as Arbovirus or Probable Arbovirus. Viruses of this serogroup clearly are mosquito-borne and most appear to be associated with rodents. Ten viruses have been isolated from sentinel animals, primarily mice.

Both Koongol group viruses were isolated in Australia and very little is known about them. These two viruses were rated as Probable Arbovirus.

8.1.6 Minatitlan, Olifantsvlei and Patois serogroup viruses. The Minatitlan serogroup listed in Table 8.1.6 now contains two registered members (Minatitlan and Palestina viruses). Several isolations of Palestina virus have been made from *Culex* sp. mosquitoes collected in Ecuador, and from sentinel hamsters. Minatitlan virus was isolated from a sentinel hamster exposed near Minatitlan, Mexico.

The Olifantsvlei group consists of three members, and all three were isolated in Africa from mosquitoes. Little information on the properties of these viruses is extant.

Viruses of the Patois group now have been isolated in North and South America, and most appear to be associated with mosquito vectors and some with rodent hosts. Babahoyo, Patois, Shark River, and Zegla viruses also were isolated from sentinel hamsters.

None of the viruses from these three serogroups have been isolated from humans, nor have they been associated with disease.

8.1.7 Simbu serogroup viruses. Table 8.1.7 shows that essentially equal numbers of Simbu serogroup viruses have been isolated from *Culicoides* flies and from mosquitoes. None have been recovered from rodents. Eight Simbu serogroup viruses have been isolated from livestock. These include Sabo, Sango, Shamonda and Shuni viruses (Nigeria); Douglas and Peaton viruses (Australia); Akabane virus (Japan, Kenya and Australia); and Sathuperi virus (India and Africa). In addition, four viruses have been isolated from birds, and Manzanilla virus has been isolated from a monkey. Oropouche and Shuni viruses are the only members that have been isolated from humans. Oropouche virus has caused frequent large outbreaks of disease in humans in Brazil.

Simbu serogroup viruses have wide distributions. Approximately 50% have been found in Africa or Africa and Asia, while others have been isolated in Asia; Asia and Australasia; Asia, Australasia and Africa; and North or South America. Only eight of the 21 members of this serogroup have been rated as Probable Arbovirus or Arbovirus. The remainder have been rated as Possible Arbovirus.

8.1.8 Tete and Turlock serogroups and unassigned (SBU) viruses. Refer to Table 8.1.8. All Tete serogroup viruses have been recovered from birds; only two of them (Bahig and Matruh viruses) have been recovered from an arthropod vector (ixodid ticks). None of these viruses have been associated with human infections. Only Bahig virus is rated above Possible Arbovirus.

All viruses of the Turlock serogroup are associated with mosquito vectors. In addition, Turlock and Umbre viruses appear to be associated with birds. Turlock virus has been found in both North and South America. All the other members have been found in single continents (Africa, Asia, and Europe).

Only Kaeng Khoi virus remains as a serologically unassigned bunyavirus. Kaeng Khoi virus was isolated from bats, sentinel mice and rats, and cimicid bugs.

8.2 Phleboviruses: Phlebotomus fever serogroup viruses. At present, the Phlebotomus fever serogroup consists of 36 members, and the entire serogroup comprises the Phlebovirus genus within the family Bunyaviridae (Table 8.2). Sicilian sandfly fever virus is the type virus for this genus.

Most of the members are associated with phlebotomine flies; only Arumowot, Chagres, Icoaraci, Itaporanga, Rift Valley fever and Zinga viruses have been isolated from mosquitoes. Nine of the phleboviruses have been isolated from humans or have been implicated in the production of disease in humans.

Gabek Forest virus has not been recovered from arthropods but has been isolated from a variety of rodents and a hedgehog collected in various areas of Africa. Gabek Forest virus has been rated as Probable Arbovirus.

Rift Valley fever (RVF) virus causes serious and extensive disease in domestic animals such as sheep and cattle, and may cause disease in veterinary personnel, field and laboratory workers, and persons who handle infected animals. Serological studies indicated that Zinga virus is closely related or identical to Rift Valley fever virus. Consequently Zinga virus has been placed in the Phlebotomus fever serogroup although it may be another strain of RVF virus. Previously it was listed as an antigenically ungrouped virus.

Corfou virus is a recently registered phletovirus and was isolated from Phlebotomus flies in 1982. By CF, Corfou virus is most closely related to SFS virus, although they are readily distinguished by cross-neutralization tests. There is very little information available concerning Corfou virus.

8.3 Nairoviruses. Members of the six antigenic groups shown in Tables 8.3.1 and 8.3.2 constitute the Nairovirus genus in the family Bunyaviridae (16). CHF-Congo virus was designated the type virus for this genus. Furthermore, reproducible intergroup antigenic relationships have been demonstrated for the six sets of viruses (18). Only members of the CHF-Congo and Nairobi sheep disease (NSD) serogroups have been associated with disease in humans.

8.3.1 CHF-Congo, Dera Ghazi Khan, and Hughes serogroups. Both Congo and Crimean hemorrhagic fever viruses are registered in the Catalogue. It must be reiterated that the agent of Crimean hemorrhagic fever (CHF) is antigenically indistinguishable from Congo virus. CHF virus has been implicated in more than two thousand cases of human disease in the USSR. Congo virus also has been associated with the production of disease in humans, either as a result of infections acquired in nature or in the laboratory. Thus far, Hazara virus has not been known to be involved in infections of humans, and little is known of this antigenic relative of CHF-Congo virus. All members of this serogroup appear to be associated with ixodid ticks although CHF virus was isolated from both ixodid and argasid ticks.

Members of the Dera Ghazi Khan (DGK) serogroup have not been isolated from vertebrate hosts, or from arthropod vectors other than ticks. Most of the viruses appear to be associated with argasid ticks. These viruses have been found in Africa, Asia and Australasia.

Only Hughes virus of the Hughes serogroup has been isolated from birds. It has been found in both North and South America while Soldado virus has been isolated in Africa, Europe and South America. All Hughes serogroup members have been associated with argasid ticks.

8.3.2 Nairobi Sheep Disease, Qalyub and Sakhalin serogroups. Nairobi sheep disease virus is an important cause of veterinary disease, while both Dugbe and Ganjam viruses have been isolated repeatedly from ticks removed from domestic animals. Dugbe and Ganjam viruses have caused febrile illnesses in humans. In the case of NSD virus, one infection in a person resulted in a febrile illness, while three others resulted in serologic conversions only. Thus, all three viruses have been isolated from humans and have been associated with laboratory infections. Pending further clarification of antigenic relationships, SIRACA considers Ganjam virus to be a variety of NSD virus.

All three Qalyub group viruses were found only in Africa, and both Bandia and Qalyub viruses have been isolated from ticks. In addition, Bandia and Omo viruses have been isolated from rodents. Omo virus was registered during the first half of 1986, although it had been isolated in 1971. Only a single isolate of Omo virus has been obtained from a rodent, and very little is known about this virus.

Except for Avalon virus, members of the Sakhalin serogroup were isolated only from ixodid ticks. Avalon virus also was recovered from a bird. Sakhalin serogroup viruses are distributed in Asia (Paramushir, Sakhalin), Australasia (Taggert), Europe (Clo Mor), and North America (Avalon). Antigenic studies have indicated that Avalon and Paramushir viruses are strains of the same virus.

8.4 Uukuviruses: Uukuniemi serogroup viruses. Except for Uukuniemi virus, all members of the Uukuniemi serogroup have been isolated only from ticks (Table 8.4). Uukuniemi virus also has been recovered from both rodents and birds. Two of the viruses in this serogroup were found in Asia while three others were discovered in Europe. The sixth member, Precarious Point virus, was found on Australasia. HI antibodies to Uukuniemi virus have been detected in the sera of humans residing in Europe. Grand Arbaud virus has been evaluated as Arbovirus and Uukuniemi as Probable Arbovirus. The rest of the members have been evaluated as Possible Arbovirus.

8.5 Hantaviruses and bunyavirus-like viruses.

8.5.1 Hantaan, Bhanja, Kaisodi and Upolu serogroups. At present, the Hantavirus genus is only a proposed taxon. If approved, this genus will contain the four registered viruses listed in the Hantaan serogroup shown in Table 8.5.1. In addition to Hantaan and Prospect Hill viruses, the serogroup contains Seoul and Puumala viruses. Seoul virus is the prototype virus for a group of Hantaan-related viruses isolated from rats, while Puumala virus is the etiologic agent of Nephropathia Epidemica. All four viruses have been isolated from rodents, while Hantaan virus has also been isolated from humans. Hantaan virus is the etiologic agent of hemorrhagic fever with renal syndrome (HFRS) or Korean hemorrhagic fever (KHF), and either is responsible for or is antigenically closely related to the agent(s) responsible for clinically similar diseases in the USSR, Japan, Manchuria, and Eastern and Northern Europe. More than 10,000 cases have occurred in Korea since the disease was first recognized in that country in 1951. Only Prospect Hill virus has not been shown to produce disease in humans. However, neutralizing antibodies to Prospect Hill virus were detected in the sera of four American mammalogists.

Bhanja virus is the sole registered virus member of the Bhanja serogroup. Kismayo virus, an unregistered member, has been demonstrated to share an antigenic relationship with Bhanja virus (24). Bhanja virus has been isolated from humans and has been implicated in a laboratory-acquired human infection.

Two of the Kaisodi serogroup viruses were isolated from ticks collected in Asia while the third was isolated in North America. None of these viruses have been found to infect humans. Unpublished studies suggest that the RNA species and polypeptides of Silverwater virus resemble those of uukuviruses. Kaisodi and Silverwater viruses had been evaluated as Probable Arbovirus while Lanjan virus had been rated as Possible Arbovirus.

The Upolu serogroup consists of Upolu and Aransas Bay viruses. Both viruses were isolated only from argasid ticks. Neither virus has been associated with infections in humans. One virus has been found in Australia (UPO), and the other in North America (AB).

8.5.2 Bakau, Mapputta, Matariya, Nyando, Resistencia, and Yogue serogroups. All the viruses listed in Table 8.5.2 are members of minor serogroups, and provisionally are classified taxonomically as bunyavirus-like members of the family Bunyaviridae. Most viruses in these minor serogroups have been primarily associated with mosquito vectors. Viruses of the Matariya and Yogue serogroups have not been recovered from mosquitoes.

Bakau serogroup viruses have been recovered only in Asia. Bakau virus has been isolated from mosquitoes, ticks and rodents.

Thus far, all four viruses of the Mapputta group have been found only in Australia. Maprik virus was rated as a Probable Arbovirus while the other three virus members were classified as Possible Arbovirus.

All three Matariya group viruses have been recovered from birds collected in Africa. Nothing is known concerning their possible vector association.

Nyando virus has been isolated from humans and from mosquitoes collected in Africa. The Nyando virus human infection resulted in a febrile illness.

The Resistencia antigenic group consists of three virus members isolated in Argentina from culicine mosquitoes. Electron microscopic investigations conducted with Barranqueras virus have shown that it resembles typical bunyaviruses morphologically and morphogenetically (see Barranqueras virus registration card).

Both Yogue virus and its unregistered relative, Kasokero virus, were isolated from the same species of bats. During the course of characterizing Kasokero virus, it was determined that Kasokero virus was related to Yogue virus and that Kasokero virus readily infected and caused disease in laboratory workers (2). Furthermore, Yogue virus was examined by electron microscopy and found to resemble viruses of the family Bunyaviridae.

8.5.3 Antigenically ungrouped bunyavirus-like viruses. The viruses shown in Table 8.5.3 have been subdivided according to their vector association. Those viruses in the upper part of the table have been listed together as mosquito-borne viruses. Those in the middle secton have been associated with tick vectors, while the last two viruses have not been associated with any vector.

Tataguine, Tamdy and Bangui viruses have been isolated from humans and have been implicated in human disease.

Issyk-Kul and Keterah viruses have been shown to be identical or closely related by complement-fixation and neutralization tests (5). Furthermore, electron microscopic studies have indicated that Issyk-Kul virus resembles viruses of the family Bunyaviridae (9). Accordingly, both viruses provisionally are being listed with other bunyavirus-like viruses which are antigenically ungrouped (Table 8.5.3). Inasmuch as Issyk-Kul and Keterah viruses appear to be identical, one of them should be withdrawn as a registered virus. Issyk-Kul virus has been isolated on more than 20 occasions from the blood of humans infected in nature. The infections were classified as febrile illnesses. Issyk-Kul virus also has been implicated in a laboratory infection.

Wanowrie virus recently was added to the listing shown in Table 8.5.3. Electron microscopic examination has shown that Wanowrie virus is a bunyavirus (6). In addition, it recently was demonstrated that this virus possesses hemagglutinating activity (8). Equally as important, Wanowrie virus has caused human disease and appears to be rather widely distributed (see virus registration card). The virus has been isolated in India, Sri Lanka, Iran, and Egypt.

9. Orbiviruses, family Reoviridae: Colorado tick fever and Kemerovo serogroups. While the viruses listed in Table 9.1 are tick-borne agents, they differ taxonomically from those in Tables 8.3.1-8.5.3 in that they have been classified as orbiviruses in the family Reoviridae. The orbiviruses are relatively resistant to lipid solvents, are inactivated at acid pH, and possess multiple segments of a double-stranded RNA génome. It is likely that members of the genus *Orbivirus*, and that the criteria used to define this genus, will be reevaluated in the near future.

Only Colorado tick fever (CTF) virus of the CTF serogroup and Kemerovo (KEM) and Lipovnik viruses of the KEM serogroup have produced disease in humans or have been isolated from humans.

Members of the KEM serogroup are widely distributed with at least one virus being found in each of the listed continents. KEM and Chenuda viruses have been found in both Africa and Asia while Wad Medani virus has been discovered in Africa, Asia, and North America. Even though all members of this serogroup have been isolated from ticks, only three viruses were rated above Possible Arbovirus. All three were rated as Probable Arbovirus.

9.2 Other antigenic groups of orbiviruses. Several of the viruses in these serogroups cause significant diseases in large animals (Tables 9.2.1, 9.2.2). Bluetongue (BLU) virus causes disease in both wild and domestic ruminants; African horsesickness (AHS) virus in mules, donkeys and horses; epizootic hemorrhagic disease (EHD) virus in deer; and Ibaraki virus in cattle. Both BLU and AHS viruses have wide geographic distributions. The first isolation of BLU virus from a tick (*Amblyomma variegatum*) has been described (see BLU virus registration card).

Changuinola virus is the only member of these serogroups that has been isolated from humans; it has been reported to produce disease in humans. Of the present twelve serogroup members, only Irituia, Jari, and Monte Dourado viruses have not been isolated from an arthropod. All others, including Changuinola virus, appear to be associated with phlebotomine insects. Registered viruses of the Changuinola serogroup appear to have a limited distribution. Eleven members were recovered only in South America, while Changuinola virus was isolated in Central America.

Between 1960 and 1980, a total of 178 Changuinola serogroup viruses were isolated in Brazil, Colombia, and Panama. In a detailed study, 24 of those viruses were selected as representative specimens and their antigenic, biological, and chemical properties were examined. Twelve of the viruses were distinct by neutralization tests and polyacrylamide gel electrophoresis (PAGE) (25). This study clearly showed that "a great many more Changuinola serotypes may exist" (25).

The three viruses of the Corriparta serogroup appear to be associated with mosquitoes. In addition, Corriparta virus was recovered from wild birds. All three viruses are widely separated in their distribution.

Thus far, Ibaraki and EHD viruses have not been associated with any known vector. The EHD virus has been found in Africa and North America, while Ibaraki virus has been recovered only in Asia.

Virus members of the Corriparta, Eubenangee, Palyam, and Umatilla serogroups appear to be primarily mosquito-associated, while members of the Wallal and Warrego (WAR) serogroups appear to be associated with Culicoides flies. Vector associations appear to be less clear for Eubenangee (EUB) virus of the EUB serogroup, and for WAR virus of the WAR serogroup.

Llano Seco virus is antigenically related to Umatilla virus, and both are related to the presently unregistered Netivot virus, an orbivirus isolated from mosquitoes collected in Israel (1). Thus, these two registered viruses plus Netivot virus now comprise the Umatilla serogroup.

9.3 Antigenically ungrouped Orbiviruses. The viruses in Table 9.3 are serologically ungrouped, though they have been clustered together on the basis of their association with mosquito or tick vectors.

Of the ungrouped orbiviruses associated with mosquito vectors, two viruses have been found in Africa (LEB, ORU), two in Australasia (JAP, PR) and one in South America (IERI).

Orungo virus has caused human disease as a result of laboratory-acquired infections and those acquired in nature. Lebombo virus, or a closely related virus, has been isolated from human plasma, although it has not been associated with the production of disease in humans thus far.

Chobar Gorge virus provisionally has been placed in the Orbivirus genus as a result of information originally present on the registration card but which previously had been overlooked.

Ife virus has not been associated with a vector and has been isolated from bats collected in Nigeria and Cameroun.

10. Family Rhabdoviridae. Members of the serogroups listed in Tables 10.1 and 10.2 or the antigenically ungrouped viruses listed in Table 10.3 possess a "bullet-shaped" morphology and are classified as members of the family Rhabdoviridae.

The rabies serogroup listed in Table 10.1 consists of kotonkan virus and Lagos bat virus. Kotonkan virus was isolated from *Culicoides* species collected in Nigeria. It was rated as Probable Arbovirus by SEAS. Lagos bat virus has been isolated only from bats and SEAS has evaluated it as Not Arbovirus.

All three viruses of the Sawgrass serogroup were isolated from ticks collected in North America. The viruses of the Timbo serogroup were isolated from lizards, and none of these viruses have been isolated from arthropods.

VSV group members have been recovered from phlebotomine flies, mosquitoes, ticks, *Culicoides*, mites, *Simulium* flies and a variety of other arthropods including house flies, face flies, Chloropidae, and Anthomyidae. Piry and VS-Alagoas viruses have not been recovered from arthropods. Of the serogroups listed in this and Table 10.2, only members of the VSV serogroup and Le Dantec virus have been shown to infect humans. In the VSV serogroup, Chandipura, Piry, VS-Indiana and VS-New Jersey viruses have been isolated from man. These viruses, plus VS-Alagoas virus, have been found to produce disease in humans during infections acquired in nature or in the laboratory. Both VS-Indiana and VS-New Jersey viruses readily infect livestock, while Cocal virus has been recovered from a horse and VS-Alagoas virus from a mule.

Table 10.2 contains the newly formed bovine ephemeral fever (BEF) serogroup, the Hart Park serogroup viruses, a Kwatta serogroup virus, the recently formed Le Dantec serogroup, and an expanded Mossuril serogroup consisting of eight members.

The bovine ephemeral fever (BEF) serogroup consists of three registered Australian viruses (AR, BRM, KIM) and BEF virus. Only BEF and KIM viruses have been isolated from vectors. KIM virus has been isolated from *Culicoides* sp. and culicine mosquitoes, while BEF virus has been isolated from *Culicoides* sp., anopheline mosquitoes and a mixed pool of mosquito species. All four viruses have been isolated from cattle. Thus far, only BEF virus has been recovered outside of Australia.

All of the Hart Park serogroup members are associated with a mosquito vector and two of the viruses (Hart Park and Flanders) have been isolated from birds. None of these viruses have been associated with disease in humans. Thus far their distribution includes only North and South America.

Kwatta virus was isolated only once from mosquitoes collected in Surinam. An antigenic relative of Kwatta virus remains unregistered. This unregistered virus was recovered from a bird collected in Brazil.

The Le Dantec serogroup consists of Le Dantec and Keuraliba viruses. Prior to the discovery of an antigenic relationship between these two rhabdoviruses, Keuraliba virus was listed as a member of the VSV serogroup. However, this relationship was not reproducible and Keuraliba virus was withdrawn from the VSV serogroup when it was demonstrated to be related to Le Dantec virus. Neither virus has been isolated from an arthropod. Le Dantec virus has been isolated from humans and Keuraliba virus was isolated from rodents.

Three of the members of the Mossuril serogroup have not been isolated from arthropods. These include Cuiaba, Kern Canyon, and Marco viruses. Kern Canyon virus has been rated as Probably Not Arbovirus by SEAS. Previous studies have demonstrated that Kern Canyon virus could be propagated in an *Aedes dorsalis* cell culture line.

All the viruses listed in Table 10.3 are antigenically ungrouped rhabdoviruses. The first nine viruses shown in the table have been associated with mosquito vectors. Inhangapi and Sripur viruses have been associated with phlebotomine flies and Tibrogargan virus with *Culicoides* flies. The latter five viruses have been isolated from vertebrates only.

Only Aruac and Almpiwar viruses have been rated as Probable Arbovirus. The rest have been rates as Possible Arbovirus or Probably Not Arbovirus.

None of the viruses listed in this table have been isolated from humans or have been implicated in human disease.

Recently, Boteke, Gossas, Nkolbisson, and Rochambeau viruses were shown to possess rhabdovirus morphology (6). Their antigenic relationship to other rhabdoviruses is being actively investigated.

11. Arenaviruses: Tacaribe serogroup viruses. Tacaribe group viruses in Table 11.1 are serologically related to lymphocytic choriomeningitis virus, and they are classified taxonomically in the *Arenavirus* genus. They are primarily rodent viruses, and there is little or no evidence that suggests that they are associated with an arthropod vector in nature. SEAS has judged most members to be Not Arbovirus or Probably Not Arbovirus.

Ippy and Toure viruses represented provisional additions to this serogroup. Previously, Ippy virus was found to be related to Lassa virus. Its antigenic relationship to other members of the Tacaribe serogroup has yet to be determined. Characteristically, Ippy virus has been isolated from *Mastomys* rodents and from rodents of other species. Toure virus has been deleted from this listing. Definitive studies have shown that it is not antigenically related to members of the Tacaribe serogroup (26).

Three members of this group have been shown to cause severe, often fatal, human disease. These include Junin (Argentine hemorrhagic fever), Machupo (Bolivian hemorrhagic fever), and Lassa (Lassa disease). In addition to causing clinically frank laboratory-acquired infections, Junin virus also has been reported to cause subclinical laboratory-acquired infections. A subclinical seroconversion to Tacaribe virus has been documented in a laboratory worker handling large quantities of Tacaribe virus. In addition, Pichinde virus has produced subclinical infections in laboratory workers. Finally, Flexal virus has produced a febrile illness in a laboratory worker following a laboratory accident. Flexal virus was recovered from rodents trapped in Brazil.

12. Thogoto serogroup viruses and antigenically ungrouped viruses of various taxa. See Table 12.1. Thogoto virus has been isolated from humans and has been involved in human disease. An unregistered antigenic relative of Thogoto virus has been isolated in Sicily (SiAr 126). In fact, there now are five other isolates from Portugal, Iran, and various areas of Africa. Their precise antigenic relationship to the registered Thogoto virus has not been determined. Molecular analysis of a Thogoto serogroup virus has indicated that its virion RNA species and structural polypeptides resemble those of members of the family Orthomyxoviridae (27).

Formerly, the Bunyaviridae study group of the ICTV had classified Dhori virus as a member of the then newly defined *Nairovirus* genus. Subsequently, molecular studies indicated that Dhori virus possessed seven virion polypeptides and seven single-stranded RNA segments, comparable to those of viruses of the family Orthomyxoviridae (27).

Tettnang virus was shown to cross-react in CF tests with mouse hepatitis virus (MHV). Subsequently, three isolates of Tettnang virus were compared to prototype strains of MHV by neutralization tests (28). The relationship of Tettnang virus to MHV was confirmed; however, the precise relationship of the Tettnang virus isolates to MHV strains remained unclear because of the past passage history of the Tettnang isolates. Further, whether the Tettnang isolates were, in fact, arthropod-borne remains unlikely but unanswered. Bocas virus formerly was included in the CAL serogroup until it was demonstrated that it was identical to or closely related to mouse hepatitis virus. Although both Tettnang and Bocas viruses are closely related to or identical to mouse hepatitis virus, they were not compared to each other.

Nodamura virus was isolated from wild-caught mosquitoes in Japan, and it has been demonstrated to produce disease in moths and honey bees. It also has been shown that it replicates in mosquitoes and is experimentally transmitted by mosquitoes. Nodamura virus is the type species for the *Nodavirus* genus within the family Nodaviridae.

Cotia virus, a poxvirus, has been reported to produce disease in humans. However, very little information is available concerning Oubangui and Salanga viruses.

13. Taxonomically unclassified viruses.

13.1 Minor antigenic groups. Nyamanini virus and the unregistered Midway virus (29) now constitute the Nyamanini serogroup. Nyamanini virus was isolated from argasid ticks and birds. It has not been associated with human disease.

Quaranfil virus has been isolated from both humans and birds and has been associated with human disease as the result of natural infections. Preliminary molecular studies conducted with Quaranfil virus indicated that this virus may resemble viruses of the family Orthomyxoviridae. At this point, further verification is required. Little is known concerning the behavior of Johnston Atoll virus in nature.

Both Marburg and Ebola viruses have caused human disease as a result of infections acquired in nature and have been associated with laboratory-acquired infections. Ebola virus was found to possess a single-stranded RNA that was noninfectious upon extraction. Recent evidence indicates that there might be different serotypes of Ebola virus (30). Marburg and Ebola viruses have been isolated from humans only.

The two viruses of the Tanjong Rabok serogroup have been isolated in Malaysia but neither has been associated with a vector. Telok Forest virus was isolated from a wild monkey and Tanjong Rabok virus from a sentinel monkey.

13.2 Antigenically ungrouped viruses. The serologically ungrouped viruses in the upper part of Table 13.2.1 have been associated with mosquito vectors, and all remain taxonomically unclassified. Gomoka and Para viruses also have been recovered from sources other than mosquitoes. Gomoka virus was isolated twice from birds collected in the Central African Republic and Para virus was isolated from sentinel mice.

With one exception, viruses shown in the lower portion of Table 13.2.1 have been associated with tick vectors or both tick and mosquito vectors. Ngaingan virus has been associated with *Culicoides* flies.

Only Termeil virus was rated above Possible Arbovirus and was rated as Probable Arbovirus.

None of the viruses listed in Table 13.2.2 have been isolated from an arthropod vector, and none has been rated higher than Possible Arbovirus. More than half were isolated from birds. Four other viruses have been recovered from rodents, two from bats, and two others from other vertebrates. Twelve of these viruses were recovered in Africa and Asia. The remaining five viruses were found in South America.

Table 14.1 gives continental distribution of viruses in different antigenic groups on the basis of virus isolation. Most of the registered viruses are very limited in their distribution. Approximately 86% have been isolated on a single continent only, while 23 (4.5%) have been found on three or more continents. The largest number of viruses have been isolated in South America and Africa, probably reflecting research emphasis as well as biological limitations.

Table 15.1 shows the number of viruses, according to antigenic group, isolated from various classes of arthropods. About 49% have been recovered from mosquitoes, 22% from ticks, and 18% from all other classes. One hundred and nine registered viruses (22%) have never been recovered from any arthropod vector. The largest number of viruses which have been isolated from any arthropod, have been recovered from a single class only (352 of 397, 88.7%).

Table 16.1 presents a similar type of analysis in terms of virus isolations from various classes of vertebrates. Humans and rodents have provided the largest number of virus isolations. Most of the viruses isolated from vertebrates have been recovered from a single class only (200 of 285, 70.2%).

Table 17.1 lists the viruses by antigenic group that cause disease in humans. Slightly less than 25% of all registered viruses have been associated with human disease, either as a result of infections acquired in nature, from laboratory accidents, or both. Members of serogroups A and B and those in the Bunyamwera Supergroup constitute 42.7% of all registered viruses but about 62% of the instances in which registered viruses are associated with disease production in humans.

An analysis of the SEAS ratings for all registered viruses is presented in Table 18.1. It shows that 266 registrations (52.6%) are rated as Possible Arbovirus. Clearly, additional data are required if we are to have a more precise rating of the arthropod-borne status of these viruses. Sufficient data are available for about 47% of all registered viruses so that 41% are rated Probable Arbovirus or Arbovirus, while 6% are rated Probably Not Arbovirus or Not Arbovirus.

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Table 1.1

ALPHABETICAL AND TAXONOMIC LISTING OF 506 VIRUSES REGISTERED AS OF DECEMBER 1986 WITH RECOMMENDED ABBREVIATIONS AND ANTIGENIC GROUPINGS

NAME	ABBR.	TAXONOMIC STATUS FAMILY	GENUS	ANTIGENIC GROUP
ABRAS	ABR	Bunyaviridae	*Bunyavirus*	PAT
ABSETTAROV	ABS	Flaviviridae	*Flavivirus*	B
ABU HAMMAD	AH	Bunyaviridae	*Nairovirus*	DGK
ACADO	ACD	Reoviridae	*Orbivirus*	COR
ACARA	ACA	Bunyaviridae	*Bunyavirus*	CAP
ADELAIDE RIVER	AR	Rhabdoviridae		BEF
AFRICAN HORSESICKNESS	AHS	Reoviridae	*Orbivirus*	AHS
AFRICAN SWINE FEVER	ASF	Iridoviridae		
AGUACATE	AGU	Bunyaviridae	*Phlebovirus*	PHL
AGUA PRETA	AP	Herpesviridae		
AINO	AINO	Bunyaviridae	*Bunyavirus*	SIM
AKABANE	AKA	Bunyaviridae	*Bunyavirus*	SIM
ALENQUER	ALE	Bunyaviridae	*Phlebovirus*	PHL
ALFUY	ALF	Flaviviridae	*Flavivirus*	B
ALMEIRIM	AMR	Reoviridae	*Orbivirus*	CGL
ALMPIWAR	ALM	Rhabdoviridae		
ALTAMIRA	ALT	Reoviridae	*Orbivirus*	CGL
AMAPARI	AMA	Arenaviridae	*Arenavirus*	TCR
ANANINDEUA	ANU	Bunyaviridae	*Bunyavirus*	GMA
ANHANGA	ANH	Bunyaviridae	*Phlebovirus*	PHL

NAME	ABBR.	TAXONOMIC STATUS FAMILY	GENUS	ANTI-GENIC GROUP
ANHEMBI	AMB	Bunyaviridae	Bunyavirus	BUN
ANOPHELES A	ANA	Bunyaviridae	Bunyavirus	ANA
ANOPHELES B	ANB	Bunyaviridae	Bunyavirus	ANB
ANTEQUERA	ANT	Bunyaviridae	Bunyavirus-like	RTA
APEU	APEU	Bunyaviridae	Bunyavirus	C
APOI	APOI	Flaviviridae	Flavivirus	B
ARAGUARI	ARA			
ARANSAS BAY	AB	Bunyaviridae	Bunyavirus-like	UPO
ARBIA	ARB	Bunyaviridae	Phlebovirus	PHL
ARIDE	ARI			
ARKONAM	ARK			
AROA	AROA	Flaviviridae	Flavivirus	B
ARUAC	ARU	Rhabdoviridae		
ARUMOWOT	AMT	Bunyaviridae	Phlebovirus	PHL
AURA	AURA	Togaviridae	Alphavirus	A
AVALON	AVA	Bunyaviridae	Nairovirus	SAK
BABAHOYO	BAB	Bunyaviridae	Bunyavirus	PAT
BAGAZA	BAG	Flaviviridae	Flavivirus	B
BAHIG	BAH	Bunyaviridae	Bunyavirus	TETE
BAKAU	BAK	Bunyaviridae	Bunyavirus-like	BAK
BAKU	BAKU	Reoviridae	Orbivirus	KEM
BANDIA	BDA	Bunyaviridae	Nairovirus	QYB
BANGORAN	BGN	Rhabdoviridae		MOS
BANGUI	BGI	Bunyaviridae	Bunyavirus-like	

NAME	ABBR.	TAXONOMIC STATUS FAMILY	GENUS	ANTI-GENIC GROUP
BANZI	BAN	Flaviviridae	Flavivirus	B
BARMAH FOREST	BF	Togaviridae	Alphavirus	A
BARRANQUERAS	BQS	Bunyaviridae	Bunyavirus-like	RTA
BARUR	BAR	Rhabdoviridae		MOS
BATAI	BAT	Bunyaviridae	Bunyavirus	BUN
BATAMA	BMA	Bunyaviridae	Bunyavirus	TETE
BATKEN	BKN			
BAULINE	BAU	Reoviridae	Orbivirus	KEM
BEBARU	BEB	Togaviridae	Alphavirus	A
BELEM	BLM			
BELMONT	BEL	Bunyaviridae	Bunyavirus-like	
BENEVIDES	BVS	Bunyaviridae	Bunyavirus	CAP
BENFICA	BEN	Bunyaviridae	Bunyavirus	CAP
BERRIMAH	BRM	Rhabdoviridae		BEF
BERTIOGA	BER	Bunyaviridae	Bunyavirus	GMA
BHANJA	BHA	Bunyaviridae	Bunyavirus-like	BHA
BIMBO	BBO			
BIMITI	BIM	Bunyaviridae	Bunyavirus	GMA
BIRAO	BIR	Bunyaviridae	Bunyavirus	BUN
BLUETONGUE	BLU	Reoviridae	Orbivirus	BLU
BOBAYA	BOB	Bunyaviridae	Bunyavirus-like	
BOBIA	BIA	Bunyaviridae	Bunyavirus	OLI
BOCAS	BOC	Coronaviridae	Coronavirus	
BORACEIA	BOR	Bunyaviridae	Bunyavirus	ANB

NAME	ABBR.	TAXONOMIC STATUS FAMILY	GENUS	ANTI-GENIC GROUP
BOTAMBI	BOT	Bunyaviridae	Bunyavirus	OLI
BOTEKE	BTK	Rhabdoviridae		
BOUBOUI	BOU	Flaviviridae	Flavivirus	B
BOVINE EPHEMERAL FEVER	BEF	Rhabdoviridae		BEF
BUENAVENTURA	BUE	Bunyaviridae	Phlebovirus	PHL
BUJARU	BUJ	Bunyaviridae	Phlebovirus	PHL
BUNYAMWERA	BUN	Bunyaviridae	Bunyavirus	BUN
BUNYIP CREEK	BC	Reoviridae	Orbivirus	PAL
BURG EL ARAB	BEA	Bunyaviridae	Bunyavirus-like	MTY
BUSHBUSH	BSB	Bunyaviridae	Bunyavirus	CAP
BUSSUQUARA	BSQ	Flaviviridae	Flavivirus	B
BUTTONWILLOW	BUT	Bunyaviridae	Bunyavirus	SIM
BWAMBA	BWA	Bunyaviridae	Bunyavirus	BWA
CABASSOU	CAB	Togaviridae	Alphavirus	A
CACAO	CAC	Bunyaviridae	Phlebovirus	PHL
CACHE VALLEY	CV	Bunyaviridae	Bunyavirus	BUN
CACIPACORE	CPC	Flaviviridae	Flavivirus	B
CAIMITO	CAI	Bunyaviridae	Phlebovirus	PHL
CALIFORNIA ENC.	CE	Bunyaviridae	Bunyavirus	CAL
CALOVO	CVO	Bunyaviridae	Bunyavirus	BUN
CANANEIA	CNA	Bunyaviridae	Bunyavirus	GMA
CANDIRU	CDU	Bunyaviridae	Phlebovirus	PHL
CANINDE	CAN	Reoviridae	Orbivirus	CGL
CAPE WRATH	CW	Reoviridae	Orbivirus	KEM

NAME	ABBR.	TAXONOMIC STATUS FAMILY	GENUS	ANTI-GENIC GROUP
CAPIM	CAP	Bunyaviridae	Bunyavirus	CAP
CARAPARU	CAR	Bunyaviridae	Bunyavirus	C
CAREY ISLAND	CI	Flaviviridae	Flavivirus	B
CATU	CATU	Bunyaviridae	Bunyavirus	GMA
CHACO	CHO	Rhabdoviridae		TIM
CHAGRES	CHG	Bunyaviridae	Phlebovirus	PHL
CHANDIPURA	CHP	Rhabdoviridae	Vesiculovirus	VSV
CHANGUINOLA	CGL	Reoviridae	Orbivirus	CGL
CHARLEVILLE	CHV	Rhabdoviridae		MOS
CHENUDA	CNU	Reoviridae	Orbivirus	KEM
CHIKUNGUNYA	CHIK	Togaviridae	Alphavirus	A
CHILIBRE	CHI	Bunyaviridae	Phlebovirus	PHL
CHIM	CHIM			
CHOBAR GORGE	CG	Reoviridae	Orbivirus	
CLO MOR	CM	Bunyaviridae	Nairovirus	SAK
COCAL	COC	Rhabdoviridae	Vesiculovirus	VSV
COLORADO TICK FEVER	CTF	Reoviridae	Orbivirus	CTF
CONGO	CON	Bunyaviridae	Nairovirus	CHF-CON
CONNECTICUT	CNT	Rhabdoviridae		SAW
CORFOU	CFU	Bunyaviridae	Phlebovirus	PHL
CORRIPARTA	COR	Reoviridae	Orbivirus	COR
COTIA	COT	Poxviridae		
COWBONE RIDGE	CR	Flaviviridae	Flavivirus	B
CRIMEAN HEM. FEVER	CHF	Bunyaviridae	Nairovirus	CHF-CON

NAME	ABBR.	TAXONOMIC STATUS FAMILY	GENUS	ANTI-GENIC GROUP
CSIRO VILLAGE	CVG	Reoviridae	Orbivirus	PAL
CUIABA	CUI	Rhabdoviridae		MOS
D'AGUILAR	DAG	Reoviridae	Orbivirus	PAL
DAKAR BAT	DB	Flaviviridae	Flavivirus	B
DENGUE-1	DEN-1	Flaviviridae	Flavivirus	B
DENGUE-2	DEN-2	Flaviviridae	Flavivirus	B
DENGUE-3	DEN-3	Flaviviridae	Flavivirus	B
DENGUE-4	DEN-4	Flaviviridae	Flavivirus	B
DERA GHAZI KHAN	DGK	Bunyaviridae	Nairovirus	DGK
DHORI	DHO	Orthomyxoviridae		
DOUGLAS	DOU	Bunyaviridae	Bunyavirus	SIM
DUGBE	DUG	Bunyaviridae	Nairovirus	NSD
EAST. EQUINE ENC.	EEE	Togaviridae	Alphavirus	A
EBOLA	EBO			MBG
EDGE HILL	EH	Flaviviridae	Flavivirus	B
ENSEADA	ENS	Bunyaviridae	Bunyavirus-like	
ENTEBBE BAT	ENT	Flaviviridae	Flavivirus	B
EP. HEM. DIS.	EHD	Reoviridae	Orbivirus	EHD
ESTERO REAL	ER			
EUBENANGEE	EUB	Reoviridae	Orbivirus	EUB
EVERGLADES	EVE	Togaviridae	Alphavirus	A
EYACH	EYA	Reoviridae	Orbivirus	CTF
FLANDERS	FLA	Rhabdoviridae		HP
FLEXAL	FLE	Arenaviridae	Arenavirus	TCR

NAME	ABBR.	TAXONOMIC STATUS FAMILY	GENUS	ANTI-GENIC GROUP
FORT MORGAN	FM	Togaviridae	Alphavirus	A
FRIJOLES	FRI	Bunyaviridae	Phlebovirus	PHL
GABEK FOREST	GF	Bunyaviridae	Phlebovirus	PHL
GADGETS GULLY	GGY	Flaviviridae	Flavivirus	B
GAMBOA	GAM	Bunyaviridae	Bunyavirus	GAM
GAN GAN	GG	Bunyaviridae	Bunyavirus-like	MAP
GANJAM	GAN	Bunyaviridae	Nairovirus	NSD
GARBA	GAR	Bunyaviridae	Bunyavirus-like	MTY
GERMISTON	GER	Bunyaviridae	Bunyavirus	BUN
GETAH	GET	Togaviridae	Alphavirus	A
GOMOKA	GOM			
GORDIL	GOR	Bunyaviridae	Phlebovirus	PHL
GOSSAS	GOS	Rhabdoviridae		
GRAND ARBAUD	GA	Bunyaviridae	Uukuvirus	UUK
GRAY LODGE	GLO	Rhabodoviridae		
GREAT ISLAND	GI	Reoviridae	Orbivirus	KEM
GUAJARA	GJA	Bunyaviridae	Bunyavirus	CAP
GUAMA	GMA	Bunyaviridae	Bunyavirus	GMA
GUARATUBA	GTB	Bunyaviridae	Bunyavirus	GMA
GUAROA	GRO	Bunyaviridae	Bunyavirus	CAL
GUMBO LIMBO	GL	Bunyaviridae	Bunyavirus	C
GURUPI	GUR	Reoviridae	Orbivirus	CGL
HANTAAN	HTN	Bunyaviridae	Hantavirus*	HTN

*Proposed genus designation.

NAME	ABBR.	TAXONOMIC STATUS FAMILY	GENUS	ANTI-GENIC GROUP
HANZALOVA	HAN	Flaviviridae	Flavivirus	B
HART PARK	HP	Rhabdoviridae		HP
HAZARA	HAZ	Bunyaviridae	Nairovirus	CHF-CON
HIGHLANDS J	HJ	Togaviridae	Alphavirus	A
HUACHO	HUA	Reoviridae	Orbivirus	KEM
HUGHES	HUG	Bunyaviridae	Nairovirus	HUG
HYPR	HYPR	Flaviviridae	Flavivirus	B
IACO	IACO	Bunyaviridae	Bunyavirus	BUN
IBARAKI	IBA	Reoviridae	Orbivirus	EHD
ICOARACI	ICO	Bunyaviridae	Phlebovirus	PHL
IERI	IERI	Reoviridae	Orbivirus	
IFE	IFE	Reoviridae	Orbivirus	
ILESHA	ILE	Bunyaviridae	Bunyavirus	BUN
ILHEUS	ILH	Flaviviridae	Flavivirus	B
INGWAVUMA	ING	Bunyaviridae	Bunyavirus	SIM
INHANGAPI	INH	Rhabdoviridae		
ININI	INI	Bunyaviridae	Bunyavirus	SIM
INKOO	INK	Bunyaviridae	Bunyavirus	CAL
IPPY	IPPY	Arenaviridae	Arenavirus	TCR
IRITUIA	IRI	Reoviridae	Orbivirus	CGL
ISFAHAN	ISF	Rhabdoviridae	Vesiculovirus	VSV
ISRAEL TURKEY MEN.	IT	Flaviviridae	Flavivirus	B
ISSYK-KUL*	IK	Bunyaviridae	Bunyavirus-like	

*Identical to Keterah virus by CF and NT.

NAME	ABBR.	TAXONOMIC STATUS FAMILY	GENUS	ANTI-GENIC GROUP
ITAITUBA	ITA	Bunyaviridae	Phlebovirus	PHL
ITAPORANGA	ITP	Bunyaviridae	Phlebovirus	PHL
ITAQUI	ITQ	Bunyaviridae	Bunyavirus	C
ITIMIRIM	ITI	Bunyaviridae	Bunyavirus	GMA
ITUPIRANGA	ITU			
JACAREACANGA	JAC	Reoviridae	Orbivirus	COR
JAMANXI	JAM	Reoviridae	Orbivirus	CGL
JAMESTOWN CANYON	JC	Bunyaviridae	Bunyavirus	CAL
JAPANAUT	JAP	Reoviridae	Orbivirus	
JAPANESE ENC.	JBE	Flaviviridae	Flavivirus	B
JARI	JARI	Reoviridae	Orbivirus	CGL
JERRY SLOUGH	JS	Bunyaviridae	Bunyavirus	CAL
JOHNSTON ATOLL	JA			QRF
JOINJAKAKA	JOI	Rhabdoviridae		
JUAN DIAZ	JD	Bunyaviridae	Bunyavirus	CAP
JUGRA	JUG	Flaviviridae	Flavivirus	B
JUNIN	JUN	Arenaviridae	Arenavirus	TCR
JURONA	JUR	Rhabdoviridae	Vesiculovirus	VSV
JUTIAPA	JUT	Flaviviridae	Flavivirus	B
KADAM	KAD	Flaviviridae	Flavivirus	B
KAENG KHOI	KK	Bunyaviridae	Bunyavirus	SBU
KAIKALUR	KAI	Bunyaviridae	Bunyavirus	SIM
KAIRI	KRI	Bunyaviridae	Bunyavirus	BUN
KAISODI	KSO	Bunyaviridae	Bunyavirus-like	KSO

NAME	ABBR.	TAXONOMIC STATUS FAMILY	GENUS	ANTI-GENIC GROUP
KAMESE	KAM	Rhabdoviridae		MOS
KAMMAVANPETTAI	KMP			
KANNAMANGALAM	KAN			
KAO SHUAN	KS	Bunyaviridae	_Nairovirus_	DGK
KARIMABAD	KAR	Bunyaviridae	_Phlebovirus_	PHL
KARSHI	KSI	Flaviviridae	_Flavivirus_	B
KASBA	KAS	Reoviridae	_Orbivirus_	PAL
KEMEROVO	KEM	Reoviridae	_Orbivirus_	KEM
KERN CANYON	KC	Rhabdoviridae		MOS
KETAPANG	KET	Bunyaviridae	_Bunyavirus_-like	BAK
KETERAH*	KTR	Bunyaviridae	_Bunyavirus_-like	
KEURALIBA	KEU	Rhabdoviridae		LD
KEYSTONE	KEY	Bunyaviridae	_Bunyavirus_	CAL
KHASAN	KHA	Bunyaviridae	_Nairovirus_	CHF-CON
KIMBERLEY	KIM	Rhabdoviridae		BEF
KLAMATH	KLA	Rhabdoviridae		
KOKOBERA	KOK	Flaviviridae	_Flavivirus_	B
KOLONGO	KOL	Rhabdoviridae		
KOONGOL	KOO	Bunyaviridae	_Bunyavirus_	KOO
KOTONKAN	KOT	Rhabdoviridae	_Lyssavirus_	RABIES
KOUTANGO	KOU	Flaviviridae	_Flavivirus_	B
KOWANYAMA	KOW	Bunyaviridae	_Bunyavirus_-like	
KUMLINGE	KUM	Flaviviridae	_Flavivirus_	B

*Identical to Issyk-Kul virus by CF and NT.

NAME	ABBR.	TAXONOMIC STATUS FAMILY	GENUS	ANTI-GENIC GROUP
KUNJIN	KUN	Flaviviridae	_Flavivirus_	B
KUNUNURRA	KNA	Rhabdoviridae		
KWATTA	KWA	Rhabdoviridae		KWA
KYASANUR FOR. DIS.	KFD	Flaviviridae	_Flavivirus_	B
KYZYLAGACH	KYZ	Togaviridae	_Alphavirus_	A
LA CROSSE	LAC	Bunyaviridae	_Bunyavirus_	CAL
LAGOS BAT	LB	Rhabdoviridae	_Lyssavirus_	RABIES
LA JOYA	LJ	Rhabdoviridae	_Vesiculovirus_	VSV
LAKE CLARENDON	LC			
LANDJIA	LJA			
LANGAT	LGT	Flaviviridae	_Flavivirus_	B
LANJAN	LJN	Bunyaviridae	_Bunyavirus_-like	KSO
LAS MALOYAS	LM	Bunyaviridae	_Bunyavirus_	ANA
LASSA	LAS	Arenaviridae	_Arenavirus_	TCR
LATINO	LAT	Arenaviridae	_Arenavirus_	TCR
LEBOMBO	LEB	Reoviridae	_Orbivirus_	
LE DANTEC	LD	Rhabdoviridae		LD
LEDNICE	LED	Bunyaviridae	_Bunyavirus_	TUR
LIPOVNIK	LIP	Reoviridae	_Orbivirus_	KEM
LLANO SECO	LLS	Reoviridae	_Orbivirus_	UMA
LOKERN	LOK	Bunyaviridae	_Bunyavirus_	BUN
LONE STAR	LS	Bunyaviridae	_Bunyavirus_-like	
LOUPING ILL	LI	Flaviviridae	_Flavivirus_	B
LUKUNI	LUK	Bunyaviridae	_Bunyavirus_	ANA

NAME	ABBR.	TAXONOMIC STATUS FAMILY	 GENUS	ANTI-GENIC GROUP
MACAUA	MCA	Bunyaviridae	Bunyavirus	BUN
MACHUPO	MAC	Arenaviridae	Arenavirus	TCR
MADRID	MAD	Bunyaviridae	Bunyavirus	C
MAGUARI	MAG	Bunyaviridae	Bunyavirus	BUN
MAHOGANY HAMMOCK	MH	Bunyaviridae	Bunyavirus	GMA
MAIN DRAIN	MD	Bunyaviridae	Bunyavirus	BUN
MALAKAL	MAL	Togaviridae		MAL
MANAWA	MWA	Bunyaviridae	Uukuvirus	UUk
MANZANILLA	MAN	Bunyaviridae	Bunyavirus	SIM
MAPPUTTA	MAP	Bunyaviridae	Bunyavirus-like	MAP
MAPRIK	MPK	Bunyaviridae	Bunyavirus-like	MAP
MAPUERA	MPR			
MARBURG	MBG			MBG
MARCO	MCO	Rhabdoviridae		MOS
MARITUBA	MTB	Bunyaviridae	Bunyavirus	C
MARRAKAI	MAR	Reoviridae	Orbivirus	PAL
MATARIYA	MTY	Bunyaviridae	Bunyavirus-like	MTY
MATRUH	MTR	Bunyaviridae	Bunyavirus	TETE
MATUCARE	MAT			
MAYARO	MAY	Togaviridae	Alphavirus	A
MEABAN	MEA	Flaviviridae	Flavivirus	B
MELAO	MEL	Bunyaviridae	Bunyavirus	CAL
MERMET	MER	Bunyaviridae	Bunyavirus	SIM
MIDDELBURG	MID	Togaviridae	Alphavirus	A

NAME	ABBR.	TAXONOMIC STATUS FAMILY	GENUS	ANTI-GENIC GROUP
MINATITLAN	MNT	Bunyaviridae	<u>Bunyavirus</u>	MNT
MINNAL	MIN			
MIRIM	MIR	Bunyaviridae	<u>Bunyavirus</u>	GMA
MITCHELL RIVER	MR	Reoviridae	<u>Orbivirus</u>	WAR
MODOC	MOD	Flaviviridae	<u>Flavivirus</u>	B
MOJU	MOJU	Bunyaviridae	<u>Bunyavirus</u>	GMA
MOJUI DOS CAMPOS	MDC			
MONO LAKE	ML	Reoviridae	<u>Orbivirus</u>	KEM
MONT. MYOTIS LEUK.	MML	Flaviviridae	<u>Flavivirus</u>	B
MONTE DOURADO	MDO	Reoviridae	<u>Orbivirus</u>	CGL
MORICHE	MOR	Bunyaviridae	<u>Bunyavirus</u>	CAP
MOSQUEIRO	MQO	Rhabdoviridae		HP
MOSSURIL	MOS	Rhabdoviridae		MOS
MOUNT ELGON BAT	MEB	Rhabdoviridae		
M'POKO	MPO	Bunyaviridae	<u>Bunyavirus</u>	TUR
MUCAMBO	MUC	Togaviridae	<u>Alphavirus</u>	A
MUNGUBA	MUN	Bunyaviridae	<u>Phlebovirus</u>	PHL
MURRAY VALLEY ENC.	MVE	Flaviviridae	<u>Flavivirus</u>	B
MURUTUCU	MUR	Bunyaviridae	<u>Bunyavirus</u>	C
MYKINES	MYK	Reoviridae	<u>Orbivirus</u>	KEM
NAIROBI SHEEP DIS.	NSD	Bunyaviridae	<u>Nairovirus</u>	NSD
NARANJAL	NJL	Flaviviridae	<u>Flavivirus</u>	B
NARIVA	NAR	Paramyxoviridae	<u>Paramyxovirus</u>	
NAVARRO	NAV	Rhabdoviridae		

NAME	ABBR.	TAXONOMIC STATUS FAMILY	GENUS	ANTI-GENIC GROUP
NDUMU	NDU	Togaviridae	Alphavirus	A
NEGISHI	NEG	Flaviviridae	Flavivirus	B
NEPUYO	NEP	Bunyaviridae	Bunyavirus	C
NEW MINTO	NM	Rhabdoviridae		SAW
NGAINGAN	NGA			
NIQUE	NIQ	Bunyaviridae	Phlebovirus	PHL
NKOLBISSON	NKO	Rhabdoviridae		
NODAMURA	NOD	Nodaviridae	Nodavirus	
NOLA	NOLA	Bunyaviridae	Bunyavirus	SIM
NORTHWAY	NOR	Bunyaviridae	Bunyavirus	BUN
NTAYA	NTA	Flaviviridae	Flavivirus	B
NUGGET	NUG	Reoviridae	Orbivirus	KEM
NYAMANINI	NYM			NYM
NYANDO	NDO	Bunyaviridae	Bunyavirus-like	NDO
OKHOTSKIY	OKH	Reoviridae	Orbivirus	KEM
OKOLA	OKO			
OLIFANTSVLEI	OLI	Bunyaviridae	Bunyavirus	OLI
OMO	OMO	Bunyaviridae	Nairovirus	QYB
OMSK HEM. FEVER	OMSK	Flaviviridae	Flavivirus	B
O'NYONG-NYONG	ONN	Togaviridae	Alphavirus	A
ORIBOCA	ORI	Bunyaviridae	Bunyavirus	C
ORIXIMINA	ORX	Bunyaviridae	Phlebovirus	PHL
OROPOUCHE	ORO	Bunyaviridae	Bunyavirus	SIM
ORUNGO	ORU	Reoviridae	Orbivirus	

NAME	ABBR.	TAXONOMIC STATUS FAMILY	GENUS	ANTIGENIC GROUP
PONTEVES	PTV	Bunyaviridae	*Uukuvirus*	UUK
POWASSAN	POW	Flaviviridae	*Flavivirus*	B
PRECARIOUS POINT	PP	Bunyaviridae	*Uukuvirus*	UUK
PRETORIA	PRE	Bunyaviridae	*Nairovirus*	DGK
PROSPECT HILL	PH	Bunyaviridae	*Hantavirus**	HTN
PUCHONG	PUC	Togaviridae		MAL
PUEBLO VIEJO	PV	Bunyaviridae	*Bunyavirus*	GAM
PUNTA SALINAS	PS	Bunyaviridae	*Nairovirus*	HUG
PUNTA TORO	PT	Bunyaviridae	*Phlebovirus*	PHL
PURUS	PUR	Reoviridae	*Orbivirus*	CGL
PUUMALA	PUU	Bunyaviridae	*Hantavirus**	HTN
QALYUB	QYB	Bunyaviridae	*Nairovirus*	QYB
QUARANFIL	QRF			QRF
RAZDAN	RAZ	Bunyaviridae	*Bunyavirus*-like	
RESISTENCIA	RTA	Bunyaviridae	*Bunyavirus*-like	RTA
RESTAN	RES	Bunyaviridae	*Bunyavirus*	C
RIFT VALLEY FEVER	RVF	Bunyaviridae	*Phlebovirus*	PHL
RIO BRAVO	RB	Flaviviridae	*Flavivirus*	B
RIO GRANDE	RG	Bunyaviridae	*Phlebovirus*	PHL
ROCHAMBEAU	RBU	Rhabdoviridae		
ROCIO	ROC	Flaviviridae	*Flavivirus*	B
ROSS RIVER	RR	Togaviridae	*Alphavirus*	A
ROYAL FARM	RF	Flaviviridae	*Flavivirus*	B

*Proposed genus designation.

NAME	ABBR.	TAXONOMIC STATUS FAMILY	 GENUS	ANTI-GENIC GROUP
OSSA	OSSA	Bunyaviridae	Bunyavirus	C
OUANGO	OUA			
OUBANGUI	OUB	Poxviridae		
OUREM	OUR	Reoviridae	Orbivirus	CGL
PACORA	PCA	Bunyaviridae	Bunyavirus-like	
PACUI	PAC	Bunyaviridae	Phlebovirus	PHL
PAHAYOKEE	PAH	Bunyaviridae	Bunyavirus	PAT
PALESTINA	PLS	Bunyaviridae	Bunyavirus	MNT
PALYAM	PAL	Reoviridae	Orbivirus	PAL
PARA	PARA			
PARAMUSHIR	PMR	Bunyaviridae	Nairovirus	SAK
PARANA	PAR	Arenaviridae	Arenavirus	TCR
PAROO RIVER	PR	Reoviridae	Orbivirus	
PATA	PATA	Reoviridae	Orbivirus	EUB
PATHUM THANI	PTH	Bunyaviridae	Nairovirus	DGK
PATOIS	PAT	Bunyaviridae	Bunyavirus	PAT
PEATON	PEA	Bunyaviridae	Bunyavirus	SIM
PHNOM-PENH BAT	PPB	Flaviviridae	Flavivirus	B
PICHINDE	PIC	Arenaviridae	Arenavirus	TCR
PICOLA	PIA			
PIRY	PIRY	Rhabdoviridae	Vesiculovirus	VSV
PIXUNA	PIX	Togaviridae	Alphavirus	A
PLAYAS	PLA	Bunyaviridae	Bunyavirus	BUN
PONGOLA	PGA	Bunyaviridae	Bunyavirus	BWA

NAME	ABBR.	TAXONOMIC STATUS FAMILY	GENUS	ANTI-GENIC GROUP
RUSS. SPR. SUM. ENC.	RSSE	Flaviviridae	Flavivirus	B
SABO	SABO	Bunyaviridae	Bunyavirus	SIM
SABOYA	SAB	Flaviviridae	Flavivirus	B
SAGIYAMA	SAG	Togaviridae	Alphavirus	A
SAINT-FLORIS	SAF	Bunyaviridae	Phlebovirus	PHL
SAKHALIN	SAK	Bunyaviridae	Nairovirus	SAK
SAKPA	SPA			
SALANGA	SGA	Poxviridae		
SALEHABAD	SAL	Bunyaviridae	Phlebovirus	PHL
SAL VIEJA	SV	Flaviviridae	Flavivirus	B
SAN ANGELO	SA	Bunyaviridae	Bunyavirus	CAL
SANDFLY F. (NAPLES)	SFN	Bunyaviridae	Phlebovirus	PHL
SANDFLY F. (SICILIAN)	SFS	Bunyaviridae	Phlebovirus	PHL
SANDJIMBA	SJA			
SANGO	SAN	Bunyaviridae	Bunyavirus	SIM
SAN JUAN	SJ	Bunyaviridae	Bunyavirus	GAM
SAN PERLITA	SP	Flaviviridae	Flavivirus	B
SANTAREM	STM			
SANTA ROSA	SAR	Bunyaviridae	Bunyavirus	BUN
SARACA	SRA	Reoviridae	Orbivirus	CGL
SATHUPERI	SAT	Bunyaviridae	Bunyavirus	SIM
SAUMAREZ REEF	SRE	Flaviviridae	Flavivirus	B
SAWGRASS	SAW	Rhabdoviridae		SAW
SEBOKELE	SEB			

NAME	ABBR.	TAXONOMIC STATUS FAMILY	GENUS	ANTI-GENIC GROUP
SELETAR	SEL	Reoviridae	Orbivirus	KEM
SEMBALAM	SEM			
SEMLIKI FOREST	SF	Togaviridae	Alphavirus	A
SENA MADUREIRA	SM	Rhabdoviridae		TIM
SEOUL	SEO	Bunyaviridae	Hantavirus*	HTN
SEPIK	SEP	Flaviviridae	Flavivirus	B
SERRA DO NAVIO	SDN	Bunyaviridae	Bunyavirus	CAL
SHAMONDA	SHA	Bunyaviridae	Bunyavirus	SIM
SHARK RIVER	SR	Bunyaviridae	Bunyavirus	PAT
SHOKWE	SHO	Bunyaviridae	Bunyavirus	BUN
SHUNI	SHU	Bunyaviridae	Bunyavirus	SIM
SILVERWATER	SIL	Bunyaviridae	Bunyavirus-like	KSO
SIMBU	SIM	Bunyaviridae	Bunyavirus	SIM
SIMIAN HEM. FEVER	SHF	Flaviviridae		
SINDBIS	SIN	Togaviridae	Alphavirus	A
SIXGUN CITY	SC	Reoviridae	Orbivirus	KEM
SLOVAKIA	SLO			
SNOWSHOE HARE	SSH	Bunyaviridae	Bunyavirus	CAL
SOKULUK	SOK	Flaviviridae	Flavivirus	B
SOLDADO	SOL	Bunyaviridae	Nairovirus	HUG
SOROROCA	SOR	Bunyaviridae	Bunyavirus	BUN
SPONDWENI	SPO	Flaviviridae	Flavivirus	B
SRIPUR	SRI	Rhabdoviridae		

*Proposed genus designation.

NAME	ABBR.	TAXONOMIC STATUS FAMILY	GENUS	ANTIGENIC GROUP
ST. LOUIS ENC.	SLE	Flaviviridae	*Flavivirus*	B
STRATFORD	STR	Flaviviridae	*Flavivirus*	B
SUNDAY CANYON	SCA	Bunyaviridae	*Bunyavirus*-like	
TACAIUMA	TCM	Bunyaviridae	*Bunyavirus*	ANA
TACARIBE	TCR	Arenaviridae	*Arenavirus*	TCR
TAGGERT	TAG	Bunyaviridae	*Nairovirus*	SAK
TAHYNA	TAH	Bunyaviridae	*Bunyavirus*	CAL
TAMDY	TDY	Bunyaviridae	*Bunyavirus*-like	
TAMIAMI	TAM	Arenaviridae	*Arenavirus*	TCR
TANGA	TAN			
TANJONG RABOK	TR			TR
TATAGUINE	TAT	Bunyaviridae	*Bunyavirus*-like	
TEHRAN	TEH	Bunyaviridae	*Phlebovirus*	PHL
TELOK FOREST	TF			TR
TEMBE	TME			
TEMBUSU	TMU	Flaviviridae	*Flavivirus*	B
TENSAW	TEN	Bunyaviridae	*Bunyavirus*	BUN
TERMEIL	TER			
TETE	TETE	Bunyaviridae	*Bunyavirus*	TETE
TETTNANG	TET	Coronaviridae		
THIMIRI	THI	Bunyaviridae	*Bunyavirus*	SIM
THOGOTO	THO	Orthomyxoviridae		THO
THOTTAPALAYAM	TPM			
TIBROGARGAN	TIB	Rhabdoviridae		

NAME	ABBR.	TAXONOMIC STATUS FAMILY	 GENUS	ANTI-GENIC GROUP
TILLIGERRY	TIL	Reoviridae	Orbivirus	EUB
TIMBO	TIM	Rhabdoviridae		TIM
TIMBOTEUA	TBT	Bunyaviridae	Bunyavirus	GMA
TINAROO	TIN	Bunyaviridae	Bunyavirus	SIM
TINDHOLMUR	TDM	Reoviridae	Orbivirus	KEM
TLACOTALPAN	TLA	Bunyaviridae	Bunyavirus	BUN
TONATE	TON	Togaviridae	Alphavirus	A
TOSCANA	TOS	Bunyaviridae	Phlebovirus	PHL
TOURE	TOU			
TRIBEC	TRB	Reoviridae	Orbivirus	KEM
TRINITI	TNT	Togaviridae		
TRIVITTATUS	TVT	Bunyaviridae	Bunyavirus	CAL
TRUBANAMAN	TRU	Bunyaviridae	Bunyavirus-like	MAP
TSURUSE	TSU	Bunyaviridae	Bunyavirus	TETE
TURLOCK	TUR	Bunyaviridae	Bunyavirus	TUR
TURUNA	TUA	Bunyaviridae	Phlebovirus	PHL
TYULENIY	TYU	Flaviviridae	Flavivirus	B
UGANDA S	UGS	Flaviviridae	Flavivirus	B
UMATILLA	UMA	Reoviridae	Orbivirus	UMA
UMBRE	UMB	Bunyaviridae	Bunyavirus	TUR
UNA	UNA	Togaviridae	Alphavivirus	A
UPOLU	UPO	Bunyaviridae	Bunyavirus-like	UPO
URUCURI	URU	Bunyaviridae	Phlebovirus	PHL
USUTU	USU	Flaviviridae	Flavivirus	B

NAME	ABBR.	TAXONOMIC STATUS FAMILY	 GENUS	ANTI-GENIC GROUP
UTINGA	UTI	Bunyaviridae	Bunyavirus	SIM
UUKUNIEMI	UUK	Bunyaviridae	Uukuvirus	UUK
VELLORE	VEL	Reoviridae	Orbivirus	PAL
VEN. EQUINE ENC.	VEE	Togaviridae	Alphavirus	A
VENKATAPURAM	VKT			
VINCES	VIN	Bunyaviridae	Bunyavirus	C
VIRGIN RIVER	VR	Bunyaviridae	Bunyavirus	ANA
VS-ALAGOAS	VSA	Rhabdoviridae	Vesiculovirus	VSV
VS-INDIANA	VSI	Rhabdoviridae	Vesiculovirus	VSV
VS-NEW JERSEY	VSNJ	Rhabdoviridae	Vesiculovirus	VSV
WAD MEDANI	WM	Reoviridae	Orbivirus	KEM
WALLAL	WAL	Reoviridae	Orbivirus	WAL
WANOWRIE	WAN	Bunyaviridae	Bunyavirus-like	
WARREGO	WAR	Reoviridae	Orbivirus	WAR
WESSELSBRON	WSL	Flaviviridae	Flavivirus	B
WEST. EQUINE ENC.	WEE	Togaviridae	Alphavirus	A
WEST NILE	WN	Flaviviridae	Flavivirus	B
WHATAROA	WHA	Togaviridae	Alphavirus	A
WITWATERSRAND	WIT	Bunyaviridae	Bunyavirus-like	
WONGAL	WON	Bunyaviridae	Bunyavirus	KOO
WONGORR	WGR			
WYEOMYIA	WYO	Bunyaviridae	Bunyavirus	BUN
XIBUREMA	XIB	Rhabdoviridae		
YACAABA	YAC			

NAME	ABBR.	TAXONOMIC STATUS FAMILY	GENUS	ANTI-GENIC GROUP
YAQUINA HEAD	YH	Reoviridae	*Orbivirus*	KEM
YATA	YATA	Rhabdoviridae		
YELLOW FEVER	YF	Flaviviridae	*Flavivirus*	B
YOGUE	YOG	Bunyaviridae	*Bunyavirus*-like	YOG
YUG BOGDANOVAC	YB	Rhabdoviridae	*Vesiculovirus*	VSV
ZALIV TERPENIYA	ZT	Bunyaviridae	*Uukuvirus*	UUK
ZEGLA	ZEG	Bunyaviridae	*Bunyavirus*	PAT
ZIKA	ZIKA	Flaviviridae	*Flavivirus*	B
ZINGA	ZGA	Bunyaviridae	*Phlebovirus*	PHL
ZINGILAMO	ZGO	Togaviridae	*Alphavirus*	A
ZIRQA	ZIR	Bunyaviridae	*Nairovirus*	HUG

Table 2.1 Antigenic Groups of 506 Viruses Registered in Catalogue

Virus Family and Genus	Antigenic Group	Abbreviation	No. Registered Viruses in Group	Percent
ARENAVIRIDAE				
Arenavirus	Tacaribe	TCR	11	2.2
BUNYAVIRIDAE				
Bunyavirus			123	24.3
(Bunyamwera	Anopheles A	ANA	5	
Supergroup)	Anopheles B	ANB	2	
	Bunyamwera	BUN	22	
	Bwamba	BWA	2	
	C	C	12	
	California	CAL	13	
	Capim	CAP	8	
	Gamboa	GAM	3	
	Guama	GMA	12	
	Koongol	KOO	2	
	Minatitlan	MNT	2	
	Olifantsvlei	OLI	3	
	Patois	PAT	6	
	Simbu	SIM	21	
	Tete	TETE	5	
	Turlock	TUR	4	
	Unassigned	SBU	1	
Nairovirus			24	4.7
	CHF-Congo	CHF-CON	4	
	Dera Ghazi Khan	DGK	5	
	Hughes	HUG	4	
	Nairobi sheep disease	NSD	3	
	Qalyub	QYB	3	
	Sakhalin	SAK	5	
Phlebovirus	Phlebotomus fever	PHL	36	7.1

Table 2.1 (Continued)

Virus Family and Genus	Antigenic Group	Abbreviation	No. Registered Viruses in Group	Percent
BUNYAVIRIDAE				
Uukuvirus	Uukuniemi	UUK	6	1.2
Hantavirus*	Hantaan	HTN	4	0.8
"Bunyavirus-like" (Unassigned, probable or possible members)	Bakau	BAK	2	0.4
	Bhanja	BHA	1	0.2
	Kaisodi	KSO	3	0.6
	Mapputta	MAP	4	0.8
	Matariya	MTY	3	0.6
	Nyando	NDO	1	0.2
	Resistencia	RTA	3	0.6
	Upolu	UPO	2	0.4
	Yogue	YOG	1	0.2
	Ungrouped		15	3.0
REOVIRIDAE				
Orbivirus	African horsesickness	AHS	1	0.2
	Bluetongue	BLU	1	0.2
	Changuinola	CGL	12	2.4
	Colorado tick fever	CTF	2	0.4
	Corriparta	COR	3	0.6
	Epizootic hemorrhagic dis.	EHD	2	0.4
	Eubenangee	EUB	3	0.6
	Kemerovo	KEM	18	3.6
	Palyam	PAL	7	1.4
	Umatilla	UMA	2	0.4
	Wallal	WAL	1	0.2
	Warrego	WAR	2	0.4
	Ungrouped		7	1.4

*Proposed genus designation.

Table 2.1 (Continued)

Virus Family and Genus	Antigenic Group	Abbreviation	No. Registered Viruses in Group	Percent
RHABDOVIRIDAE				
Vesiculovirus	Vesicular stomatitis	VSV	10	2.0
Lyssavirus	Rabies		2	0.4
Unassigned or possible members	Bovine ephemeral fever	BEF	4	0.8
	Hart Park	HP	3	0.6
	Kwatta	KWA	1	0.2
	Le Dantec	LD	2	0.4
	Mossuril	MOS	8	1.6
	Sawgrass	SAW	3	0.6
	Timbo	TIM	3	0.6
	Ungrouped		18	3.6
TOGAVIRIDAE				
Alphavirus	A		27	5.3
Possible members	Malakal		2	0.4
	Ungrouped		1	0.2
FLAVIVIRIDAE				
Flavivirus	B		66	13.0
Possible members	Ungrouped		1	0.2
CORONAVIRIDAE				
Coronavirus	Ungrouped		2	0.4
HERPESVIRIDAE	Ungrouped		1	0.2
AFRICAN SWINE FEVER*	Ungrouped		1	0.2

*Removed from family Iridoviridae. A new official family name has not been designated.

Table 2.1 (Continued)

Virus Family and Genus	Antigenic Group	Abbreviation	No. Registered Viruses in Group	Percent
NODAVIRIDAE				
Nodavirus	Ungrouped		1	0.2
ORTHOMYXOVIRIDAE	Thogoto	THO	1	0.2
	Ungrouped		1	0.2
PARAMYXOVIRIDAE	Ungrouped		1	0.2
POXVIRIDAE	Ungrouped		3	0.6
UNCLASSIFIED	Marburg	MBG	2	0.4
	Nyamanini	NYM	1	0.2
	Tanjong Rabok	TR	2	0.4
	Quaranfil	QRF	2	0.4
	Ungrouped		37	7.3
TOTAL			506	

Table 3.1 Initial Isolations of Viruses by Decade and Country of Origin

Decade	Continent	Country	Virus
1900-09	Africa	S. Africa	BLU
1910-19	Africa	Kenya	ASF,NSD
1920-29	Africa	Nigeria	YF
	Europe	Scotland	LI
	N. America	U.S.A	VSI
1930-39	Africa	Kenya	RVF
		S. Africa	AHS
		Uganda	BWA,WN
	Asia	Japan	JE
		U.S.S.R.	RSSE
	N. America	U.S.A.	EEE,SLE,WEE
	S. America	Venezuela	VEE
1940-49	Africa	Uganda	BUN,NTA,SF,UGS,ZIKA
	Asia	Japan	NEG
		U.S.S.R.	OMSK
	Australasia	Hawaii	DEN-1
		New Guinea	DEN-2
	Europe	Czechoslovakia	HAN
		Italy	SFN,SFS
	N. America	U.S.A.	CE,CTF,TVT
	S. America	Brazil	ILH
		Colombia	ANA,ANB,WYO
1950-59	Africa	Egypt	CNU,QRF,QYB,SIN
		Nigeria	ILE,LB
		S. Africa	BAN,GER,ING,LEB,MID,MOS,NDU,NYM, PGA,SIM,SPO,TETE,USU,WIT,WSL
		Sudan	WM
		Uganda	CHIK,CON,ENT,NDO,ONN,ORU
	Asia	India	ARK,BHA,GAN,KAS,KSO,KFD,MIN,PAL, SAT,VKT,UMB,WAN
		Israel	IT
		Japan	AKA,APOI,IBA,NOD,SAG,TSU
		Malaya	BAK,BAT,BEB,GET,KET,LGT,TMU
	Australasia	Australia	MVE
		Philippines	DEN-3,DEN-4
	Europe	Czechoslovakia	HYPR,TAH
		Finland	KUM
		U.S.S.R.	ABS
	N. America	Canada	POW
		Panama	BOC,LJ,PCA
		U.S.A.	CV,EHD,HP,MML,MOD,RB,SA,SSH,TUR,VSNJ
	S. America	Argentina	JUN
		Brazil	APEU,AURA,BSQ,CAP,CAR,CATU,GJA,GMA, ITQ,MAG,MIR,MOJU,MTB,MUC,MUR,ORI, TCM,UNA
		Colombia	GRO,NAV
		Trinidad	ARU,BIM,BSB,IERI,KRI,LUK,MAN,MAY, MEL,NEP,ORO,TCR,TNT

Table 3.1 (Continued)

Decade	Continent	Country	Virus
1960-69	Africa	Cameroun	NKO,OKO
		Cent. Afr. Rep.	BAG,BGN,BIA,BIR,BOT,BOU,BTK,MPO, PATA,YATA,ZGA
		Egypt	ACD,AMT,BAH,BEA,MTR,MTY,RF
		Kenya	THO
		Nigeria	DUG,KOT,LAS,SABO,SAN,SHA,SHU
		Senegal	BDA,DB,GOS,KEU,KOU,LD,SAB,TAT,TOU,YOG
		South Africa	OLI,SHO
		Sudan	GF,MAL
		Uganda	KAD,KAM,MEB,TAN
	Asia	Cambodia	PPB
		India	BAR,CHP,DHO,KAN,KMP,SEM,THI,TPM,VEL
		Iran	KAR,SAL,TEH
		Japan	AINO
		Malaysia	JUG,KTR,LJN,PUC,TR
		Pakistan (West)	DGK,HAZ,MWA
		Persian Gulf	ZIR
		Singapore	SEL
		Thailand	KK
		U.S.S.R.	CHF,KYZ,OKH,SAK,TYU,ZT
	Australasia	Australia	ALF,ALM,BEF,BEL,CHV,COR,DAG,EH,EUB, JAP,JOI,KOK,KOO,KOW,KUN,MAP,MPK,MR, RR,SEP,STR,TRU,UPO,WAR,WON
		New Zealand	WHA
		Pacific Island	JA
	Europe	Czechoslovakia	CVO,KEM,LED,LIP,TRB
		Finland	INK,UUK
		France	GA,PTV
		West Germany	MBG
	N. America	Canada	SIL
		Guatemala	JUT
		Mexico	MNT,TLA
		Panama	AGU,CHG,CHI,CGL,FRI,GAM,JD,LAT,MAD, MAT,OSSA,PAR,PAT,PT,ZEG
		U.S.A.	BUT,CR,EVE,FLA,GL,HJ,HUG,JC,JS,KC, KEY,KLA,LAC,LOK,LS,MER,MD,MH,ML,PAH, SAW,SC,SHF,SR,TAM,TEN,UMA
	S. America	Bolivia	MAC
		Brazil	ACA,AMA,AMB,ANH,ANU,AP,ARA,BEN,BER, BLM,BOR,BUJ,BVS,CAN,CDU,CHO,COT,GTB, GUR,ICO,INH,IRI,ITP,JUR,MCO,OUR,PAC, PIRY,PIX,SDN,SOR,TBT,TIM,TME,URU,UTI, VSA
		Colombia	BUE,PIC
		French Guiana	CAB

Table 3.1 (Continued)

Decade	Continent	Country	Virus
1960-69	S. America	Peru	HUA,PS
		Surinam	KWA
		Trinidad	COC,MOR,NAR,RES,SOL
1970-79	Africa	Cent. Afr. Rep.	BBO,BGI,BMA,BOB,GAR,GOM,GOR,IPPY,KOL,LJA,NOLA,OUA,OUB,SAF,SEB,SGA,SJA,SPA,ZGO
		Egypt	AH,KS,PTH
		Ethiopia	OMO
		Nigeria	IFE
		Seychelles	ARI
		S. Africa	PRE
		Zaire	EBO
	Asia	India	CG,KAI,SRI
		Iran	ISF
		Korea	HTN
		Malaysia	CI,TF
		U.S.S.R.	BKN,CHIM,IK,KHA,KSI,PMR,RAZ,SOK,TDY
	Australasia	Australia	BC,BF,CVG,DOU,GGY,GG,KNA,MAR,NGA,NUG,PEA,PIA,PR,PP,SRE,TAG,TER,TIB,TIL,TIN,WAL,WGR,YAC
	Europe	Czechoslovakia	SLO
		Denmark	MYK,TDM
		Germany	EYA,TET
		Italy	TOS
		Scotland	CM,CW
		U.S.S.R.	BAKU
		Yugoslavia	YB
	N. America	Canada	AVA,BAU,GI
		Mexico	SAR
		Panama	CAC,CAI,NIQ
		U.S.A.	AB,CNT,FM,GLO,LLS,NM,NOR,RG,SCA,SP,SV,VR,YH
	S. America	Brazil	ALE,ALT,CNA,CPC,CUI,ENS,FLE,IACO,ITA,ITI,ITU,JAC,JAM,MCA,MDC,MPR,MQO,PARA,ROC,SM,STM,TUA
		Ecuador	ABR,BAB,NJL,PLA,PLS,PV,SJ,VIN
		French Guiana	INI,RBU,TON
		Venezuela	AROA
1980-86	Asia	Korea	SEO
	Australasia	Australia	AR,BRM,KIM,LC
	Europe	Finland	PUU
		France	MEA
		Greece	CFU
		Italy	ARB
	N. America	Cuba	ER
		USA	PH
	S. America	Argentina	ANT,BQS,LM,RTA
		Brazil	AMR,JARI,MDO,MUN,ORX,PUR,SRA,XIB

Table 4.1 Initial Isolation of 506 Registered Viruses by Continent or Region, Country, and Chronological Period

Continent	Country or Area	Before 1930	1930 -39	1940 -49	1950 -59	1960 -69	1970 -79	1980 -86	Totals
AFRICA	Cameroon					2			2
	Cent. Afr. Rep.					11	19		30
	Egypt				5	7	3		15
	Ethiopia						1		1
	Kenya	2	1			1			4
	Nigeria	1			2	7	1		11
	Senegal					10			10
	Seychelles						1		1
	S. Africa	1	1		15	2	1		20
	Sudan					2			2
	Uganda		2	5	6	4			17
	Zaire						1		1
	Totals	4	4	5	28	46	27	0	114
ASIA	Cambodia					1			1
	India				12	9	3		24
	Iran					3	1		4
	Israel				1				1
	Japan		1	1	6	1			9
	Korea						1	1	2
	Malaysia				7	5	2		14
	W. Pakistan					3			3
	Persian Gulf					1			1
	Singapore					1			1
	Thailand					1			1
	U.S.S.R. (East)		1	1		6	9		17
	Totals	0	2	2	26	31	16	1	78
AUSTRAL-ASIA and PACIFIC ISLANDS	Australia				1	25	23	4	53
	Hawaii			1					1
	Johnston Island					1			1
	New Guinea			1					1
	New Zealand					1			1
	Philippines				2				2
	Totals	0	0	2	3	27	23	4	59
EUROPE	Czechoslovakia			1	2	5	1		9
	Denmark						2		2
	Finland				1	2		1	4
	France					2		1	3
	Greece							1	1
	Italy			2			1	1	4
	Scotland	1					2		3
	U.S.S.R. (West)				1		1		2
	West Germany					1	2		3
	Yugoslavia						1		1
	Totals	1	0	3	4	10	10	4	32

Table 4.1 (Continued)

Continent	Country or Area	Before 1930	1930 -39	1940 -49	1950 -59	1960 -69	1970 -79	1980 -86	Totals
NORTH AMERICA	Canada				1	1	3		5
	Cuba							1	1
	Guatemala					1			1
	Mexico					2	1		3
	Panama				3	15	3		21
	U.S.A.	1	3	3	10	27	13	1	58
	Totals	1	3	3	14	46	20	2	89
SOUTH AMERICA	Argentina				1			4	5
	Bolivia					1			1
	Brazil			1	18	37	22	8	86
	Colombia			3	2	2			7
	Ecuador						8		8
	French Guiana					1	3		4
	Peru					2			2
	Surinam					1			1
	Trinidad				13	5			18
	Venezuela		1				1		2
	Totals	0	1	4	34	49	34	12	134
	GRAND TOTALS	6	10	19	109	209	130	23	506

Table 5.1 Alphaviruses, Family Togaviridae

VIRUS	Isolated from: Arthropods: Mosq.: Culicine	Isolated from: Arthropods: Mosq.: Anopheline	Isolated from: Arthropods: Ticks: Ixodid	Isolated from: Arthropods: Ticks: Argasid	Isolated from: Arthropods: Phlebotomine	Isolated from: Arthropods: Culicoides	Isolated from: Arthropods: Other	Isolated from: Vertebrates: Humans	Isolated from: Vertebrates: Other Primates	Isolated from: Vertebrates: Rodents	Isolated from: Vertebrates: Birds	Isolated from: Vertebrates: Bats	Isolated from: Vertebrates: Marsupials	Isolated from: Vertebrates: Other	Isolated from: Vertebrates: Sentinels	Isolated in: Africa	Isolated in: Asia	Isolated in: Australasia	Isolated in: Europe	Isolated in: North America	Isolated in: South America	Human Disease: Natural Infection	Human Disease: Lab Infection	SALS Rating: Level	SALS Rating: Basis	SEAS RATING**	TAXONOMIC STATUS
Aura	+																				+			2	S	22	Alphavirus
Barmah Forest	+																	+						2	A7	22	"
Bebaru	+																+	+					+α	2	S	22	"
Cabassou	+										+	+	+		+						+			3*V	IE	21	"
Chikungunya	+			+				+	+		+	+			+	+	+					+	+	3*	S	20	"
Eastern equine enc.	+	+				+	+	+	+	+	+	+	+	+			+	+	+	+	+	+	+	2V	S	20	"
Everglades	+	+								+			+							+		+		3*V	S	20	"
Fort Morgan							+				+									+				2	S	20	"
Getah	+	+												+			+	+						3	A1	20	"
Highlands J	+										+	+			+					+				2	S	20	"
Kyzylagach	+																+							3	IE	22	"
Mayaro	+						+	+			+			+							+	+	+	3	S	20	"
Middleburg	+		+													+								3	A1	20	"
Mucambo	+							+		+	+		+		+						+	+	+	3*V	S	20	"
Ndumu	+													+		+								3	A1	21	"
O'nyong-nyong		+						+							+	+						+		2	S	20	"
Pixuna	+	+								+											+			2	S	22	"
Ross River	+							+			+		+					+				+	+α	2	S	20	"
Sagiyama	+																+							3	A1	21	"
Semliki Forest	+	+						+			+				+	+	+						+	3	A2	20	"
Sindbis	+	+	+				+	+			+	+			+	+	+	+	+			+		2	S	20	"
Tonate	+	+						+			+				+						+	+		3*V	IE	21	"
Una	+	+												+	+					+	+			2	S	21	"
Ven. equine enc.	+	+						+		+		+	+	+	+					+	+	+	+	3*V	S	20	"
Western equine enc.	+	+					+	+		+	+			+	+				?	+	+	+	+	2V	S	20	"
Whataroa	+																	+						2	S	20	"
Zingilamo											+					+								2	S	22	"

* Work with these viruses at containment level 3 requires HEPA filtration of all exhaust air prior to discharge to the outside.

α Inapparent infection(s) only.

** 20 = Arbovirus
21 = Probable Arbovirus
22 = Possible Arbovirus
23 = Probably not Arbovirus
24 = Not Arbovirus

V = Vaccination with demonstration of antibody development; without such vaccination, the next higher containment level is recommended.

Table 6.1 Mosquito-Borne Flaviviruses, Family Flaviviridae

VIRUS	ISOLATED FROM: ARTHROPODS: Mosq.: Culicine	Mosq.: Anopheline	Ticks: Ixodid	Ticks: Argasid	Phlebotomine	Culicoides	Other	VERTEBRATES: Humans	Other Primates	Rodents	Birds	Bats	Marsupials	Other	Sentinels	ISOLATED IN: Africa	Asia	Australasia	Europe	North America	South America	HUMAN DISEASE: Natural Infection	Lab Infection	SALS RATING: Level	Basis	SEAS RATING**	TAXONOMIC STATUS
Alfuy	+										+							+						2	S	20	Flavivirus
Bagaza	+															+								2	S	20	"
Banzi	+							+							+	+						+		2	S	20	"
Bouboui	+	+							+							+								2	S	20	"
Bussuquara	+							+		+					+					+	+	+		2	S	20	"
Dengue 1	+							+								+	+	+		+	+	+	+	2	S	20	"
Dengue 2	+							+	+							+	+	+		+	+	+	+	2	S	20	"
Dengue 3	+							+									+	+			+	+	+	2	S	20	"
Dengue 4	+							+									+	+		+	+	+	+	2	S	20	"
Edge Hill	+	+																+						2	S	20	"
Ilheus	+							+			+				+					+	+	+	+	2	S	20	"
Israel turkey men.	+					+					+					+	+							3	S	21	"
Japanese enc.	+	+						+			+	+		+			+					+	+	2	S	20	"
Jugra	+											+					+							2	S	20	"
Kokobera	+																	+						2	S	20	"
Kunjin	+							+			+			+				+				+	+	2	S	20	"
Murray Valley enc.	+							+			+				+			+				+	+α	3	S	20	"
Naranjal	+														+						+			3	IE	21	"
Ntaya	+															+								2	S	21	"
Rocio	+							+			+				+						+	+	+	3*	S	20	"
Sepik	+																	+				+		3	IE	21	"
St. Louis enc.	+	+	+				+	+			+	+		+						+	+	+	+	3	S	20	"
Spondweni	+							+								+						+	+	3	S	20	"
Stratford	+																	+						2	S	22	"
Tembusu	+	+													+		+	+						2	S	21	"
Uganda S	+										+				+	+								2	S	20	"
Usutu	+							+		+	+					+						+		2	S	22	"
Wesselsbron	+	+						+		+				+		+	+					+	+	3*X	S	20	"
West Nile	+	+	+	+				+		+	+	+		+	+	+	+		+			+	+	3	S	20	"
Yellow fever	+		+					+	+				+			+					+	+	+	3*V	S	20	"
Zika	+							+	+						+	+	+					+	+	2	S	20	"

* See footnote Table 5.1
** See footnote Table 5.1
α Inapparent infections only.

V: See footnote Table 5.1
X: Arboviruses restricted by U.S. Department of Agriculture regulations or policy.

Table 6.2 Tick-Borne Flaviviruses, Family Flaviviridae

VIRUS	ISOLATED FROM: ARTHROPODS: Mosq.: Culicine	Mosq.: Anopheline	Ticks: Ixodid	Ticks: Argasid	Phlebotomine	Culicoides	Other	VERTEBRATES: Humans	Other Primates	Rodents	Birds	Bats	Marsupials	Other	Sentinels	ISOLATED IN: Africa	Asia	Australasia	Europe	North America	South America	HUMAN DISEASE: Natural Infection	Lab Infection	SALS RATING: Level	Basis	SEAS RATING**	TAXONOMIC STATUS
Absettarov			+					+						+					+			+	+	4	A4	20	Flavivirus
Gadgets Gully			+															+								22	"
Hanzalova			+					+											+			+		4	A4	20	"
Hypr			+					+		+	+	+		+					+			+	+	4	S	20	"
Kadam			+													+								2	S	21	"
Karshi				+													+							2	S	22	"
Kumlinge			+					+		+	+			+					+			+	+	4	A4	20	"
Kyasanur Forest dis.			+	+			+	+	+	+	+	+		+			+					+	+	4	S	20	"
Langat			+														+							2	S	20	"
Louping ill			+					+		+	+			+					+			+	+	3*X	S	20	"
Meaban				+															+							22	"
Omsk hem. fever			+					+		+				+			+		?			+	+	4	S	20	"
Powassan	+	+	+					+		+				+						+		+	+	3	S	20	"
Royal Farm				+													+							2	S	22	"
Russ. spr. sum. enc.			+				+	+		+	+						+		+			+	+	4	S	20	"
Saumarez Reef			+	+														+						3	IE	22	"
Tyuleniy			+														+			+				2	S	21	"

* See footnote Table 5.1
** See footnote Table 5.1
X See footnote Table 6.1

Table 6.3 Flaviviruses, Family Flaviviridae: No Arthropod Vector Demonstrated

VIRUS	ISOLATED FROM: ARTHROPODS: Mosq.: Culicine	Mosq.: Anopheline	Ticks: Ixodid	Ticks: Argasid	Phlebotomine	Culicoides	Other	VERTEBRATES: Humans	Other Primates	Rodents	Birds	Bats	Marsupials	Other	Sentinels	ISOLATED IN: Africa	Asia	Australasia	Europe	North America	South America	HUMAN DISEASE: Natural Infection	Lab Infection	SALS RATING: Level	Basis	SEAS RATING**	TAXONOMIC STATUS
Apoi										+							+						+	2	S	22	Flavivirus
Aroa															+						+			2	S	22	"
Cacipacore											+										+					22	"
Carey Island												+					+							2	S	22	"
Cowbone Ridge										+										+				2	S	23	"
Dakar bat								+				+				+						+		2	S	24	"
Entebbe bat												+				+								2	S	24	"
Jutiapa										+										+				2	S	22	"
Koutango										+						+							+	3	S	21	"
Modoc										+										+			+[α]	2	S	24	"
Montana Myotis leuk.												+								+				2	S	24	"
Negishi								+									+					+	+	3	S	22	"
Phnom-Penh bat												+					+							2	S	23	"
Rio Bravo												+								+		+	+	2	S	24	"
Saboya										+						+								2	S	22	"
Sal Vieja										+										+				3	A7	22	"
San Perlita										+										+				3	A7	22	"
Sokuluk												+					+							2	S	22	"

** See footnote Table 6.1

α Inapparent infection only.

Table 7.1 Families Togaviridae and Flaviviridae: Antigenically Grouped and Ungrouped Possible Members

VIRUS	ISOLATED FROM															ISOLATED IN						HUMAN DISEASE		SALS RATING		SEAS RATING**	TAXONOMIC STATUS
	ARTHROPODS							VERTEBRATES																			
	Mosq.		Ticks																								
	Culicine	Anopheline	Ixodid	Argasid	Phlebotomine	Culicoides	Other	Humans	Other Primates	Rodents	Birds	Bats	Marsupials	Other	Sentinels	Africa	Asia	Australasia	Europe	North America	South America	Natural Infection	Lab Infection	Level	Basis		
MALAKAL GR.																											
Malakal	+															+								2	S	22	Togaviridae
Puchong	+																+							2	S	22	"
Triniti	+																				+			2	S	21	Togaviridae
Simian hem. fever									+								?			+				2	S	24	Flaviviridae

** See footnote Table 5.1

Table 8.1.1 Bunyaviruses, Family Bunyaviridae:
Bunyamwera Supergroup, Anopheles A and Anopheles B Serogroup Viruses

VIRUS	ISOLATED FROM: ARTHROPODS: Mosq.: Culicine	Mosq.: Anopheline	Ticks: Ixodid	Ticks: Argasid	Phlebotomine	Culicoides	Other	VERTEBRATES: Humans	Other Primates	Rodents	Birds	Bats	Marsupials	Other	Sentinels	ISOLATED IN: Africa	Asia	Australasia	Europe	North America	South America	HUMAN DISEASE: Natural Infection	Lab Infection	SALS RATING: Level	Basis	SEAS RATING**	TAXONOMIC STATUS
ANOPHELES A GR.																											
Anopheles A		+																			+			2	S	21	Bunyavirus
Las Maloyas		+																			+			2	A7	22	"
Lukuni	+	+																			+			2	S	22	"
Tacaiuma	+	+						+	+						+						+	+		2	S	21	"
Virgin River	+																			+				2	A7	22	"
ANOPHELES B GR.																											
Anopheles B		+																			+			2	S	22	Bunyavirus
Boraceia	+	+																			+			2	S	22	"

** See footnote Table 5.1

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Table 8.1.2 Bunyaviruses, Family Bunyaviridae:
Bunyamwera Supergroup, Bunyamwera Serogroup Viruses

VIRUS	ISOLATED FROM															ISOLATED IN						HUMAN DISEASE		SALS RATING		SEAS RATING**	TAXONOMIC STATUS
	ARTHROPODS							VERTEBRATES																			
	Mosq.		Ticks																								
	Culicine	Anopheline	Ixodid	Argasid	Phlebotomine	Culicoides	Other	Humans	Other Primates	Rodents	Birds	Bats	Marsupials	Other	Sentinels	Africa	Asia	Australasia	Europe	North America	South America	Natural Infection	Lab Infection	Level	Basis		
BUNYAMWERA GR.																											
Anhembi	+									+											+			2	S	22	Bunyavirus
Batai	+	+															+		+					2	S	21	".
Birao		+														+								2	S	22	"
Bunyamwera	+							+								+						+	+	2	S	20	"
Cache Valley	+	+												+						+				2	S	20	"
Calovo†		+																	+			+		2	S	21	"
Germiston	+							+		+					+	+							+	3*	S	20	"
Iaco	+																				+			3	IE	22	"
Ilesha		+						+								+						+		2	S	21	"
Kairi	+								+	+					+						+			3	AI	20	"
Lokern	+					+								+						+				2	S	20	"
Macaua	+									+	+										+			3	IE	21	"
Maguari	+	+												+	+						+			2	S	20	"
Main Drain	+					+								+						+				2	S	20	"
Northway	+									+					+					+				3	IE	21	"
Playas	+																				+			3	IE	22	"
Santa Rosa	+																			+				3	IE	22	"
Shokwe	+	+						+		+						+						+		3	IE	21	"
Sororoca	+																				+			2	S	22	"
Tensaw	+	+								+				+	+					+		+		2	S	20	"
Tlacotalpan	+	+																		+				3	IE	22	"
Wyeomyia	+	+						+												+	+	+		2	S	21	"

* See footnote Table 5.1
** See footnote Table 5.1
† May be strain of Batai

Table 8.1.3 Bunyaviruses, Family Bunyaviridae:
Bunyamwera Supergroup, Bwamba Serogroup and Serogroup C Viruses

VIRUS	ISOLATED FROM															ISOLATED IN						HUMAN DISEASE		SALS RATING		SEAS RATING**	TAXONOMIC STATUS
	ARTHROPODS							VERTEBRATES																			
	Mosq.		Ticks																								
	Culicine	Anopheline	Ixodid	Argasid	Phlebotomine	Culicoides	Other	Humans	Other Primates	Rodents	Birds	Bats	Marsupials	Other	Sentinels	Africa	Asia	Australasia	Europe	North America	South America	Natural Infection	Lab Infection	Level	Basis		
<u>BWAMBA GR.</u>																											
Bwamba		+						+								+						+		2	S	21	Bunyavirus
Pongola	+	+						+								+						+		2	S	20	"
<u>GROUP C</u>																											
Apeu	+							+					+		+						+	+	+	2	S	20	Bunyavirus
Caraparu	+							+		+					+					+	+	+	+	2	S	20	"
Gumbo Limbo	+									+										+				2	S	21	"
Itaqui	+							+		+			+		+						+	+		2	S	20	"
Madrid	+							+		+					+					+		+		2	S	20	"
Marituba	+							+					+		+						+	+	+	2	S	20	"
Murutucu	+							+		+			+	+	+						+	+	+	2	S	20	"
Nepuyo	+							+		+		+			+					+	+	+		2	S	20	"
Oriboca	+							+		+			+		+						+	+	+	2	S	20	"
Ossa	+							+		+					+					+		+	+	2	S	20	"
Restan	+							+													+	+		2	S	20	"
Vinces	+														+						+			2	A7	21	"

** See footnote Table 5.1

Table 8.1.4 Bunyaviruses, Family Bunyaviridae:
Bunyamwera Supergroup, California and Capim Serogroup Viruses

VIRUS	ISOLATED FROM: ARTHROPODS: Mosq. Culicine	Mosq. Anopheline	Ticks Ixodid	Ticks Argasid	Phlebotomine	Culicoides	Other	VERTEBRATES: Humans	Other Primates	Rodents	Birds	Bats	Marsupials	Other	Sentinels	ISOLATED IN: Africa	Asia	Australasia	Europe	North America	South America	HUMAN DISEASE: Natural Infection	Lab Infection	SALS RATING: Level	Basis	SEAS RATING**	TAXONOMIC STATUS
CALIFORNIA GR.																											
California enc.	+																			+		+		2	S	20	Bunyavirus
Guaroa		+						+												+	+	+		2	S	20	"
Inkoo	+																		+			+		2	S	22	"
Jamestown Canyon	+						+								+					+		+		2	S	20	"
Jerry Slough	+																			+				2	S	20	"
Keystone	+	+								+					+					+			+[α]	2	S	20	"
La Crosse	+							+		+					+					+		+		2	S	20	"
Melao	+																				+			2	S	21	"
San Angelo	+	+																		+				2	S	20	"
Serra do Navio	+																				+			3	IE	22	"
Snowshoe hare	+									+				+	+					+		+		2	S	20	"
Tahyna	+	+						+							+	+	+		+	+		+		2	S	20	"
Trivittatus	+									+					+					+				2	S	20	"
CAPIM GR.																											
Acara	+									+					+					+	+			2	S	21	Bunyavirus
Benevides	+														+						+			2	A7	21	"
Benfica	+									+					+						+			2	A7	20	"
Bushbush	+														+						+			2	S	20	"
Capim	+									+			+		+						+			2	S	20	"
Guajara	+									+					+					+	+			2	S	20	"
Juan Diaz															+					+				2	S	22	"
Moriche.	+																				+			2	S	22	"

** See footnote Table 5.1
α Inapparent infection only.

Table 8.1.5 Bunyaviruses, Family Bunyaviridae:
Bunyamwera Supergroup, Gamboa, Guama and Koongol Serogroup Viruses

VIRUS	ISOLATED FROM: ARTHROPODS: Mosq.: Culicine	Mosq.: Anopheline	Ticks: Ixodid	Ticks: Argasid	Phlebotomine	Culicoides	Other	VERTEBRATES: Humans	Other Primates	Rodents	Birds	Bats	Marsupials	Other	Sentinels	ISOLATED IN: Africa	Asia	Australasia	Europe	North America	South America	HUMAN DISEASE: Natural Infection	Lab Infection	SALS RATING: Level	Basis	SEAS RATING**	TAXONOMIC STATUS
GAMBOA GR.																											
Gamboa	+																			+				2	S	21	Bunyavirus
Pueblo Viejo	+																				+			3	IE	22	"
San Juan	+																				+			3	2E	22	"
GUAMA GR.																											
Ananindeua	+									+	+		+		+						+			2	A7	21	Bunyavirus
Bertioga															+						+			2	S	22	"
Bimiti	+									+					+						+			2	S	20	"
Cananeia	+														+						+			3	IE	21	"
Catu	+	+						+		+		+	+		+						+	+	+	2	S	20	"
Guama	+				+			+		+		+	+		+					+	+	+		2	S	20	"
Guaratuba	+										+				+						+			3	IE	21	"
Itimirim										+											+			3	IE	22	"
Mahogany Hammock	+									+										+				2	S	22	"
Mirim	+														+						+			2	S	20	"
Moju	+									+			+		+						+			2	S	20	"
Timboteua										+					+						+			2	A7	21	"
KOONGOL GR.																											
Koongol	+	?																+						2	S	21	Bunyavirus
Wongal	+																	+						2	S	21	"

** See footnote Table 5.1

Table 8.1.6 Bunyaviruses, Family Bunyaviridae:
Bunyamwera Supergroup, Minatitlan, Olifantsvlei and Patois Serogroup Viruses

VIRUS	ISOLATED FROM: ARTHROPODS: Mosq.: Culicine	Mosq.: Anopheline	Ticks: Ixodid	Ticks: Argasid	Phlebotomine	Culicoides	Other	VERTEBRATES: Humans	Other Primates	Rodents	Birds	Bats	Marsupials	Other	Sentinels	ISOLATED IN: Africa	Asia	Australasia	Europe	North America	South America	HUMAN DISEASE: Natural Infection	Lab Infection	SALS RATING: Level	SALS RATING: Basis	SEAS RATING**	TAXONOMIC STATUS
MINATITLAN GR.																											
Minatitlan															+					+				2	S	22	Bunyavirus
Palestina	+														+						+			3	IE	21	"
OLIFANTSVLEI GR.																											
Bobia	+															+								3	IE	22	Bunyavirus
Botambi	+															+								2	S	22	"
Olifantsvlei	+															+								2	S	22	"
PATOIS GR.																											
Abras	+																				+			2	A7	22	Bunyavirus
Babahoyo	+														+						+			2	A7	21	"
Pahayokee	+																			+				2	S	22	"
Patois	+									+					+					+				2	S	20	"
Shark River	+	+								+					+					+				2	S	21	"
Zegla										+					+					+				2	S	22	"

** See footnote Table 5.1

Table 8.1.7 Bunyaviruses, Family Bunyaviridae:
Bunyamwera Supergroup, Simbu Serogroup Viruses

VIRUS	ISOLATED FROM: ARTHROPODS: Mosq.: Culicine	Mosq.: Anopheline	Ticks: Ixodid	Ticks: Argasid	Phlebotomine	Culicoides	Other	VERTEBRATES: Humans	Other Primates	Rodents	Birds	Bats	Marsupials	Other	Sentinels	ISOLATED IN: Africa	Asia	Australasia	Europe	North America	South America	HUMAN DISEASE: Natural Infection	Lab Infection	SALS RATING: Level	SALS RATING: Basis	SEAS RATING**	TAXONOMIC STATUS
Aino	+					+											+	+						3	S	22	Bunyavirus
Akabane	+					+								+		+	+	+						3	S	21	"
Buttonwillow						+								+						+				2	S	20	"
Douglas						+								+	+			+						3	IE	21	"
Ingwavuma	+										+			+		+	+							2	S	20	"
Inini											+										+			3	IE	22	"
Kaikalur	+																+							2	S	22	"
Manzanilla									+												+			2	S	22	"
Mermet											+									+				2	S	22	"
Nola	+															+								2	S	20	"
Oropouche	+					+		+						+							+	+	+	3*	S	21	"
Peaton						+								+				+						3	A1	21	"
Sabo						+								+		+								2	S	22	"
Sango	+					+								+		+								2	S	22	"
Sathuperi	+					+								+		+	+							2	S	22	"
Shamonda						+								+		+								2	S	22	"
Shuni	+					+		+						+		+						+		2	S	22	"
Simbu	+															+								2	S	21	"
Thimiri											+					+	+							2	S	22	"
Tinaroo						+												+						3	IE	22	"
Utinga														+							+			3	IE	22	"

* See footnote Table 5.1
** See footnote Table 5.1

Table 8.1.8 Bunyaviruses, Family Bunyaviridae:
Bunyamwera Supergroup, Tete and Turlock Serogroups and Unassigned Viruses

VIRUS	ISOLATED FROM: ARTHROPODS: Mosq.: Culicine	Mosq.: Anopheline	Ticks: Ixodid	Ticks: Argasid	Phlebotomine	Culicoides	Other	VERTEBRATES: Humans	Other Primates	Rodents	Birds	Bats	Marsupials	Other	Sentinels	ISOLATED IN: Africa	Asia	Australasia	Europe	North America	South America	HUMAN DISEASE: Natural Infection	Lab Infection	SALS RATING: Level	Basis	SEAS RATING**	TAXONOMIC STATUS
TETE GR.																											
Bahig			+								+					+			+					2	S	21	Bunyavirus
Batama											+					+								3	IE	22	"
Matruh			+								+					+			+					2	S	22	"
Tete											+					+								2	S	22	"
Tsuruse											+						+							2	S	22	"
TURLOCK GR.																											
Lednice	+																		+					2	A7	21	Bunyavirus
M'Poko	+															+								2	S	22	"
Turlock	+										+			+	+					+	+			2	S	20	"
Umbre	+										+						+							2	S	21	"
UNASSIGNED - "SBU"																											
Kaeng Khoi							+					+			+		+							2	S	22	Bunyavirus

** See footnote Table 5.1

Table 8.2 Phleboviruses, Family Bunyaviridae: Phlebotomus Fever Serogroup Viruses

VIRUS	ISOLATED FROM: ARTHROPODS: Mosq.: Culicine	Anopheline	Ticks: Ixodid	Argasid	Phlebotomine	Culicoides	Other	VERTEBRATES: Humans	Other Primates	Rodents	Birds	Bats	Marsupials	Other	Sentinels	ISOLATED IN: Africa	Asia	Australasia	Europe	North America	South America	HUMAN DISEASE: Natural Infection	Lab Infection	SALS RATING: Level	Basis	SEAS RATING**	TAXONOMIC STATUS
Aguacate					+															+				2	S	21	Phlebovirus
Alenquer								+													+	+		3	IE	22	"
Anhanga														+							+			2	S	22	"
Arbia					+														+					3	IE	21	"
Arumowot	+									+	+			+		+								2	S	22	"
Buenaventura					+															+	+			3	IE	22	"
Bujaru										+											+			2	S	22	"
Cacao					+															+				2	S	21	"
Caimito					+															+				2	S	22	"
Candiru								+													+	+		2	S	22	"
Chagres	+				+			+												+		+		2	S	21	"
Chilibre					+															+				2	S	21	"
Corfou					+														+							22	"
Frijoles					+															+				2	S	22	"
Gabek Forest										+				+		+										21	"
Gordil										+						+								3	IE	22	"
Icoaraci	+	+			+					+	+				+						+			2	S	21	"
Itaituba													+								+			3	IE	22	"
Itaporanga	+										+		+		+						+			2	S	20	"
Karimabad					+												+							2	S	21	"
Munguba					+																+			3	IE	22	"
Nique					+															+				2	S	22	"
Oriximina					+																+			3	IE	22	"
Pacui					+					+											+			2	S	21	"
Punto Toro					+			+												+	+	+		2	S	21	"
Rift Valley fever	+							+						+		+						+	+	3*VX	S	20	"

* See footnote Table 5.1
** See footnote Table 5.1

V: See footnote Table 5.1
X: See footnote Table 6.1

Table 8.2 Phleboviruses, Family Bunyaviridae:
Phlebotomus Fever Serogroup Viruses (Continued)

VIRUS	ISOLATED FROM															ISOLATED IN						HUMAN DISEASE		SALS RATING		SEAS RATING**	TAXONOMIC STATUS
	ARTHROPODS							VERTEBRATES																			
	Mosq.		Ticks																								
	Culicine	Anopheline	Ixodid	Argasid	Phlebotomine	Culicoides	Other	Humans	Other Primates	Rodents	Birds	Bats	Marsupials	Other	Sentinels	Africa	Asia	Australasia	Europe	North America	South America	Natural Infection	Lab Infection	Level	Basis		
Rio Grande										+										+				2	S	21	Phlebovirus
Saint-Floris										+						+								2	S	21	"
Salehabad					+												+							2	S	22	"
SF-Naples					+			+								+	+		+			+		2	S	20	"
SF-Sicilian					+			+								+	+		+			+		2	S	20	"
Tehran					+												+							2	A7	22	"
Toscana					+			+											+			+		2	S	21	"
Turuna					+																+			3	IE	22	"
Urucuri										+											+			2	S	22	"
Zinga	+							+								+						+		3	S	22	"

** See footnote Table 5.1

Table 8.3.1 Nairoviruses, Family Bunyaviridae: CHF-Congo, Dera Ghazi Khan and Hughes Serogroups

VIRUS	ISOLATED FROM: ARTHROPODS: Mosq.: Culicine	Mosq.: Anopheline	Ticks: Ixodid	Ticks: Argasid	Phlebotomine	Culicoides	Other	VERTEBRATES: Humans	Other Primates	Rodents	Birds	Bats	Marsupials	Other	Sentinels	ISOLATED IN: Africa	Asia	Australasia	Europe	North America	South America	HUMAN DISEASE: Natural Infection	Lab Infection	SALS RATING: Level	Basis	SEAS RATING**	TAXONOMIC STATUS
CHF-CONGO GR.																											
Congo			+			+		+						+		+	+		+			+	+	4	A6	20	Nairovirus
Crimean hem. fever			+	+				+								+	+		+			+	+	4	A6	20	"
Hazara			+														+							2	S	22	"
Khasan			+														+							3	IE	22	"
DERA GHAZI KHAN GR.																											
Abu Hammad				+												+	+							2	S	22	Nairovirus
Dera Ghazi Khan			+														+							2	S	22	"
Kao Shuan				+													+	+						2	S	22	"
Pathum Thani				+													+							2	S	22	"
Pretoria				+												+								2	S	22	"
HUGHES GR.																											
Hughes				+							+									+	+			2	S	21	Nairovirus
Punta Salinas				+																	+			2	S	22	"
Soldado				+												+			+		+			2	S	20	"
Zirqa				+													+							2	S	22	"

** See footnote Table 5.1

Table 8.3.2 Nairoviruses, Family Bunyaviridae:
Nairobi Sheep Disease, Qalyub and Sakhalin Serogroups

VIRUS	ISOLATED FROM: ARTHROPODS: Mosq.: Culicine	Anopheline	Ticks: Ixodid	Argasid	Phlebotomine	Culicoides	Other	VERTEBRATES: Humans	Other Primates	Rodents	Birds	Bats	Marsupials	Other	Sentinels	ISOLATED IN: Africa	Asia	Australasia	Europe	North America	South America	HUMAN DISEASE: Natural Infection	Lab Infection	SALS RATING: Level	Basis	SEAS RATING**	TAXONOMIC STATUS
NAIROBI SHEEP DIS.																											
Dugbe	+		+			+		+		+	+			+		+						+	+	3	S	21	Nairovirus
Ganjam	+		+					+									+					+	+	X		22	"
Nairobi sheep dis.			+			+		+						+		+						+	+	X		20	"
QALYUB GR.																											
Bandia				+						+						+								2	S	22	Nairovirus
Omo										+						+										22	"
Qalyub				+												+								2	S	20	"
SAKHALIN GR.																											
Avalon			+								+									+				2	S	21	Nairovirus
Clo Mor			+																+					2	S	22	"
Paramushir			+														+							3	IE	22	"
Sakhalin			+														+							2	S	21	"
Taggert			+															+						2	S	22	"

** See footnote Table 5.1
X: See footnote Table 6.1

Table 8.4 Uukuviruses, Family Bunyaviridae:
Uukuniemi Serogroup Viruses

VIRUS	ISOLATED FROM															ISOLATED IN						HUMAN DISEASE		SALS RATING		SEAS RATING**	TAXONOMIC STATUS
	ARTHROPODS							VERTEBRATES																			
	Mosq.		Ticks																								
	Culicine	Anopheline	Ixodid	Argasid	Phlebotomine	Culicoides	Other	Humans	Other Primates	Rodents	Birds	Bats	Marsupials	Other	Sentinels	Africa	Asia	Australasia	Europe	North America	South America	Natural Infection	Lab Infection	Level	Basis		
UUKUNIEMI GR.																											
Grand Arbaud				+															+					2	S	20	Uukuvirus
Manawa			+	+													+							2	S	22	"
Ponteves				+															+					3	IE	22	"
Precarious Point			+															+								22	"
Uukuniemi			+							+	+								+					2	S	20	"
Zaliv Terpeniya			+														+							2	S	22	"

** See footnote Table 5.1

Table 8.5.1 Hantaviruses and Bunyavirus-like Viruses, Family Bunyaviridae: Hantaan and Other Antigenic Groups

VIRUS	ISOLATED FROM															ISOLATED IN						HUMAN DISEASE		SALS RATING		SEAS RATING**	TAXONOMIC STATUS
	ARTHROPODS							VERTEBRATES																			
	Mosq.		Ticks																								
	Culicine	Anopheline	Ixodid	Argasid	Phlebotomine	Culicoides	Other	Humans	Other Primates	Rodents	Birds	Bats	Marsupials	Other	Sentinels	Africa	Asia	Australasia	Europe	North America	South America	Natural Infection	Lab Infection	Level	Basis		
HANTAAN GR.																											
Hantaan								+		+							+					+	+	3¶	S	22	Hantavirus*
Prospect Hill										+										+						23	"
Puumala										+									+			+	+			23	"
Seoul										+							+			+	+	+	+			23	"
BHANJA GR.																											
Bhanja			+					+		+				+		+	+		+				+	3	S	21	Bunyavirus-like
KAISODI GR.																											
Kaisodi			+								+						+							2	S	21	Bunyavirus-like
Lanjan			+						+								+							2	S	22	"
Silverwater			+											+						+				2	S	21	"
UPOLU GR.																											
Aransas Bay				+																+				3	IE	22	Bunyavirus-like
Upolu				+														+						2	S	22	"

* Hantavirus: Proposed genus designation.
** See footnote Table 5.1
¶ If virus is handled in very high concentrations or in animals, then level 4.

Table 8.5.2 Bunyavirus-Like Viruses, Family Bunyaviridae: Other Antigenic Groups

VIRUS	ISOLATED FROM: ARTHROPODS: Mosq.: Culicine	Mosq.: Anopheline	Ticks: Ixodid	Ticks: Argasid	Phlebotomine	Culicoides	Other	VERTEBRATES: Humans	Other Primates	Rodents	Birds	Bats	Marsupials	Other	Sentinels	ISOLATED IN: Africa	Asia	Australasia	Europe	North America	South America	HUMAN DISEASE: Natural Infection	Lab Infection	SALS RATING: Level	Basis	SEAS RATING**	TAXONOMIC STATUS
BAKAU GR.																											
Bakau	+			+					+								+							2	S	22	Bunyavirus-like
Ketapang	+																+							2	S	21	"
MAPPUTTA GR.																											
Gan Gan	+																	+						2	A7	22	Bunyavirus-like
Mapputta		+																+						2	S	22	"
Maprik	+	+																+						2	S	21	"
Trubanaman		+																+						2	S	22	"
MATARIYA GR.																											
Burg el Arab											+					+								2	S	22	Bunyavirus-like
Garba											+					+								3	IE	22	"
Matariya											+					+								2	S	22	"
NYANDO GR.																											
Nyando	+	+						+								+						+		2	S	21	Bunyavirus-like
RESISTENCIA GR.																											
Antequera	+																				+					22	Bunyavirus-like
Barranqueras	+																				+					22	"
Resistencia	+																				+					22	"
YOGUE GR.																											
Yogue												+				+								2	S	22	Bunyavirus-like

** See footnote Table 5.1

Table 8.5.3 Bunyavirus-Like Viruses, Family Bunyaviridae: Antigenically Ungrouped Viruses

VIRUS	ISOLATED FROM															ISOLATED IN						HUMAN DISEASE		SALS RATING		SEAS RATING**	TAXONOMIC STATUS
	ARTHROPODS							VERTEBRATES																			
	Mosq.		Ticks		Phlebotomine	Culicoides	Other	Humans	Other Primates	Rodents	Birds	Bats	Marsupials	Other	Sentinels	Africa	Asia	Australasia	Europe	North America	South America	Natural Infection	Lab Infection	Level	Basis		
	Culicine	Anopheline	Ixodid	Argasid																							
Belmont	+																	+						2	S	22	Bunyavirus-like
Enseada	+																				+			3	IE	22	"
Issyk-Kul	+	+		+				+				+					+					+	+	3	IE	20	"
Kowanyama		+																+						2	S	22	"
Pacora	+																			+				2	S	22	"
Tataguine	+	+						+								+						+		2	S	21	"
Witwatersrand	+									+					+	+								2	S	20	"
Keterah				+								+					+							2	S	21	Bunyavirus-like
Lone Star			+																	+				2	S	22	"
Razdan			+														+							3	IE	22	"
Sunday Canyon				+																+				2	S	22	"
Tamdy				+				+									+					+		3	IE	22	"
Wanowrie	+		+					+								+	+					+		2	S	22	"
Bangui								+								+						+		2	S	22	Bunyavirus-like
Bobaya											+					+								3	IE	22	"

** See footnote Table 5.1

Table 9.1 Orbiviruses, Family Reoviridae:
Colorado Tick Fever and Kemerovo Serogroups

VIRUS	ISOLATED FROM														ISOLATED IN						HUMAN DISEASE		SALS RATING		SEAS RATING**	TAXONOMIC STATUS
	ARTHROPODS							VERTEBRATES																		
	Mosq.		Ticks																							
	Culicine	Anopheline	Ixodid	Argasid	Phlebotomine	Culicoides	Other	Humans	Other Primates	Rodents	Birds	Bats	Marsupials	Other	Sentinels	Africa	Asia	Australasia	Europe	North America	South America	Natural Infection	Lab Infection	Level	Basis		
COL.TICK FEV. GR.																											
Col.tick fever			+	+				+		+				+						+		+	+	2	S	20	Orbivirus
Eyach			+																+					2	S	22	"
KEMEROVO GR.																											
Baku				+															+					2	S	22	Orbivirus
Bauline			+																	+				2	S	22	"
Cape Wrath			+																+					2	S	22	"
Chenuda			+	+												+	+							2	S	22	"
Great Island			+																	+				2	S	22	"
Huacho				+																	+			2	S	22	"
Kemerovo			+					+			+					+	+					+	+	2	S	21	"
Lipovnik			+																+			+	+	2	S	22	"
Mono Lake				+																+				2	S	22	"
Mykines			+																+							22	"
Nugget			+															+						2	S	22	"
Okhotskiy			+														+							2	S	22	"
Seletar			+														+							2	S	22	"
Sixgun City				+																+				2	S	22	"
Tindholmur			+																+							22	"
Tribec			+							+				+	+				+					2	S	21	"
Wad Medani			+													+	+			+				2	S	21	"
Yaquina Head			+																	+				2	S	22	"

** See footnote Table 5.1

Table 9.2.1 Orbiviruses, Family Reoviridae:
Bluetongue Group and Other Antigenic Groups

VIRUS	Isolated from: Arthropods: Mosq.: Culicine	Arthropods: Mosq.: Anopheline	Arthropods: Ticks: Ixodid	Arthropods: Ticks: Argasid	Arthropods: Phlebotomine	Arthropods: Culicoides	Arthropods: Other	Vertebrates: Humans	Vertebrates: Other Primates	Vertebrates: Rodents	Vertebrates: Birds	Vertebrates: Bats	Vertebrates: Marsupials	Vertebrates: Other	Vertebrates: Sentinels	Isolated in: Africa	Asia	Australasia	Europe	North America	South America	Human Disease: Natural Infection	Human Disease: Lab Infection	SALS Rating: Level	SALS Rating: Basis	SEAS RATING**	TAXONOMIC STATUS
AFR. HORSESICKNESS																											
Afr. horsesickness						+								+		+	+		+					X		20	Orbivirus
BLUETONGUE GR.																											
Bluetongue			+			+								+		+	+	+	+	+			+	2	S	20	Orbivirus
CHANGUINOLA GR.																											
Almeirim					+																+			3	IE	22	Orbivirus
Altamira					+																+			3	IE	22	"
Caninde					+																+			3	IE	22	"
Changuinola					+			+												+		+		2	S	21	"
Gurupi					+																+			3	IE	22	"
Irituia										+											+			2	S	22	"
Jamanxi					+																+			3	IE	22	"
Jari														+							+			3	IE	22	"
Monte Dourado														+							+			3	IE	22	"
Ourem					+																+			3	IE	22	"
Purus	+																				+			3	IE	22	"
Saraca					+																+			3	IE	22	"
CORRIPARTA GR.																											
Acado	+															+								2	S	22	Orbivirus
Corriparta	+										+							+						2	S	21	"
Jacareacanga	+																				+			3	IE	22	"
EHD GR.																											
Epizootic hem.dis.														+		+				+				2	S	21	Orbivirus
Ibaraki														+			+							3	IE	22	"

** See footnote Table 5.1
X See footnote Table 6.1

Table 9.2.2 Orbiviruses, Family Reoviridae:
Other Antigenic Groups of Viruses

VIRUS	ISOLATED FROM															ISOLATED IN						HUMAN DISEASE		SALS RATING		SEAS RATING**	TAXONOMIC STATUS
	ARTHROPODS							VERTEBRATES																			
	Mosq.		Ticks																								
	Culicine	Anopheline	Ixodid	Argasid	Phlebotomine	Culicoides	Other	Humans	Other Primates	Rodents	Birds	Bats	Marsupials	Other	Sentinels	Africa	Asia	Australasia	Europe	North America	South America	Natural Infection	Lab Infection	Level	Basis		
EUBENANGEE GR.																											
Eubenangee	+	+?				+												+						2	S	22	Orbivirus
Pata	+															+								2	S	22	"
Tilligerry		+																+						3	IE	22	"
PALYAM GR.																											
Bunyip Creek						+								+				+						2	S	21	Orbivirus
CSIRO Village						+								+				+						2	S	21	"
D'Aguilar						+								+				+						2	S	22	"
Kasba	+																+							2	S	22	"
Marrakai						+								+				+						2	S	22	"
Palyam	+																+							2	S	22	"
Vellore	+																+							2	S	22	"
UMATILLA GR.																											
Llano Seco	+																			+				3	IE	21	Orbivirus
Umatilla	+										+									+				2	S	20	"
WALLAL GR.																											
Wallal						+												+						2	S	22	Orbivirus
WARREGO GR.																											
Mitchell River						+												+						2	S	22	Orbivirus
Warrego	+	+				+												+						2	S	22	"

** See footnote Table 5.1

Table 9.3 Orbiviruses, Family Reoviridae:
Antigenically Ungrouped Viruses

VIRUS	ISOLATED FROM: ARTHROPODS: Mosq.: Culicine	Anopheline	Ticks: Ixodid	Argasid	Phlebotomine	Culicoides	Other	VERTEBRATES: Humans	Other Primates	Rodents	Birds	Bats	Marsupials	Other	Sentinels	ISOLATED IN: Africa	Asia	Australasia	Europe	North America	South America	HUMAN DISEASE: Natural Infection	Lab Infection	SALS RATING: Level	Basis	SEAS RATING**	TAXONOMIC STATUS
Ieri	+																				+			2	S	22	Orbivirus
Japanaut	+											+						+						2	S	21	"
Lebombo	+						+	+								+								2	S	21	"
Orungo	+	+						+	+						+	+						+	+	3	S	21	"
Paroo River	+																	+						3	IE	22	"
Chobar Gorge				+													+							2	S	22	Orbivirus
Ife												+				+								3	IE	22	Orbivirus

** See footnote Table 5.1

Table 10.1 Lyssaviruses and Vesiculoviruses, Family Rhabdoviridae; Family Rhabdoviridae: Vesicular Stomatitis and Other Antigenic Groups

VIRUS	ISOLATED FROM: ARTHROPODS: Mosq.: Culicine	Mosq.: Anopheline	Ticks: Ixodid	Ticks: Argasid	Phlebotomine	Culicoides	Other	VERTEBRATES: Humans	Other Primates	Rodents	Birds	Bats	Marsupials	Other	Sentinels	ISOLATED IN: Africa	Asia	Australasia	Europe	North America	South America	HUMAN DISEASE: Natural Infection	Lab Infection	SALS RATING: Level	SALS RATING: Basis	SEAS RATING**	TAXONOMIC STATUS
RABIES SEROGROUP																											
Kotonkan						+										+								2	S	21	Lyssavirus
Lagos bat												+				+								2	S	24	"
SAWGRASS GR.																											
Connecticut			+																	+				3	IE	22	Rhabdoviridae
New Minto			+																	+				3	IE	22	"
Sawgrass			+																	+				2	S	22	"
TIMBO GR.																											
Chaco														+							+			2	S	22	Rhabdoviridae
Sena Madureira														+							+			3	IE	22	"
Timbo														+							+			2	S	22	"
VES. STOMATITIS GR.																											
Chandipura					+			+						+		+	+					+		2	S	20	Vesiculovirus
Cocal	+						+			+				+	+						+			3	A1	20	"
Isfahan	+		+		+												+							2	S	21	"
Jurona	+																				+			2	S	22	"
La Joya	+																			+				2	S	22	"
Piry								+					+								+		+	3	S	22	"
VS-Alagoas														+							+	+		3	S	22	"
VS-Indiana	+				+			+						+						+	+	+	+	2	A3	20	"
VS-New Jersey	+					+	+	+						+						+	+	+	+	2	A3	22	"
Yug Bogdanovac					+														+					3	IE	22	"

** See footnote Table 5.1

Table 10.2 Family Rhabdoviridae:
Bovine Ephemeral Fever and Other Antigenic Groups

VIRUS	Isolated from: Arthropods: Mosq.: Culicine	Mosq.: Anopheline	Ticks: Ixodid	Ticks: Argasid	Phlebotomine	Culicoides	Other	Vertebrates: Humans	Other Primates	Rodents	Birds	Bats	Marsupials	Other	Sentinels	Isolated in: Africa	Asia	Australasia	Europe	North America	South America	Human Disease: Natural Infection	Lab Infection	SALS Rating: Level	Basis	SEAS RATING**	TAXONOMIC STATUS
BOVINE EPHEMERAL FEVER GR.																											
Adelaide River														+				+								22	Rhabdovirida
Berrimah														+				+								22	"
Bovine ephem. fev.		+				+								+		+	+	+						X		22	"
Kimberley	+					+								+				+								22	"
HART PARK GR.																											
Flanders	+										+									+				2	S	22	Rhabdovirida
Hart Park	+										+									+				2	S	21	"
Mosqueiro	+																				+			3	IE	22	"
KWATTA GR.																											
Kwatta	+																				+			2	S	22	Rhabdovirida
LE DANTEC GR.																											
Keuraliba										+						+								2	S	22	Rhabdovirida
Le Dantec								+								+						+		2	S	22	"
MOSSURIL GR.																											
Bangoran	+										+					+								2	S	22	Rhabdovirida
Barur	+	+	+							+						+	+							2	S	22	"
Charleville					+									+				+						2	S	22	"
Cuiaba														+							+			2	S	22	"
Kamese	+															+								2	S	22	"
Kern Canyon												+								+				2	S	23	"
Marco														+							+			2	S	22	"
Mossuril	+										+					+								2	S	22	"

** See footnote Table 5.1
X See footnote Table 6.1

Table 10.3 Family Rhabdoviridae: Antigenically Ungrouped Viruses

VIRUS	Isolated from: Arthropods: Mosq.: Culicine	Arthropods: Mosq.: Anopheline	Arthropods: Ticks: Ixodid	Arthropods: Ticks: Argasid	Arthropods: Phlebotomine	Arthropods: Culicoides	Arthropods: Other	Vertebrates: Humans	Vertebrates: Other Primates	Vertebrates: Rodents	Vertebrates: Birds	Vertebrates: Bats	Vertebrates: Marsupials	Vertebrates: Other	Vertebrates: Sentinels	Isolated in: Africa	Asia	Australasia	Europe	North America	South America	Human Disease: Natural Infection	Human Disease: Lab Infection	SALS Rating: Level	SALS Rating: Basis	SEAS RATING**	TAXONOMIC STATUS
Aruac	+																				+			2	S	21	Rhabdoviridae
Boteke	+															+								2	S	22	"
Gray Lodge	+																			+				3	IE	22	"
Joinjakaka	+																	+						2	S	22	"
Kununurra	+																	+						2	S	22	"
Nkolbisson	+															+								2	S	22	"
Rochambeau	+																				+			3	IE	22	"
Xiburema	+																				+					22	"
Yata	+															+								2	S	22	"
Inhangapi					+																+			3	IE	22	Rhabdoviridae
Sripur					+												+							3	IE	22	"
Tibrogargan						+												+						2	S	22	"
Almpiwar														+				+						2	S	21	Rhabdoviridae
Gossas												+				+								2	S	23	"
Klamath										+										+				2	S	22	"
Mount Elgon bat												+				+								2	S	23	"
Navarro											+										+			2	S	22	"

** See footnote Table 5.1

Table 11.1 Arenaviruses, Family Arenaviridae:
Tacaribe (LCM) Serogroup Viruses

VIRUS	ISOLATED FROM: ARTHROPODS: Mosq.: Culicine	Anopheline	Ticks: Ixodid	Argasid	Phlebotomine	Culicoides	Other	VERTEBRATES: Humans	Other Primates	Rodents	Birds	Bats	Marsupials	Other	Sentinels	ISOLATED IN: Africa	Asia	Australasia	Europe	North America	South America	HUMAN DISEASE: Natural Infection	Lab Infection	SALS RATING: Level	Basis	SEAS RATING**	TAXONOMIC STATUS
Amapari							+			+											+			2	A5	24	Arenavirus
Flexal										+											+		+	3	S	23	"
Junin							+	+		+				+							+	+	+	4	A6	24	"
Ippy										+						+								2	S	22	"
Lassa								+		+						+						+	+	4	S	24	"
Latino										+											+			2	A5	24	"
Machupo								+		+											+	+	+	4	S	24	"
Parana										+											+			2	A5	24	"
Pichinde			+				+			+											+		+	2	A5	24	"
Tacaribe	?	?										+									+		+	2	A5	24	"
Tamiami										+										+				2	A5	24	"

** See footnote Table 5.1

Table 12.1 Families Orthomyxoviridae, Coronaviridae, Herpesviridae Iridoviridae, Nodaviridae, Paramyxoviridae and Poxviridae: Thogoto Serogroup and Antigenically Ungrouped Viruses

VIRUS	ISOLATED FROM: ARTHROPODS: Mosq.: Culicine	Mosq.: Anopheline	Ticks: Ixodid	Ticks: Argasid	Phlebotomine	Culicoides	Other	VERTEBRATES: Humans	Other Primates	Rodents	Birds	Bats	Marsupials	Other	Sentinels	ISOLATED IN: Africa	Asia	Australasia	Europe	North America	South America	HUMAN DISEASE: Natural Infection	Lab Infection	SALS RATING: Level	Basis	SEAS RATING**	TAXONOMIC STATUS
THOGOTO GR.																											
Thogoto			+					+						+		+			+			+		3	S	21	Orthomyxoviridae
Dhori			+													+	+		+					3	S	22	Orthomyxoviridae
Bocas	+											+								+	+					22	Coronavirus
Tettnang			+																+					2	S	22	"
Agua Preta												+									+			3	IE	22	Herpesviridae
Afr. swine fever				+										+		+			+	+§	+α			X		20	Iridoviridae
Nodamura	+																+							3	IE	23	Nodavirus
Nariva										+											+			3	IE	23	Paramyxoviridae
Cotia	+				+			+							+						+	+		2	S	24	Poxviridae
Oubangui	+															+								3	IE	22	"
Salanga										+						+								3	IE	22	"

** See footnote Table 5.1
X See footnote Table 6.1
§ Cuba
α Brazil

Table 13.1 Taxonomically Unclassified Viruses:
Quaranfil, Marburg and Other Antigenic Groups of Viruses

VIRUS	ISOLATED FROM															ISOLATED IN						HUMAN DISEASE		SALS RATING		SEAS RATING**	TAXONOMIC STATUS
	ARTHROPODS							VERTEBRATES																			
	Mosq.		Ticks																								
	Culicine	Anopheline	Ixodid	Argasid	Phlebotomine	Culicoides	Other	Humans	Other Primates	Rodents	Birds	Bats	Marsupials	Other	Sentinels	Africa	Asia	Australasia	Europe	North America	South America	Natural Infection	Lab Infection	Level	Basis		
NYAMANINI GR.																											
Nyamanini				+							+					+								2	S	21	Unclassified
QUARANFIL GR.																											
Johnston Atoll				+														+						2	S	20	Unclassified
Quaranfil				+				+			+					+						+		2	S	20	"
MARBURG GR.																											
Ebola								+								+						+	+	4	S	23	Unclassified
Marburg								+								+			+			+	+	4	S	23	"
TANJONG RABOK GR.																											
Tanjong Rabok															+		+							2	S	22	Unclassified
Telok Forest									+								+							3	IE	22	"

** See footnote Table 5.1

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Table 13.2.1 Taxonomically Unclassified Viruses:
Antigenically Ungrouped Mosquito-, Tick-, or Culicoides-Associated Viruses

VIRUS	ISOLATED FROM: ARTHROPODS: Mosq.: Culicine	Mosq.: Anopheline	Ticks: Ixodid	Ticks: Argasid	Phlebotomine	Culicoides	Other	VERTEBRATES: Humans	Other Primates	Rodents	Birds	Bats	Marsupials	Other	Sentinels	ISOLATED IN: Africa	Asia	Australasia	Europe	North America	South America	HUMAN DISEASE: Natural Infection	Lab Infection	SALS RATING: Level	Basis	SEAS RATING**	TAXONOMIC STATUS
Arkonam	+	+															+							2	S	22	Unclassified
Gomoka	+	+									+					+								2	S	22	"
Itupiranga	+																				+					22	"
Minnal	+																+							2	S	22	"
Okola	+															+								2	S	22	"
Para	+														+						+					22	"
Picola	+																	+						3	IE	22	"
Tanga		+														+								2	S	22	"
Tembe		+																			+			2	S	22	"
Termeil	+																	+						3	IE	21	"
Venkatapuram	+																+							2	S	22	"
Wongorr	+																	+						2	S	22	"
Yacaaba	+																	+						3	IE	22	"
Aride			+													+								2	S	22	Unclassified
Batken	+		+														+							3	IE	22	"
Chim			+														+							3	IE	22	"
Estero Real				+																+				3	IE	22	"
Lake Clarendon				+														+								22	"
Matucare				+																	+			2	S	22	"
Ngaingan						+												+						2	S	22	"
Slovakia				+															+					3	IE	24	"

** See footnote Table 5.1

Table 13.2.2 Taxonomically Unclassified Viruses: Antigenically Ungrouped Viruses - No Arthropod Vector Known

VIRUS	ISOLATED FROM: ARTHROPODS: Mosq.: Culicine	Mosq.: Anopheline	Ticks: Ixodid	Ticks: Argasid	Phlebotomine	Culicoides	Other	VERTEBRATES: Humans	Other Primates	Rodents	Birds	Bats	Marsupials	Other	Sentinels	ISOLATED IN: Africa	Asia	Australasia	Europe	North America	South America	HUMAN DISEASE: Natural Infection	Lab Infection	SALS RATING: Level	Basis	SEAS RATING**	TAXONOMIC STATUS
Araguari													+								+			3	IE	22	Unclassified
Belem											+										+			3	IE	22	"
Bimbo											+					+								3	IE	22	"
Kammavanpettai											+						+							2	S	22	"
Kannamangalam											+						+							2	S	22	"
Kolongo											+					+								2	S	22	"
Landjia											+					+								2	S	22	"
Mapuera												+									+			3	IE	23	"
Mojui dos Campos												+									+			3	IE	22	"
Ouango											+					+								3	IE	22	"
Sakpa										+						+								3	IE	22	"
Sandjimba											+					+								2	S	22	"
Santarem										+											+			3	IE	22	"
Sebokele										+						+								2	S	22	"
Sembalam											+						+							2	S	22	"
Thottapalayam														+			+							2	S	22	"
Toure										+						+								2	S	22	"

** See footnote Table 5.1

Table 14.1 Continental Distribution of Grouped and Ungrouped Viruses

Supergroup	Antigenic Group	Total in Group	Africa	Asia	Australasia	Europe	North America	South America	No. of Continents involved: 1	2	3	4	5	6
	A	27	7	8	7	2	7	10	18	7	0	2	0	0
	AHS	1	1	1	0	1	0	0	0	0	1	0	0	0
	B	66	19	23	14	9	15	12	50	11	2	1	2	0
	BAK	2	0	2	0	0	0	0	2	0	0	0	0	0
	BEF	4	1	1	4	0	0	0	3	0	1	0	0	0
	BHA	1	1	1	0	1	0	0	0	0	1	0	0	0
	BLU	1	1	1	1	1	1	0	0	0	0	0	1	0
Bunyamwera Supergroup	ANA	5	0	0	0	0	1	4	5	0	0	0	0	0
Bunyamwera Supergroup	ANB	2	0	0	0	0	0	2	2	0	0	0	0	0
Bunyamwera Supergroup	BUN	22	5	1	0	2	8	8	20	2	0	0	0	0
Bunyamwera Supergroup	BWA	2	2	0	0	0	0	0	2	0	0	0	0	0
Bunyamwera Supergroup	C	12	0	0	0	0	5	9	10	2	0	0	0	0
Bunyamwera Supergroup	CAL	13	1	1	0	2	9	3	11	1	1	0	0	0
Bunyamwera Supergroup	CAP	8	0	0	0	0	3	7	6	2	0	0	0	0
Bunyamwera Supergroup	GAM	3	0	0	0	0	1	2	3	0	0	0	0	0
Bunyamwera Supergroup	GMA	12	0	0	0	0	2	11	11	1	0	0	0	0
Bunyamwera Supergroup	KOO	2	0	0	2	0	0	0	2	0	0	0	0	0
Bunyamwera Supergroup	MNT	2	0	0	0	0	1	1	2	0	0	0	0	0
Bunyamwera Supergroup	OLI	3	3	0	0	0	0	0	3	0	0	0	0	0
Bunyamwera Supergroup	PAT	6	0	0	0	0	4	2	6	0	0	0	0	0
Bunyamwera Supergroup	SIM	21	10	6	5	0	2	4	16	4	1	0	0	0
Bunyamwera Supergroup	TETE	5	4	1	0	2	0	0	3	2	0	0	0	0
Bunyamwera Supergroup	TUR	4	1	1	0	1	1	1	3	1	0	0	0	0
Bunyamwera Supergroup	SBU	1	0	1	0	0	0	0	1	0	0	0	0	0
	CGL	12	0	0	0	0	1	11	12	0	0	0	0	0
	CTF	2	0	0	0	1	1	0	2	0	0	0	0	0
	COR	3	1	0	1	0	0	1	3	0	0	0	0	0
	EHD	2	1	1	0	0	1	0	1	1	0	0	0	0
	EUB	3	1	0	2	0	0	0	3	0	0	0	0	0
	HTN	4	0	2	0	1	2	1	3	0	1	0	0	0
	HP	3	0	0	0	0	2	1	3	0	0	0	0	0
	KSO	3	0	2	0	0	1	0	3	0	0	0	0	0
	KEM	18	3	5	1	6	6	1	15	2	1	0	0	0
	KWA	1	0	0	0	0	0	1	1	0	0	0	0	0
	LD	2	2	0	0	0	0	0	2	0	0	0	0	0
	MAL	2	1	1	0	0	0	0	2	0	0	0	0	0
	MAP	4	0	0	4	0	0	0	4	0	0	0	0	0
	MBG	2	2	0	0	1	0	0	1	1	0	0	0	0
	MOS	8	4	1	1	0	1	2	7	1	0	0	0	0

Table 14.1 (Continued) Continental Distribution of Grouped and Ungrouped Viruses

Antigenic Group	Total in Group	Africa	Asia	Australasia	Europe	North America	South America	No. of Continents involved 1	2	3	4	5	6
MTY	3	3	0	0	0	0	0	3	0	0	0	0	0
Nairoviruses: CHF-CON	4	2	4	0	2	0	0	2	0	2	0	0	0
Nairoviruses: DGK	5	2	4	1	0	0	0	3	2	0	0	0	0
Nairoviruses: HUG	4	1	1	0	1	1	3	2	1	1	0	0	0
Nairoviruses: NSD	3	2	1	0	0	0	0	3	0	0	0	0	0
Nairoviruses: QYB	3	3	0	0	0	0	0	3	0	0	0	0	0
Nairoviruses: SAK	5	0	2	1	1	1	0	5	0	0	0	0	0
NDO	1	1	0	0	0	0	0	1	0	0	0	0	0
NYM	1	1	0	0	0	0	0	1	0	0	0	0	0
PAL	7	0	3	4	0	0	0	7	0	0	0	0	0
PHL	36	8	5	0	5	10	14	32	2	2	0	0	0
QRF	2	1	0	1	0	0	0	2	0	0	0	0	0
RABIES	2	2	0	0	0	0	0	2	0	0	0	0	0
RTA	3	0	0	0	0	0	3	3	0	0	0	0	0
SAW	3	0	0	0	0	3	0	3	0	0	0	0	0
TCR	11	2	0	0	0	1	8	11	0	0	0	0	0
THO	1	1	1	0	1	0	0	0	0	1	0	0	0
TIM	3	0	0	0	0	0	3	3	0	0	0	0	0
TR	2	0	2	0	0	0	0	2	0	0	0	0	0
UMA	2	0	0	0	0	2	0	2	0	0	0	0	0
UPO	2	0	0	1	0	1	0	2	0	0	0	0	0
UUK	6	0	2	1	3	0	0	6	0	0	0	0	0
VSV	10	1	2	0	1	3	6	7	3	0	0	0	0
WAL	1	0	0	1	0	0	0	1	0	0	0	0	0
WAR	2	0	0	2	0	0	0	2	0	0	0	0	0
YOG	1	1	0	0	0	0	0	1	0	0	0	0	0
Ungrouped	89	29	18	14	4	9	22	85	2	1	1	0	0
TOTAL	506	131	104	68	48	106	153	435	48	16	4	3	0

Table 15.1 Number of Viruses Isolated from Classes of Wild-Caught Arthropods

Antigenic Group	Total in Group	Isolated From: Mosq.	Ticks	Phleboto-mine Flies	Culi-coides	Other	No. of Classes Involved 1	2	3
A	27	25	3	0	1	5	20	4	2
AHS	1	0	0	0	1	0	1	0	0
B	66	32	20	0	1	3	41	7	1
BAK	2	2	1	0	0	0	1	1	0
BEF	4	2	0	0	2	0	0	2	0
BHA	1	0	1	0	0	0	1	0	0
BLU	1	0	1	0	1	0	0	1	0
Bunyamwera Serogroup									
ANA	5	5	0	0	0	0	5	0	0
ANB	2	2	0	0	0	0	2	0	0
BUN	22	22	0	0	2	0	20	2	0
BWA	2	2	0	0	0	0	2	0	0
C	12	12	0	0	0	0	12	0	0
CAL	13	13	0	0	0	1	12	1	0
CAP	8	7	0	0	0	0	7	0	0
GAM	3	3	0	0	0	0	3	0	0
GMA	12	9	0	1	0	0	8	1	0
KOO	2	2	0	0	0	0	2	0	0
MNT	2	1	0	0	0	0	1	0	0
OLI	3	3	0	0	0	0	3	0	0
PAT	6	6	0	0	0	0	6	0	0
SIM	21	10	0	0	11	0	11	5	0
TETE	5	0	2	0	0	0	2	0	0
TUR	4	4	0	0	0	0	4	0	0
SBU	1	0	0	0	0	1	1	0	0
CGL	12	1	0	8	0	0	9	0	0
CTF	2	0	2	0	0	0	2	0	0
COR	3	3	0	0	0	0	3	0	0
EHD	2	0	0	0	0	0	0	0	0
EUB	3	3	0	0	1	0	2	1	0
HTN	4	0	0	0	0	0	0	0	0
HP	3	3	0	0	0	0	3	0	0
KSO	3	0	3	0	0	0	3	0	0
KEM	18	0	18	0	0	0	18	0	0
KWA	1	1	0	0	0	0	1	0	0
LD	2	0	0	0	0	0	0	0	0
MAL	2	2	0	0	0	0	2	0	0
MAP	4	4	0	0	0	0	4	0	0
MBG	2	0	0	0	0	0	0	0	0
MOS	8	4	1	1	0	0	4	1	0

Table 15.1 (Continued) **Number of Viruses Isolated from Wild-Caught Arthropods**

Antigenic Group	Total in Group	Mosq.	Ticks	Isolated From: Phleboto-mine Flies	Culi-coides	Other	No. of Classes Involved 1	2	3
MTY	3	0	0	0	0	0	0	0	0
Nairo-viruses CHF-CON	4	0	4	0	1	0	3	1	0
Nairo-viruses DGK	5	0	5	0	0	0	5	0	0
Nairo-viruses HUG	4	0	4	0	0	0	4	0	0
Nairo-viruses NSD	3	2	3	0	2	0	0	2	1
Nairo-viruses QYB	3	0	2	0	0	0	2	0	0
Nairo-viruses SAK	5	0	5	0	0	0	5	0	0
NDO	1	1	0	0	0	0	1	0	0
NYM	1	0	1	0	0	0	1	0	0
PAL	7	3	0	0	4	0	7	0	0
PHL	36	6	0	22	0	0	24	2	0
QRF	2	0	2	0	0	0	2	0	0
RABIES	2	0	0	0	1	0	1	0	0
RTA	3	3	0	0	0	0	3	0	0
SAW	3	0	3	0	0	0	3	0	0
TCR	11	1	1	0	0	3	3	1	0
THO	1	0	1	0	0	0	1	0	0
TIM	3	0	0	0	0	0	0	0	0
TR	2	0	0	0	0	0	0	0	0
UMA	2	2	0	0	0	0	2	0	0
UPO	2	0	2	0	0	0	2	0	0
UUK	6	0	6	0	0	0	6	0	0
VSV	10	6	1	4	1	2	4	2	2
WAL	1	0	0	0	1	0	1	0	0
WAR	2	1	0	0	2	0	1	1	0
YOG	1	0	0	0	0	0	0	0	0
Ungrouped	89	41	18	3	2	1	54	5	0
TOTAL	506	249	110	39	34	16	351	40	6

Table 16.1 Number of Virus Isolated from Classes of Naturally-Infected Vertebrates

	Anti-genic Group	Total in Group	Humans	Other Primates	Rodents	Birds	Bats	Marsu-pials	Live-stock	All Others	No. of Classes Involved 1	2	3	4	5	6
	A	27	11	2	6	13	4	6	6	3	8	3	4	3	1	1
	AHS	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0
	B	66	29	5	19	17	13	1	6	7	28	6	8	4	2	1
	BAK	2	0	1	0	0	0	0	0	0	1	0	0	0	0	0
	BEF	4	0	0	0	0	0	0	4	0	4	0	0	0	0	0
	BHA	1	1	0	1	0	0	0	1	1	0	0	0	1	0	0
	BLU	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0
Bunyamwera Serogroup	ANA	5	1	1	0	0	0	0	0	0	0	1	0	0	0	0
	ANB	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	BUN	22	5	1	7	1	0	0	2	4	7	5	0	0	0	0
	BWA	2	2	0	0	0	0	0	0	0	2	0	0	0	0	0
	C	12	10	0	8	0	1	5	0	1	2	5	3	1	0	0
	CAL	13	3	0	4	0	0	0	0	1	4	2	0	0	0	0
	CAP	8	0	0	4	0	0	1	0	0	3	1	0	0	0	0
	GAM	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GMA	12	2	0	8	2	2	4	0	0	5	1	1	2	0	0
	KOO	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MNT	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	OLI	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	PAT	6	0	0	3	0	0	0	0	0	3	0	0	0	0	0
	SIM	21	2	1	0	4	0	0	8	4	13	3	0	0	0	0
	TETE	5	0	0	0	5	0	0	0	0	5	0	0	0	0	0
	TUR	4	0	0	0	2	0	0	0	1	1	1	0	0	0	0
	SBU	1	0	0	0	0	1	0	0	0	1	0	0	0	0	0
	CGL	12	1	0	1	0	0	0	0	2	4	0	0	0	0	0
	CTF	2	1	0	1	0	0	0	0	1	0	0	1	0	0	0
	COR	3	0	0	0	1	0	0	0	0	1	0	0	0	0	0
	EHD	2	0	0	0	0	0	0	1	1	2	0	0	0	0	0
	EUB	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	HTN	4	1	0	4	0	0	0	0	0	3	1	0	0	0	0
	HP	3	0	0	0	2	0	0	0	0	2	0	0	0	0	0
	KSO	3	0	1	0	1	0	0	0	1	3	0	0	0	0	0
	KEM	18	1	0	1	1	0	0	1	0	0	2	0	0	0	0
	KWA	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	LD	2	1	0	1	0	0	0	0	0	2	0	0	0	0	0
	MAL	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MAP	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MBG	2	2	0	0	0	0	0	0	0	2	0	0	0	0	0
	MOS	8	0	0	1	2	1	0	0	3	7	0	0	0	0	0

Table 16.1 (Continued) Number of Viruses Isolated from Naturally-Infected Vertebrates

Antigenic Group		Total in Group	Humans	Other Primates	Rodents	Birds	Bats	Marsupials	Livestock	All Others	No. of Classes Involved 1	2	3	4	5	6
MTY		3	0	0	0	3	0	0	0	0	3	0	0	0	0	0
Nairoviruses	CHF-CON	4	2	0	0	0	0	0	1	1	1	1	0	0	0	0
	DGK	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	HUG	4	0	0	0	1	0	0	0	0	1	0	0	0	0	0
	NSD	3	3	0	1	1	0	0	2	1	1	1	0	1	0	0
	QYB	3	0	0	2	0	0	0	0	0	2	0	0	0	0	0
	SAK	5	0	0	0	1	0	0	0	0	1	0	0	0	0	0
NDO		1	1	0	0	0	0	0	0	0	1	0	0	0	0	0
NYM		1	0	0	0	1	0	0	0	0	1	0	0	0	0	0
PAL		7	0	0	0	0	0	0	4	0	4	0	0	0	0	0
PHL		36	9	0	9	3	0	2	1	3	15	4	1	0	0	0
QRF		2	1	0	0	1	0	0	0	0	0	1	0	0	0	0
RABIES		2	0	0	0	0	1	0	0	0	1	0	0	0	0	0
RTA		3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SAW		3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TCR		11	3	0	10	0	1	0	0	1	8	2	1	0	0	0
THO		1	1	0	0	0	0	0	1	0	0	1	0	0	0	0
TIM		3	0	0	0	0	0	0	0	3	3	0	0	0	0	0
TR		2	0	1	0	0	0	0	0	0	1	0	0	0	0	0
UMA		2	0	0	0	1	0	0	0	0	1	0	0	0	0	0
UPO		2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
UUK		6	0	0	1	1	0	0	0	0	0	1	0	0	0	0
VSV		10	4	0	1	0	0	1	3	2	1	5	0	0	0	0
WAL		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WAR		2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
YOG		1	0	0	0	0	1	0	0	0	1	0	0	0	0	0
Ungrouped		89	8	2	8	12	10	1	1	3	39	2	0	0	0	0
TOTAL		506	105	15	101	76	35	21	44	44	200	49	19	12	3	2

Table 17.1 Number of Viruses Associated with Naturally- or Laboratory-Acquired Disease in Humans

	Antigenic Group	Total in Group	In Nature	Lab. Infection	Either or Both	
					Number	Percent
	Group A	27	11	7	12	45.2
	Afr. horsesickness	1	0	0	0	
	Group B	66	31	26	33	50.0
	Bakau	2	0	0	0	
	Bhanja	1	0	1	1	100.0
	Bluetongue	1	0	1	1	100.0
	Bovine ephem. fever	4	0	0	0	
Bunyamwera Serogroup	Anopheles A	5	1	0	2	100.0
Bunyamwera Serogroup	Anopheles B	2	0	0	0	
Bunyamwera Serogroup	Bunyamwera	22	6	2	7	31.8
Bunyamwera Serogroup	Bwamba	2	2	0	2	100.0
Bunyamwera Serogroup	C	12	10	6	10	83.3
Bunyamwera Serogroup	California	13	7	0	7	53.8
Bunyamwera Serogroup	Capim	8	0	0	0	
Bunyamwera Serogroup	Gamboa	3	0	0	0	
Bunyamwera Serogroup	Guama	12	2	1	2	16.7
Bunyamwera Serogroup	Koongol	2	0	0	0	
Bunyamwera Serogroup	Minatitlan	2	0	0	0	
Bunyamwera Serogroup	Olifantsvlei	3	0	0	0	
Bunyamwera Serogroup	Patios	6	0	0	0	
Bunyamwera Serogroup	Simbu	21	2	1	2	9.5
Bunyamwera Serogroup	Tete	5	0	0	0	
Bunyamwera Serogroup	Turlock	4	0	0	0	
Bunyamwera Serogroup	SBU	1	0	0	0	
	Changuinola	12	1	0	1	8.3
	Colorado tick fever	2	1	1	1	50.0
	Corriparta	3	0	0	0	
	Epizoot. hem. dis.	2	0	0	0	
	Eubenangee	3	0	0	0	
	Hantaan	4	3	3	3	75.0
	Hart Park	3	0	0	0	
	Kaisodi	3	0	0	0	
	Kemerovo	18	2	2	2	11.1
	Kwatta	1	0	0	0	
	Le Dantec	2	1	0	1	50.0
	Malakal	2	0	0	0	
	Mapputta	4	0	0	0	
	Marburg	2	2	2	2	100.0
	Matariya	3	0	0	0	

Table 17.1 (Continued) Number of Viruses Associated with Naturally- or Laboratory-Acquired Disease in Humans

Antigenic Group		Total in Group	In Nature	Lab. Infection	Either or Both	
					Number	Percent
Mossuril		8	0	0	0	
Nairo-viruses	CHF-Congo	4	2	2	2	50.0
	Dera Ghazi Khan	5	0	0	0	
	Hughes	4	0	0	0	
	Nairobi sheep dis.	3	3	3	3	100.0
	Qalyub	2	0	0	0	
	Sakhalin	5	0	0	0	
Nyando		1	1	0	1	100.0
Nyamanini		1	0	0	0	
Palyam		7	0	0	0	
Phlebotomus fever		36	9	1	9	25.0
Quaranfil		2	1	0	1	50.0
Rabies		2	0	0	0	
Resistencia		3	0	0	0	
Sawgrass		3	0	0	0	
Tacaribe		11	3	6	6	54.5
Tanjong Rabok		2	0	0	0	
Thogoto		1	1	0	1	100.0
Timbo		3	0	0	0	
Umatilla		2	0	0	0	
Upolu		2	0	0	0	
Uukuniemi		6	0	0	0	
Vesicular stom.		10	4	3	5	50.0
Wallal		1	0	0	0	
Warrego		2	0	0	0	
Yogue		1	0	0	0	
Ungrouped		89	7	2	7	7.8
TOTAL		506	113	70	123	24.3

Table 18.1 Evaluation of Arthropod-Borne Status of 506 Registered Viruses (SEAS)

Antigenic Group	Total in Group	Arbovirus	Probably Arbovirus	Possible Arbovirus	Probably not Arbovirus	Not Arbovirus	Arbo or Probably Arbo		Not or Probably Not Arbo	
							No.	%	No.	%
A	27	16	5	6	0	0	21	80.8	0	
AHS	1	1	0	0	0	0	1	100.0	0	
B	66	34	8	17	2	5	42	63.6	7	10.6
BAK	2	0	1	1	0	0	1	50.0	0	
BEF	4	0	0	4	0	0	0		0	
BHA	1	0	1	0	0	0	1	100.0	0	
BLU	1	1	0	0	0	0	1	100.0	0	
Bunyamwera Serogroup										
ANA	5	0	2	3	0	0	2	40.0	0	
ANB	2	0	0	2	0	0	0		0	
BUN	22	8	7	7	0	0	15	68.2	0	
BWA	2	1	1	0	0	0	2	100.0	0	
C	12	10	2	0	0	0	12	100.0	0	
CAL	13	10	1	2	0	0	11	84.6	0	
CAP	8	4	2	2	0	0	6	75.0	0	
GAM	3	0	1	2	0	0	1	33.3	0	
GMA	12	5	4	3	0	0	9	75.0	0	
KOO	2	0	2	0	0	0	2	100.0	0	
MNT	2	0	1	1	0	0	1	50.0	0	
OLI	3	0	0	3	0	0	0		0	
PAT	6	1	2	3	0	0	3	50.0	0	
SIM	21	3	5	13	0	0	8	38.1	0	
TETE	5	0	1	4	0	0	1	20.0	0	
TUR	4	1	2	1	0	0	3	75.0	0	
SBU	1	0	0	1	0	0	0		0	
CGL	12	0	1	11	0	0	1	8.3	0	
CTF	2	1	0	1	0	0	1	50.0	0	
COR	3	0	1	2	0	0	1	33.3	0	
EHD	2	0	1	1	0	0	1	50.0	0	
EUB	3	0	0	3	0	0	0		0	
HTN	4	0	0	1	3	0	0		3	75.0
HP	3	0	1	2	0	0	1	33.3	0	
KSO	3	0	2	1	0	0	2	66.7	0	
KEM	18	0	3	15	0	0	3	16.7	0	
KWA	1	0	0	1	0	0	0		0	
LD	2	0	0	2	0	0	0		0	
MAL	2	0	0	2	0	0	0		0	
MAP	4	0	1	3	0	0	1	25.0	0	
MBG	2	0	0	0	2	0	0		2	100.0
MOS	8	0	0	7	1	0	0		1	12.5

Table 18.1 (Continued) Evaluation of Arthropod-Borne Status of 506 Registered Viruses (SEAS)

Antigenic Group	Total in Group	Arbovirus	Probably Arbovirus	Possible Arbovirus	Probably not Arbovirus	Not Arbovirus	Arbo or Probably Arbo No.	Arbo or Probably Arbo %	Not or Probably Not Arbo No.	Not or Probably Not Arbo %
MTY	3	0	0	3	0	0	0		0	
Nairoviruses: CHF-CON	4	2	0	2	0	0	2	50.0	0	
Nairoviruses: DGK	5	0	0	5	0	0	0		0	
Nairoviruses: HUG	4	1	1	2	0	0	2	50.0	0	
Nairoviruses: NSD	3	1	1	1	0	0	2	66.7	0	
Nairoviruses: QYB	3	1	0	2	0	0	1	33.3	0	
Nairoviruses: SAK	5	0	2	3	0	0	2	20.0	0	
NDO	1	0	1	0	0	0	1	100.0	0	
NYM	1	0	1	0	0	0	1	100.0	0	
PAL	7	0	2	5	0	0	2	28.6	0	
PHL	36	4	13	19	0	0	17	47.2	0	
QRF	2	2	0	0	0	0	2	100.0	0	
RABIES	2	0	1	0	0	1	1	50.0	1	50.0
RTA	3	0	0	3	0	0	0		0	
SAW	3	0	0	3	0	0	0		0	
TCR	11	0	0	1	1	9	0		10	90.9
THO	1	0	1	0	0	0	1	100.0	0	
TIM	3	0	0	3	0	0	0		0	
TR	2	0	0	2	0	0	0		0	
UMA	2	1	1	0	0	0	2	100.0	0	
UPO	2	0	0	2	0	0	0		0	
UUK	6	2	0	4	0	0	2	33.3	0	
VSV	10	3	1	6	0	0	4	40.0	0	
WAL	1	0	0	1	0	0	0		0	
WAR	2	0	0	2	0	0	0		0	
YOG	1	0	0	1	0	0	0		0	
Ungrouped	89	3	9	69	5	3	12	13.4	8	9.0
TOTAL	506	116	92	266	14	18	208	41.1	32	6.3

APPENDIX I

Summary Description of Recommended Practice and Containment Levels for Arboviruses and Certain Other Viruses of Vertebrates[a] (11).

Level	Laboratory Practices	Primary Containment	Secondary Containment
1	Standard microbiological practices are required.	None. Open bench.	None required.
2	Care required to limit aerosols and contamination. Limited access.[c]	Class I or II BSC[b] required for aerosol producing procedures.	Designed to facilitate cleaning and disinfection.
3	All virus materials contained. Special lab gowns required.	Class I or II BSC or equivalent required for all manipulations of infectious materials.	Restricted access,[d] air lock facility, controlled unidirectional air flow. Exhaust air discharged away from building. Work with certain viruses indicated by an * requires HEPA filtration of exhaust air.
4	Rigorous containment of all virus manipulations. Change of clothing and shower required.	Class I or II BSC adequate for work with infectious materials if all laboratory personnel are immune or insuceptible. Otherwise, Class III or one-piece positive pressure suits are required.	Facility equivalent to separate building. Includes shower facilities, heat-treated biowaste, HEPA filtration of all exhaust air, double-door autoclaves.

[a]There are also SALS recommendations concerning vector and vertebrate studies.
[b]BSC = Biological Safety Cabinets.
[c]Access limited to persons with knowledge of the biohazard potential.
[c]Access restricted to persons with programmatic or support requirements for entry.

APPENDIX II

Explanation of Symbols Used to Define Basis for Assignment of Viruses to Levels of Practice and Containment (11).

S = Results of SALS surveys and information from the Catalogue.

IE = Insufficient experience with virus; i.e., experience factor from SALS surveys was less than 500 in laboratory facilities with low biocontainment.

A = Additional criteria 1, 2, 3, 4, etc.

1. Disease in sheep, cattle or horses.

2. Fatal human laboratory infection, 1978, probably aerosol (14). This is recognized to be a unique incident in a long history of work with SFV under minimal biocontainment conditions. However, since the virulence characteristics of the strain responsible in this case require further study and the prevalence of subclinical infections in laboratories working with SFV remains unknown, the committee recommends Level 3 until further information is available warranting reconsideration at a lower level.

3. Extensive laboratory experience and mild nature of aerosol laboratory infections justifies Level 2.

4. Placed in Level 4 based on the close antigenic relationship with a known Level 4 agent, Russian spring-summer encephalitis, plus insufficient laboratory experience.

5. Level 2 arenaviruses are not known to cause serious acute disease in man and are not acutely pathogenic for laboratory animals, including primates. Survey experience is sufficient to conclude that laboratory aerosol infection does not occur in the course of routine work with cell cultures and animals not subject to chronic infection. In view of a reported high frequency of laboratory aerosol infection that occurred in workers manipulating high concentrations of Pichinde virus, it is strongly recommended that work with high concentrations of Level 2 arenaviruses be done at Level 3.

6. Level assigned to prototype or wild-type virus. A lower level may be recommended for laboratory strains or geographic variants of the virus with well-defined reduced virulence characteristics, as mentioned in the text.

VECTOR INDEX

* Currently considered to be a subspecies of *Aedes theobaldi*.

Aedes marshallii: MID
Aedes mediolineatus: WSL
Aedes melanimon: CE, JC, SLE, WEE
Aedes melanimon-dorsalis: CE
Aedes metallicus: YF
Aedes minutus: NDU, WSL
Aedes mitchellae: EEE, TEN
Aedes neoafricanus: CHIK, YF, ZIKA
Aedes nigripes: SSH
Aedes nigromaculis: CV, CE, EEE, MD, WEE
Aedes nocturnus:* BAT
Aedes normanensis: BF, EH, GG, KOK, MVE, RR, SIN, WGR
Aedes opok: BOU, BUN, CHIK, DEN-2, MID, ORU, YF, WSL, ZIKA
Aedes palpalis: MID, PATA, SF, SIM, ZGA
Aedes pembaensis: BUN, TAH
Aedes polynesiensis: DEN-1, RR
Aedes procax: BF
Aedes punctor: BAT, JC, NOR, SSH
Aedes scapularis: CV, CAR, ILH, KRI, LUK, MAG, MAN, MAY, MEL, SLE, VEE, WYO
Aedes septemstriatus: APEU, WYO
Aedes serratus: AURA, COT, GTB, ILH, ITU, MAG, MEL, MIR, ORO, SLE, UNA, VEE, WYO
Aedes sexlineatus: WYO
Aedes simpsoni: YF
Aedes simulans: MID, WSL
Aedes sollicitans: CV, JC, KEY, LAC, VEE
Aedes species: BUN, CHIK, GMA, ICO, JC, KEY, KOK, MAG, MUC, NOR, ORI, SIN,** SSH, TVT, UGS, UNA, VSI, WSL, WEE, ZIKA
Aedes (Adm) species: MID, WSL
Aedes (Can) species: JUG
Aedes (Dic) species: ORU
Aedes (Neo) species: WSL
Aedes (Och) species: UNA, WYO
Aedes (Ver) species: BF
Aedes spencerii: CV, WEE
Aedes sticticus: EEE, TAH
Aedes stimulans: CV, JC, SSH
Aedes stokesi: NKO
Aedes taeniorhynchus: CV, EEE, EVE, GL, KRI, KEY, NOR, ORI, PLA, TEN, TLA, TVT, VEE, WYO
Aedes tarsalis: MID, PATA, PGA, SHO, WSL, ZIKA
Aedes taylori: DEN-2, YF, ZIKA
Aedes thelcter: JC, VEE
Aedes theobaldi: GG, SIN
Aedes togoi: POW
Aedes tremulus: KUN
Aedes triseriatus: CV, JC, KEY, LAC, SSH, TVT
Aedes trivittatus: BOC, CV, JC, LAC, SSH, TVT
Aedes vexans: BAT, CV, CE, EEE, GET, JC, KEY, LAC, MD, SAG, SLE, SF, SSH, TAH, TVT, WEE
Aedes vexans nipponii: AKA, GET
Aedes vigilax: BF, DEN-1, DEN-4, EH, GG, KOK, RR, SIN, STR, TER, YAC
Aedes vittatus: BUN, CHIK, MID, PGA, SAB, SF, SIM, SIN, WSL, YF, ZIKA
Aedes vittiger: SIN
Alectorobius capensis†*:* SOL
Alectorobius sonrai§*:* CHIK, BDA, KOU
Alveonasus lahorensis@*:* CON, CHF
Amblyomma americanum: LS
Amblyomma cajennense: WM
Amblyomma cohaerens: DUG
Amblyomma loculosum: ARI
Amblyomma pomposum: DUG

* Currently considered to be a subspecies of *Ae vexans*.
**Virus of Karelian fever. About 80% of mosquitoes were *Ae communis*.
† Considered by most to be *Ornithodoros (Alectorobius) capensis*.
§ Considered by most to be *Ornithodoros (Alectorobius) sonrai*.
@ Considered by most to be *Ornithodoros (Alveonasus) lahorensis*.

Boophilus decoloratus: BHA, CON, DUG, THO
Boophilus decoloratus, Rhipicephalus appendiculatus, R. evertsi, R. simus: THO
Boophilus geigyi: CON, DUG
Boophilus microplus: SEL
Boophilus microplus and *Hyalomma a. anatolicum:* WM
Chloropidae: VSNJ
Chrysops cincticornis: JC
Chrysops obsoletus: KEY
Cimex insuetus: KK
Coquillettidia: ILH, UNA
Coquillettidia albicosta: RBU, TON
Coquillettidia arribalzagai: UNA, WYO
Coquillettidia aurites: TAT, USU
Coquillettidia crassipes: WON
Coquillettidia fraseri: SIM
Coquillettidia fuscopennata: SIN, YF
Coquillettidia linealis: RR, TRU
Coquillettidia linealis, Culex molestus and *Cx cylindricus:* BF
Coquillettidia maculipennis: BTK
Coquillettidia metallica: MID, WN
Coquillettidia perturbans: CV, EEE, JC, TEN, TVT
Coquillettidia richiardii: CVO
Coquillettidia venezuelensis: ANU, BSQ, CAB, COT, ITP, MAY, MOJU, MUR, ORO, SLE, TON
Coquillettidia xanthogaster: DEN-4
Culex accelerans: BSB, NEP
Culex adamesi: ABR, NJL
Culex aikenii:* APEU, MTB, MUR, VEE
Culex albinensis: SLE
Culex albiventris: MPO
Culex amazonensis: ACA, MOR, WYO
Culex annulirostris: BF, BEL, COR, DEN-4, EH, EUB, GG, KIM, KOK, KOO, KOW, KUN, MVE, PR, PIA, RR, SIN, TER, TRU, UMB, WAR, WON, WGR
Culex annulioris: KAM, MID
Culex antennatus: AMT, PGA, SIN, WN
Culex antennatus and *Cx univittatus neavi:* ACD
Culex australicus: KUN, MVE, SIN
Culex Belem complex No. 19: ANU
Culex Belem species No. 11: BEN
Culex (Mel) Belem species No. 1: BSQ, CAP
Culex (Mel) Belem species No. 17: ACA
Culex (Mel) Belem species No. 27: ANU
Culex bitaeniorhynchus: BAT, GET, MVE, SIN, UMB
Culex caudelli: ITP, SLE
Culex cinereus: MPO
Culex cinereus and *Cx albiventris:* MID
Culex corniger: VEE
Culex coronator: SLE
Culex crybda: BSQ
Culex (Cux) species: BUN, SLE, VEE
Culex decens: BAG, KAM, MOS, MPO, WN
Culex declarator: SLE, TUR
Culex delpontei: ANT, BQS, RTA, VEE
Culex dunni: EEE, LJ, PCA, WEE
Culex eastor: ITP
Culex edwardsi: COR, SIN
Culex elevator: BOC
Culex epanatasis: ENS
Culex erraticus: SLE, WEE
Culex fuscocephala: JBE
Culex gelidus: BAT, GET, JBE, TMU
Culex gelidus, Cx pseudovishnui and *Cx tritaeniorhynchus:* TMU

* *Culex (Mel) aikenii* is a synonym of *Cx ocossa*.

Culex guiarti: BAG, BOT, ING, MID, NTA, OUB, WN
Culex ingrami and *Cx guiarti:* BAG
Culex iolambdis: PAT
Culex (Lop) species: BAK, BEB, KET
Culex Malaysia species No. 1: BAK
Culex Malaysia species No. 3: BAK
Culex (Mel) species: ANU, AURA, BSQ, EVE, GL, JAC, KEY, MH, MTB, MIR, MOJU, NJL, PAH, SR, VEE
Culex mixed: See *Culex* species
Culex modestus: KYZ, LED, WN
Culex molestus:* WN
Culex nakuruensis: BAN
Culex neavei: SPO
Culex nebulosus: MID, MPO, NTA
Culex nigripalpus: CAB, EEE, EVE, HP, KEY, PAH, SR, SLE, TEN, TVT, VEE, VSNJ, WYO
Culex ocossa: BAB, PARA, VEE, WEE
*Culex opisthopus**:* PAT
Culex orbostiensis: COR
Culex panocossa: EEE
Culex paracrybda: ABR, PLS
Culex paracrybda and *Cx ocossa:* BAB
Culex perfuscus: BAG, BGN, GOM, KAM, MPO, MOS, NOLA, ORU, USU, WSL, WN
Culex pervigilans: WHA
Culex pipiens: CV, FLA, HP, IT, JBE, LAC, OLI, SF, SIN, SLE, TAH, TVT, TUR, UMA, WEE
Culex peus: SLE, TUR, WEE
Culex pipiens quinquefasciatus†*:* BAN, EEE
Culex pipiens and *Cx pseudovishnui:* AINO
Culex poicilipes: OLI
Culex portesi: ANU, BIM, CAB, CAR, CATU, COC, COT, GJA, GMA, ITQ, MAG, MTB, MOJU, MQO, MUC, MUR, ORI, RES, SLE, TON, TUR
Culex pruina: BAG, KAM, MOS, SIN, WN
Culex pseudosinensis: UMB
Culex pseudovishnui: KUN, SIN, TMU, UMB
Culex pseudovishnui and *Culex* India species No. 3: VEL
Culex pullus: ALF, SIN
Culex quinquefasciatus: CHIK, EEE, KUN, MTB, MUR, MVE, ORO, RR, SLE, SIN, TUR, VEE, WAN, WEE, WN
Culex quinque-salinarius: EEE
Culex restuans: EEE, HP, SLE, WEE
Culex rubinotus: AMT, BAN, GER, UGS, WIT
Culex sacchettae: BER, EEE
Culex salinarius: EEE, FLA, SLE, TEN
Culex sitiens: MOS,§ TMU
***Culex* species:** ACA, ANU, APEU, ARU, BAG, BVS, BIM, BUN, BSB, BSQ, CAB, CAP, CAR, CATU, CHIK, COT, GER, GG, GJA, GMA, ICO, ILH, ITP, ITQ, KWA, MAY, MOS, MPO, MUC, MUR, NEP, NTA, ORI, PAT, SLE, SIN, UNA, USU, WEE, WIT
Culex spissipes: BVS, BIM, KRI, SLE, TON
Culex squamosus: KUN, SIN
Culex taeniopus: ANU, BIM, BSQ, CAP, EEE, ENS, MAG, MIR, OSSA, PAT, SLE
Culex tarsalis: CV, CE, FLA, GLO, HP, LLS, LOK, MD, SLE, TUR, UMA, VEE, WEE

* *Culex molestus* is considered to be a biotype of *Cx pipiens*.
***Culex opisthopus* is a synonym for *Cx taeniopus*.
† Elevated to a full species *(Culex quinquefasciatus)*.
§ Recovered from a pool identified as *Cx sitiens* but may also have contained *Cx thalassius* and *Cx tritaeniorhynchus*.

Culex telesilla: BAG, MID, MOS, NKO, WSL
Culex territans: EEE, FLA, SLE
Culex thalassius: BAG, ILE, SIN
Culex theileri: RVF, SHU
Culex theileri and *Cx rubinotus:* GER
Culex thriambus: PAT
Culex tigripes: BIA, KAM, MOS, SIN
Culex tritaeniorhynchus: AINO, AKA, ARK, DEN-3, GET, JBE, KAI, NOD, SAG, SIN, TMU, WN
Culex univittatus: BAG, ING, MOS, MPO, SIN, SPO, USU, WSL, WN
Culex virgultus:* SLE, TUR
Culex vishnui: GAN, GET, ING, JBE, KAS, MIN, PAL, SAT, TMU, UMB, VKT, WN
Culex vomerifer: ANU, BSQ, CAR, GMA, ITQ, MAD, MOJU, OSSA, VIN
Culex weschei: BOU, MOS, MPO, WN
Culex zeteki: TON
Culex zombaensis: BUN, PGA
Culicines: BEF, JAP, JOI, MPK, SIN, TAH
Culicoides actoni: WAR
Culicoides austropalpalis: KNA
Culicoides brevitarsis: AINO, AKA, BC, BEF, BLU, CVG, DAG, DOU, EHD, KIM, NGA, PEA, TIB, TIN, WAL
Culicoides bundyensis: BEL
Culicoides dycei: WAL, WAR
Culicoides fulvus: BLU
Culicoides histris: SAT, THI
Culicoides imicola (= C. pallidipennis): BLU, SABO, SHA
Culicoides Kenya species No. 23: BLU
Culicoides kingi, C. nivosus, C. bedfordi, C. pallidipennis, C. cornatus, mixed pool: BEF
Culicoides marksi: BEL, BF, EUB, WAL, WAR
Culicoides milnei: BLU
Culicoides obsoletus: BLU
Culicoides oxystoma: BC, DAG
Culicoides oxystoma and *C. peregrinus:* MAR
Culicoides pallidothorax: WGR
Culicoides paraensis: ANU, ORO
Culicoides species: AHS, AINO, AKA, BLU, BUT, CON, CVG, DAG, DUG, EEE, EHD, IT, KOT, LOK, MAR, MR, NGA, RVF, SABO, SAN, SAT, SHA, SHU, WAL, WAR
Culicoides schultzei: BEF, BC, DAG, EHD
Culicoides schultzei and *C. peregrinus:* MAR
Culicoides tororensis: NSD
Culicoides variipennis: BLU, BUT, LOK, MD
Culicoides wadai: AKA
Culiseta: SIN,** WEE
Culiseta alaskaensis: NOR
Culiseta annulata: TAH
Culiseta impatiens: SSH
Culiseta inornata: CV, CE, JC, JS, MD, NOR, SLE, SSH, TVT, TUR, WEE
Culiseta melanura: EEE, FLA, HP, HJ
Culiseta morsitans: EEE, SIN
Culiseta tonnoiri: WHA
Deinocerites pseudes: SLE, VEE
Dermacentor albipictus: CTF
Dermacentor andersoni: CE, CTF, POW
Dermacentor auratus: KFD, LJN
Dermacentor marginatus: BHA, CHF, DHO, HYPR, OMSK, RAZ, RSSE
Dermacentor occidentalis: CTF
Dermacentor parumapertus: CTF
Dermacentor reticulatus (= D. pictus): HYPR, OMSK, RSSE, TET
Dermacentor silvarum: OMSK, RSSE

* Nomen Dubium.
**Virus of Ockelbo disease.

Dermacentor variabilis: SAW, SLE
Dermanyssus: WEE
Dermanyssus americanus: SLE
Dermanyssus gallinae: EEE, SLE
Echinolaelaps echidninus: JUN
Eomenocanthus stramineus: EEE
Eretmapodites chrysogaster: MID, NKO, OKO, RVF, SIM
Eretmapodites grahami: SF
Eretmapodites leucopous: NKO
Eretmapodites quinquevittatus: PGA
Eretmapodites semisimplicipes: OKO
Eretmapodites silvestris: SPO
Eretmapodites species: NKO, SPO
Eubrachilaelaps rotundus: JUN
Eusimulium johannseni: EEE
Ficalbia species: KOO, SEP
Gigantolaelaps inca: PIC
Gigantolaelaps species: COC, MAY, PIC, SLE
Haemagogus capricornii: YF
Haemagogus equinus: YF
Haemagogus janthinomys: MAY, YF
Haemagogus leucocelaenus: WYO, YF
Haemagogus lucifer: YF
Haemagogus mesodentatus: YF
Haemagogus species: ILH, MAY, MUC, TCM, YF
Haemagogus spegazzinii: JUR
Haemaphysalis bispinosa: KFD
Haemaphysalis concina: OMSK, RSSE, TDY
Haemaphysalis cuspidata: KFD
Haemaphysalis intermedia: BAR, BHA, GAN
Haemaphysalis inermis: HYPR
Haemaphysalis japonica douglasi: RSSE
Haemaphysalis kyasanurensis: KFD
Haemaphysalis leporispalustris: NM, SAW, SIL
Haemaphysalis longicornis: KHA, RSSE
Haemaphysalis minuta: KFD
Haemaphysalis neumanii: POW
Haemaphysalis papuana: LGT
Haemaphysalis papuana kinneari: KFD
Haemaphysalis punctata: BHA, CHF, HYPR, TRB
Haemaphysalis semermis: LJN
Haemaphysalis species: LJN
Haemaphysalis spinigera: KSO, KFD
Haemaphysalis ticks: BHA
Haemaphysalis turturis: KSO, KFD
Haemaphysalis wellingtoni: GAN, KFD
Hyalomma anatolicum anatolicum: CHF, KEM, THO, WM
Hyalomma asiaticum asiaticum: CNU, CHF, ISF, TDY, WM, WAN
Hyalomma detritum: CHF
Hyalomma dromedarii: BHA, DGK, DHO, KAD
Hyalomma excavatum: CON
Hyalomma impeltatum: CON, DUG, WAN
Hyalomma impressum: CON
Hyalomma marginatum: BAH, CHF, DHO, MWA, MTR, SIN, TDY, WAN, WN
Hyalomma marginatum isaaci: WM
Hyalomma marginatum rufipes: BAH, BHA, CON, DUG
Hyalomma marginatum turanicum: CHF
Hyalomma nitidum: CON, DUG, THO
Hyalomma plumbeum plumbeum:* BKN, CHF, DHO, TDY, WN
Hyalomma rufipes: CON
Hyalomma species: CHF, CON, WM, WN
Hyalomma truncatum: BHA, CON, DUG, THO, WM
Hybomitra lasiophthalma: JC
Hybomitra nuda: JC
Ixodes apronophorus: OMSK
Ixodes cookei: POW
Ixodes dentatus: CNT
Ixodes eudyptidis: GGY, SRE

* *Hyalomma plumbeum* = *Hyalomma marginatum* of Hoogstraal.

Ornithodoros species: BDA, CG, HUG, KFD
Ornithodoros tadaridae: ER
Ornithodoros tartakovskyi: CHIM
Ornithonysus sylviarum: SLE
Otobius lagophilus: CTF
Phlebotomines: CGL
Phlebotomines species: ORX
Phlebotomus papatasi: ISF, SFN, TEH
Phlebotomus perfiliewi: ARB, SFN, YB
Phlebotomus perniciosus: ARB, TOS
Phlebotomus species: CHP, CHV, KAR, SAL, SFN, SFS
Phoniomyia pilicauda: AMB, BOR
Phoniomyia species: ARU
Psorophora albipes: IERI, ILH, ITU, PUR, UNA, WYO
Psorophora ciliata: VEE
Psorophora cilipes: VEE
Psorophora cingulata: WYO
Psorophora columbiae: CV, JC, SA, TEN, WEE
Psorophora confinnis: VEE
Psorophora cyanescens: VEE
Psorophora discolor: JC, VEE
Psorophora ferox: ARU, CV, COT, IERI, ILH, ITU, KRI, MEL, MIR, ORI, ROC, SLE, UNA, WYO
Psorophora ferox and *Ps albipes:* UNA
Psorophora howardii: LAC
Psorophora lutzii: UNA
Psorophora signipennis: CE, LOK, MD, SA, TVT, WEE
Psorophora species: CV, GMA, ILH, MAG, MAY, VEE, WEE, WYO
Rhipicephalus appendiculatus: NSD
Rhipicephalus bursa: CON, CHF, THO
Rhipicephalus evertsi: THO, WM
Rhipicephalus guilhoni: WM
Rhipicephalus lunulatus: DUG, WN
Rhipicephalus muhsamae: DUG, KOU, WSL, WN
Rhipicephalus pravus: KAD
Rhipicephalus pulchellus: BAR, DUG
Rhipicephalus pumilio: CHF
Rhipicephalus rossicus: CHF
Rhipicephalus sanguineus: CHF, CON, THO, WM
Rhipicephalus sanguineus turanicus: MWA
Rhipicephalus species: KFD, LJN, MWA, THO
Rhipicephalus sulcatus: DUG
Rhipicephalus turanicus: CHIM, CHF, MWA, TDY
Sabethes belisarioi: SLE
Sabethes chloropterus: ARU, CHG, SLE, YF
Sabethes intermedius: XIB
Sabethes soperi: MCA
Sabethes species: ILH, SLE
Sabethines: MUR
Sabethini species: ICO, KRI, MAY, MOJU, MUC, ORI, SOR, WYO
Scipio aulacodi: LEB
Sergentomyia species: SRI
Simulidae: VSNJ
Simulium bivittatum: LOK
Simulium black flies: VSNJ
Simulium malyscheri: SSH
Simulium meridionale: EEE
Stricticimex parvus: KK
Tabanus agrestis: IK
Ticks: BHA
Triatoma: WEE
Trichoprosopon digitatum: PIX, WYO
Trichoprosopon leucopus: WYO
Trichoprosopon longipes: SLE, WYO
Trichoprosopon pallidiventer: AMB
Trichoprosopon species: BSQ, GMA, ILH, SLE, TNT, WYO
Trichoprosopon theobaldi: ARU
Uranotaenia species: JUG
Wyeomyia aporonoma: KRI, WYO
Wyeomyia complosa: WYO
Wyeomyia melanocephala: TON, WYO
Wyeomyia occulta: CAB, TON, WYO
Wyeomyia pseudopecten: TON
Wyeomyia species: ARU, CAR, IACO, ILH, KRI, MCA, MAG, MQO, MUC, SLE, UNA, WYO
Wyeomyia ypsipola: KRI

* A single isolation of either a Hantaan or Seoul virus from *Bandicota indica*.
**Most of these isolates have not been serotyped; they may represent Bahig or Matruh viruses or other Tete group viruses.

Cattle: AINO, AKA, AR, BHA, BLU, BEF, BC, BRM, CV, CON, CHF, CVG, DAG, DOU, DUG, EHD, IBA, KIM, LI, MAR, NDU, PEA, RVF, SABO, SAN, SAT, SHA, SHU, THO, TIN, VSI, VSNJ, WSL
Cattle, sentinel: BC, CVG
Cavia pamparum: JUN
Cebus, sentinel: CAR, CATU, GMA, ILH, ITQ, MTB, MIR, MOJU, MUC, MUR, ORI
Cebus apella, sentinel: APEU, GMA, MTB, TCM
Centropus phasianius: ALF
Cercopithecus aethiops: CHIK, YF, ZIKA
Cercopithecus nictitans: BOU
Chaerephon pumila [= Tadarida (Chaerephon) limbata]: ENT
Charadrius melanops: COR
Chickens, sentinel: ANU, MVE, TMU, TUR, WEE, WN
Chimney swift: SLE
Chloris chloris: BAH*
Choloepus brasiliensis: ANH
Choloepus didactylus: JARI
Cisticola chiniana: TETE
Clethrionomys glareolus: KEM, LI, PUU, TBE, TET, TRB
Clethrionomys rufocanus: PUU
Clethrionomys rutilus: KEM, KLA, NOR
Clethrionomys species: POW
Clytospiza monteiri: ING
Coendou species: GMA
Coliuspasser macrourus: MOS
Columbigallina: MAY
Coracopsis vasa: WN
Corvus corone sardonius: SIN
Corvus splendens: KAN
Corythornis cristata: GAR
Cotton rat: See *Sigmodon hispidus*
Coturnix coturnix: MTR*
Cows: See Cattle
Cricetomys gambianus: BDA, DUG, GF, UGS
Crocidura species: AMT, BLU
Cyanocitta cristata: HJ, MER, SLE
Cyanopica cyanus: TSU
Cynopterus brachyotis: CI, JUG, PPB
Cynopterus brachyotis angulatus: PPB
Dasypus novemcinctus: MDO
Deer: EHD, LI, WEE
Deer, sentinel: JC
Deer, red: See Deer
Deer, white-tailed: See Deer
Desmodillus auricularis: WSL
Dicrostonyx rubricatus: SSH
Didelphis m. marsupialis: ANU, CAB, CATU, ITA, MTB, MOJU, MUR, ORI
Dog: AHS, EEE, TEN, WN
Donkey: See Horse
Dove, mourning: SLE
Dove, ruddy ground: SLE
Dove, white tipped: SLE
Dryoscopus gambensis: DUG
Egret: WN
Egret, nestling: NYM
Eidolon helvum: IFE, LB
Emberiza citrinella: KUM
Eonycteris spelaea: PPB
Epomophorus species: YF
Epomophorus wahlbergi: LB
Eptesicus fuscus: RB
Eptesicus (= Vespertilio) serotinus: IK
Erethizon dorsatum: CTF
Erinaceus albiventris (= Atelerix spiculus; A. albiventris): BHA, CHP, CON, GF, SF
Erinaceus concolor (= E. roumanicus): HYPR, RSSE
Erithacus luscinia (= Luscinia luscinia): BAH,* MTR*

* Most of these isolates have not been serotyped; they may represent Bahig or Matruh viruses or other Tete group viruses.

Erithacus megarhynchos (= Luscinia magarhynchos): BAH*
Erythrocebus patas: CHIK, DEN-2, YF, ZIKA
Estrilda melpoda: ING, WN
Euplectes afra: BMA, BBO, KOL
Euplectes orix: ING, TETE
Flicker: SLE
Formicarius analis: CPC
Fowl, domestic: MVE
Fox: POW, SLE
Fringilla coelebs: BAH*
Fringilla montifringilla: BAH*
Frogs: OMSK, WEE
Galago: WN
Galago senegalensis: CHIK, GF
Gehyra australis: CHV
Goats: ABS, CON, CHF, NSD, SABO
Goats, sentinel: TRB
Goose: SLE
Gracula religiosa: SIN
Grallina cyanoleuca: RR
Grouse: LI
Halcyon senegalensis: SF
Hamster, sentinel: AROA, BAB, BAN, GER, GMA, GTB, ITQ, MAD, MNT, MIR, NJL, NEP, OSSA, PAT, PLS, SR, VEE, VIN, WIT, ZEG
Hares: See Rabbits
Heron, white-faced: MVE
Heteromys anomalus: BIM, CAR, COC, GMA, MUC, VEE
Hipposideridae: SIN**
Hipposideros caffer: ZGA
Hipposideros terasensis: JBE
Hirundo rustica: IK
Horse: AHS, CV, COC, EEE, GET, JBE, KUN, LI, MAG, MD, MID, RR, UNA, VEE, VSA, VSI, VSNJ, WEE, WN
House finch: See *Carpodacus mexicanus*
House sparrow: See *Passer domesticus*
Humans: ABS, ALE, APEU, BGI, BAN, BHA, BUN, BSQ, BWA, CDU, CAR, CATU, CHG, CHP, CGL, CHIK, CTF, CON, COT, CHF, DB, DEN-1, DEN-2, DEN-3, DEN-4, DHO, DUG, EEE, EBO, EVE, GAN, GER, GMA, GRO, HTN, HAN, HYPR, ILE, ILH, IK, ITQ, JBE, JUN, KEM, KOU, KUM, KUN, KFD, LAC, LAS, LEB, LD, LI, MAC, MAD, MBG, MTB, MAY, MID, MUC, MVE, MUR, NSD, NEG, NEP, NDO, OMSK, ONN, ORI, ORO, ORU, OSSA, PGA, PIRY, POW, PT, QRF, RES, RVF, ROC, RR, RSSE, SFN, SFS, SF, SHO, SHU, SIN, SLE, SPO, TCM, TAH, TDY, TAN, TAT, TET, THO, TOS, (UGS),† UMB, USU, VEE, VSI, VSNJ, WAN, WSL, WEE, WN, WYO, YF, ZIKA, ZGA
Hylochoerus meinertzhageni: ASF
Hylomyscus species: SEB
Hylophylax naevioides: BLM
Hylophylax poecilonota: MCA
Hyphanturgus brachypterus: ING
Hyphanturgus nigricollis: BMA
Hyphanturgus ocularius: ING
Jynx torquilla: IK
Kentropyx calcaratus: CHO
Lanius collurio: MTR*
Larus argentatus: AVA
Lavia frons: RVF
Lemniscomys barbarus: GF
Lemniscomys species: GF, KOU

* Most of these isolates have not been serotyped; they may represent Bahig or Matruh viruses or other Tete group viruses.
**Isolated from a pool of organs from bats of above family plus bats of Rhinolophidae family.
† ( ) = questionable.

Lemniscomys striatus: AMT, GOR, IPPY, KOU
Lepus americanus: SIL, SSH
Lepus californicus: BUT, CTF, LOK, MD, TUR
Lepus europaeus: JUN
Lepus timidus: KUM
Lizard: OMSK
Lophuromys flavopunctatus: WIT
Macaca fascicularis: BAK
Macaca mulatta: SHF
Macaca nemestrina: LJN, TR, TF
Macaca radiata: KFD
Macroglossus lagochilus: CI
Macropus (= Wallabia) agilis: RR
Mammals, small: AMT
Manakin, black and white: SLE
Manakin, flame-headed: SLE
Marmosa: EEE
Marmosa cinerea: APEU
Marmosa mitis: MUC
Marmosa murina: ITQ
Marmosa species: MUR
Marmota monax: POW
Marsupials: GMA, MUC
Meleagris gallopavo: IT
Metachirus nudicaudatus: CAB, ITQ
Microeca fascinans: RR
Micropteropus pusillus: LB
Microtus agrestis: KUM
Microtus montanus: KLA
Microtus oeconomus: KLA
Microtus pennsylvanicus: PH
Microtus gregalis (= M. stenocranius): OMSK
Migratory finch: MTR
Miniopterus s. fuliginosus: JBE
Mockingbird: SLE
Molossus obscurus: CATU
Monkey: DEN-2, YF
Monkey, sentinel: ANU, DEN-1, DEN-2, KRI, ORU, VEE, ZIKA
Motacilla alba: IK, SIN
Motacilla cinerea: IK
Mouse, deer: CTF
Mouse, sentinel: ACA, ANU, APEU, BVS, BEN, BER, BIM, BSB, BSQ, CAB, CNA, CAP, CAR, CATU, CHIK, COC, COT, GF, GJA, GMA, GTB, HJ, ICO, ITP, ITQ, JD, MAD, MAG, MTB, MIR, MOJU, MUC, MUR, NEP, ONN, ORI, PARA, PAT, ROC, SF, SIN, TBT, TON, TUR, UGS, UNA, VEE, WN, WYO, ZEG
Mule: See Horse
Mus musculus: JUN, SAB, TBE
Mus species: LAS, WEE
Muscicapa striata: BAH*
Myotis blythii (= M. oxygnathus): IK
Myotis lucifugus: BOC, MML
Myotis yumanensis: KC
Neacomys guianae: AMA, ICO
Nectarinia pulchella: GAR
Nectomys: NEP
Nectomys squamipes: ACA, CAR, CATU, GMA, ITQ, MOJU, MUC, MUR
Nectomys squamipes amazonicus: BEN
Neotoma micropus: RG
Numida meleagris: ING
Nyctalus noctula: IK
Nycticorax nycticorax: SEM
Odocoileus virginianus: See Deer
Ondatra zibethicus: OMSK
Opossum: EVE
Oriolus flavocinctus: KUN
Oriolus oriolus: BAH*
Oryzomys: EEE
Oryzomys albigularis: PIC
Oryzomys bicolor: FLE
Oryzomys (= Oecomys) bicolor: KRI, MOJU
Oryzomys buccinatus: PAR
Oryzomys capito: AMA, CAR, CATU, FLE, ITQ, MUC, ORI

* Most of these isolates have not been serotyped; they may represent Bahig or Matruh viruses or other Tete group viruses.

Oryzomys capito goeldii: PAC
Oryzomys capito velutinus: PAC
Oryzomys flavescens: JUN
Oryzomys goeldii: AMA
Oryzomys laticeps: CAR, CATU, MUC
Oryzomys palustris: TAM
Oryzomys, sentinel: CAR, GMA, MUC
Oryzomys species: BIM, GMA, IRI, ITI, MOJU, MUR, STM
Otomys irroratus: BLU
Ovine: See Sheep
Papio papio: BOU, CHIK
Passer domesticus: FM, HP, SLE, TUR, UMA
Passer hispaniolensis: IK
Peromyscus gossypinus: TEN
Peromyscus leucopus: SV
Peromyscus maniculatus: CTF, MOD
Peromyscus species: EEE, POW, WEE
Petrochelidon pyrrhonota: FM
Phacochoerus aethiopicus: ASF
Pheasant: EEE
Philander opossum: ARA, PIRY
Phoenicurus phoenicurus: BAH,* IK, KEM, MTR*
Phylloscopus collybitus: BAH*
Phylloscopus trochilus: BAH,* MTR*
Pigeon: QRF, SLE
Pig: CNU, GET, ING, JBE, VSI, VSNJ, WEE
Pipistrellus (= Vespertilio) pipistrellus: SOK, IK
Pipra erythrocephala: MUC
Pitmys subterraneus: TRB
Platyrinchus coronatus: MCA
Plesiositagra cucullata: ING, KOL, TETE
Ploceide: ING
Ploceus cucullatus: TETE
Ploceus melanocephalus: BMA, OUA
Porcupine: CTF
Potomochoerus species: ASF
Praomys (= Mastomys) erythroleucus: SGA
Praomys (= Mastomys) femelle: CON
Praomys (= Mastomys) natalensis: DUG, GF, LAS, UGS
Praomys (= Mastomys) species: BDA, BLU, IPPY, KEU, KOU, SAB, SGA, SPA, SEB
Presbytis entellus: KFD
Primates: YF
Proechimys iheringi: AMB
Proechimys guyannensis: BIM, BSQ, CAP, CAR, CATU, GJA, GMA, ITQ, MOJU, MUC, MUR, ORI, URU
Proechimys oris (= Proechimys g. oris): BUJ, ICO, PIX
Proechimys longicaudatus: URU
Proechimys semispinosus: MAD, OSSA
Proechimys species: EEE, MCA, NEP, TBT
Progne subis: MER
Psarocolius decumanus: TON
Pteroglossus aracari: INI
Puffinus pacificus chlorohynchus: UPO
Pycnonotus barbatus: ING
Pyriglena leucoptera: BLM
Quelea erythrops: SF
Quelea quelea: ING
Rabbits (and Hares): CON, CHF, LI, TEN
Rabbit, sentinel: KEY, NOR, SSH, TAH, TVT
Rat: KK
Rat, laboratory: SEO
Rat, sentinel: MUC
Rat, Sprague-Dawley: SEO
Rat, Wistar: SEO
Rattus blanfordi: KFD
Rattus nitidus: SEO
Rattus norvegicus: SEO, VEE
Rattus rattus: LAS, SEO, VEE

* Most of these isolates have not been serotyped; they may represent Bahig or Matruh viruses or other Tete group viruses.

Rattus rattus wroughtoni: BAR, KFD
Rattus species: SEO
Rhinolophidae: SIN**
Rhinolophus c. cornutus: JBE
Rhinolophus ferromequinum: IK
Rhinolophus hildebrandti eloquens: MEB
Rhinolophus rouxi: KFD
Riparia paludicola: LJA
Robin: SLE
Robin, pale vented: SLE
Rodents: EEE, GER, ICO, RVF, RSSE, SHO, WEE
Rousettus aegyptiacus: YOG
Rousettus leschenaulti: WN
Ruminants, domestic: BLU
Ruminants, wild: BLU
Saimiri: KRI
Saxicola rubetra: MTR,* UGS
Sciurus carolinensis: LAC
Sciurus carolinensis, sentinel: LAC
Sciurus griseus: WEE
Sciurus vulgaris: KUM
Scotophilus nigrita nigrita: DB
Scotophilus species: CHIK, DB
Scotophilus temmencki: KTR
Seiurus aurocapillus: FLA
Serinus canaria: MTR*
Serinus mozambicus: TETE
Sheep: BHA, BLU, CV, GAN, LI, NSD, RVF, SABO, SHU, WSL
Siberian polecat: TDY
Sigmodon hispidus: CR, EVE, GL, JUT, KEY, MH, PAT, SP, SR, TAM, TEN, TVT, VEE, WEE, ZEG
Sigmodon species: PAT, TAM, ZEG
Snake: WEE
Sorex araneus: HYPR, LI
Spermophilus (= Citellus) beecheyi: WEE
Spermophilus (= Citellus) columbianus: CTF
Spermophilus (= Citellus) lateralis: CTF
Spermophilus (= Citellus) richardsoni: WEE
Spilogale putorius (= spotted skunk): POW
Squirrel: CTF
Starling, immature: FLA
Sterna fuscata: HUG
Sturnira lilium: MPR
Sturnus pagodarum: KMP
Suncus murinus: HTN/SEO, KFD, TPM
Sus scrofa: ASF
Syconycteris crassa: JAP
Sylvia atricapilla: BAH*
Sylvia borin: BAH,* MTY, MTR*
Sylvia communis: BAH,* MTR,* THI
Sylvia curraca: BAH,* BEA, MTY, MTR,* THI
Sylvia hortensis: BAH*
Sylvia nisoria: BAH*
Sylvia ruppelli: BAH*
Sylvilagus aquaticus: TEN
Sylvilagus auduboni: BUT, LOK
Tadarida brasiliensis mexicana: RB, SLE, VEE
Tadarida condylura wonderi: DB
Tadarida plicata: KK
Tadarida species: DB, GOS
Talpa europaea: HYPR
Tamias striatus: LAC
Tamiasciurus hudsonicus: POW
Tanager, silver beak: SLE
Taphozous theobaldi: KK
Tatera valida (= T. kempi): AMT, BDA, GF, KEU, KOU, SAB, TOU
Tatera species: GF, GOR, GOS, SAF
Taterillus gracilis: GF
Taterillus nigeriae: GF

* Most of these isolates have not been serotyped; they may represent Bahig or Matruh viruses or other Tete group viruses.
**Isolated from a pool of organs from bats of above family plus bats of Hipposideridae family.

Taterillus species: BDA, GF, KTR, KEU, KOU
Tchagra australis: WN
Thamnomys macmillani: AMT
Thamnophilus aethiops: ITP
Thryonomys swinderianus: LAT, LEB
Tolmomyias poliocephalus: CAB
Trichosurus vulpecula: WHA
Trionyx spinifer: CV
Tropidurus torquatus hispidis: MAY
Turdus libonyanus: AMT, BGN, BOB, MPO, USU
Turdus merula: KUM, UUK
Turdus nudigenis: CAB
Turdus philomelos: KUM
Urocyon cinereoargenteus: TEN
Vespertilio murinus: IK
Xanthocephalus xanthocephalus: HP
Xanthomyias virescens: GTB
Xerus erythropus: BDA, BHA
Zoothera citrina: KSO
Zygodontomys brevicauda: BIM, BOC, CAR, GMA, MUC, NAR, PAC
Zygodontomys species: BIM, CAR, CATU, GMA, PAC, VEE

REPORT FROM THE WHO COLLABORATING CENTRE FOR REFERNECE AND RESEARCH (Dengue and Dengue Haemorrhagic Fever)

Department of Medical Microbiology, University of Malaya, Kuala Lumpur, Malaysia.

A moderately large outbreak of dengue took place in Malaysia in 1986. Out of 1399 cases reported to the Ministry of Health throughout the country, 310 were classified clinically as dengue haemorrhagic fever. There were 9 deaths from among the DHF cases, giving a case fatality rate of 2.9%. The outbreak was predicted when the Centre noticed an increase of dengue cases seen at the University Hospital in December, 1985. The peak reporting period was June-July (Table 1). Four states in the west coast of Peninsular Malaysia and one in the eastern state reported the highest number of cases.

In the University Hospital, 624 patients were tested serologically for dengue infections. Many of the samples were single specimens, making interpretation of results difficult. 81 (13%) cases were found to be positive serologically, 46 samples displaying a secondary type infection based on WHO criteria. 43 of the 81 positive cases were in males and 38 females. The majority of cases were found in those under 30 years of age. There were 47 cases among the Chinese, 24 in Malays, 9 Indians and 1 others. Thirty-two viruses were isolated in mosquito larvae from clinical specimens. Twenty-five were Den-3, four Den-1, 2 Den-4 and only 1 Den-2.

When it was evident that we have an imminent outbreak of dengue in the country, the Centre liased closely with the Ministry of Health and regular dialogue was established with the Vector Borne Diseases Control Programme. Increased surveillance was initiated by approaching general practitioners and private cinics, seeking their cooperation to submit specimens for investigation. This was particularly so in the Jinjang-Kepong area where we have an ongoing dengue project. The Ministry mounted an intensive programme of vector control. As a result of all these efforts, the number of cases reported in 1986 were much less than the previous large outbreak in 1982 when 3126 cases were reported with 36 deaths. Detailed analyses of this outbreak are in progress.

Dr. S.K. Lam

Table 1 Dengue Activity in Malaysia - 1986

Month	DF Cases	DHF Cases	Total DF & DHF	Deaths
January	23	9	32	1
February	30	18	48	2
March	73	32	105	3
April	107	23	130	-
May	148	36	184	-
June	196	60	256	1
July	157	43	200	-
August	113	21	134	-
September	97	15	112	1
October	47	29	76	-
November	29	8	37	1
December	69	16	85	-
TOTAL	1089	310	1399	9

REPORT FROM THE DEPARTMENT OF VIROLOGY

COLLEGE OF MEDICINE, UNIVERSITY OF IBADAN, IBADAN, NIGERIA.

Pathogenicity of Potiskum Virus in Laboratory Animals and Tissue Culture

The growth of Potiskum virus (Ib-AN 10069), a hitherto unknown flavivirus isolated from the liver of a giant rat (*Cricetomys gambianus*) collected at Fika, Bornu State of Nigeria was studied in various laboratory animal hosts and tissue culture. A ninth suckling mouse passage of the virus was used in all tests.

Mice - Suckling mice infected with 100 suckling mouse intracerebral (SMIC) LD_{50} of Potiskum virus were susceptible to infection by intracerebral (i.c.), intraperitoneal (i.p.) and subcutaneous routes. The average survival times were 3.99, 4.67 and 6.0 respectively. All infected animals developed viraemia and this was detected from day 1 post infection (p.i.) until the time of death. Peak viraemia of 4.0 logs and 4.5 logs occurred on day 5 in i.c. and i.p. inoculated animals respectively.

Weanling (WM) and adult mice infected with Potiskum virus by i.c. and i.p. routes also developed viraemia on day 2 p.i. and lasting 3 days. Mortality rate in WM inoculated by i.c. route was 100% while 33% of those infected by i.p. route died. Peak viraemia of 3.2 logs and 2.6 logs occurred on day 5 in WM infected by i.c. and i.p. routes respectively. In adult mice, peak viraemia of 2.5 logs occurred in i.p. inoculated mice but those infected by s.c. route did not circulate the virus.

Rabbits - Adult rabbits were infected with 100 SMIC LD_{50} of Potiskum virus. No viraemia was detected but all infected rabbits developed neutralising (N) and complement fixing (CF) antibody to Potiskum virus. Sera collected on day 28 p.i. had neutralising antibody titres of between 1:16 - 1:64 and CF antibody titres of 1:32 - 1:128.

Chicks - Four to 5 day old chicks were also susceptible to fatal Potiskum virus infection by subcutaneous (S.C.) and oral routes. Chicks were infected with 200 SMIC LD_{50} of Potiskum virus. All chicks developed viraemia on day 1 p.i. which lasted until the time of death on day 4 p.i.

Tissue Culture

BHK-21 - Baby hamster kidney cells were infected with Potiskum virus using 100 SMIC LD_{50}/2ml of virus suspension. The virus replicated to high titres in this cell line. Highest virus titre (6×10^4 pfu/ml) was obtained on day 5 p.i. Cytopathic effect (CPE) commenced on day 3 p.i. and progressed until day 5 p.i.

Potiskum virus also produces plaques in BHK-21 under carboxylmethyl cellulose (CMC) overlay medium. Plaques which appeared on day 4 p.i. were small and distinct with a diameter of about 1.5mm.

$P388D_1$ Cells - $P388D_1$ cells (a macrophage-like cell line) were also infected with Potiskum virus at two multiplicities of infection (MOI) 0.04 and 0.0004. Infectivity titres were determined by plaque assay. In cell cultures infected with high MOI, virus replication was detected on day 1. Virus titre increased from 2×10^3 pfu/ml to 8×10^3 pfu/ml. on day 3 p.i. Cultures infected with low MOI (0.0004) had late virus growth; virus replication was detected on day 2 p.i. Peak virus titres (4×10^3 pfu/ml.) was detected on day 3. Low grade CPE was detected on days 3 and 4 p.i. in cultures infected at both MOI.

Potiskum virus also produces plaques in $P388D_1$ cells under CMC overlay medium. Plaques appeared on day 3 p.i. and were similar in morphology to those of BHK-21 cells.

(A. H. Fagbami; S. A. Omilabu)

REPORT FROM THE DEPARTAMENTO DE PATOLOGIA TROPICAL, CENTRO DE INVESTIGACIONES REGIONALES "DR. HIDEYO NOGUCHI," UNIVERSIDAD AUTONOMA DE YUCATAN, MEXICO AND SAN JUAN LABORATORIES, DIVISION OF VECTOR-BORNE VIRAL DISEASES, CENTERS FOR INFECTIOUS DISEASES, CENTERS FOR DISEASE CONTROL, SAN JUAN, PUERTO RICO

Clinical, serologic and virologic studies were carried out on 538 patients with a clinical diagnosis of dengue fever during epidemic in Yucatán, Mexico, 1984. Dengue virus infection was confirmed in 200 patients by serology (HI, CF or MAC ELISA) or by virus isolation. It was not possible to confirm the etiology of 207 patients on whom only a single serum sample was obtained. The rest were negative.

Of the 200 confirmed dengue patients, 189 (94.5%) were classified as secondary infections and 9 (4.5%) as primary infections using HI criteria. Two could not be classified. Virus isolation was attempted from patients from whom serum samples were collected in the first five days of illness. Dengue 4 (DEN-4) virus was isolated from 34 patients and dengue 1 (DEN-1) virus from one patient.

The signs and symptoms observed most frequently (in more than the 50% of the confirmed patients were: fever, headache, myalgias and retro-orbital pain. Rash was observed in 31.5% of the patients.

Ten cases of hemorrhagic disease were reported, four with a fatal outcome. Eight were confirmed as dengue, including the four fatal cases. The latter were all female, 8, 9, 19 and 37 years old, and from rural areas with low socio-economic conditions. DEN-4 virus was isolated from one fatal case and from three of the other cases with hemorrhagic disease. The other five cases of hemorrhagic disease were confirmed by IgM capture ELISA and/or by HI and CF tests. They included 3 males (5, 11 and 38 years old) and 2 females (19 and 43 years old). Hemorrhagic manifestations of confirmed cases are shown in Table 1.

Many of the outbreaks caused by DEN-4 virus in the American Region have been associated with relatively mild illness. The experience in tyhe Yucatán, however, demonstrates that not all DEN-4 infections are mild and reinforces the fact that all four dengue serotypes can cause severe and fatal disease.

(María Alba Loroño Pino; José Arturo Farfán Ale; D. J. Gubler; G. Kuno; G. E. Sather and J. E. Zavala Velázquez).

Table 1

Hemorrhagic Manifestations Associated with Confirmed Dengue 4 Infection, Mérida, Mexico, 1984

Hemorrhagic Manifestation	Fatal Cases	Nonfatal Cases	Total
Petechiae	4/4 (100)*	3/4 (75)	7/8 (87)
Purpura/Ecchymosis	3/4 (75)	1/4 (25)	4/8 (50)
Epistaxis	1/4 (25)	2/4 (50)	3/8 (37)
Gum Bleeding	1/4 (25)	2/4 (50)	3/8 (37)
Hematemesis	4/4 (100)	0/4 (0)	4/8 (50)
Melena	2/4 (50)	0/4 (0)	2/8 (25)
Hematuria	1/4 (25)	1/4 (25)	2/8 (25)
Thrombocytopenia	3/3 (100)	0/1 (0)	3/4 (75)

*No. positive/No. examined (% positive).

RETROSPECTIVE SEROEPIDEMIOLOGICAL SURVEY TO DENGUE VIRUS IN "EL CERRO"MUNICIPALITY HAVANA C U B A.

INSTITUTO DE MEDICINA TROPICAL "PEDRO KOURI" LA HABANA, CUBA.

The well known history of Dengue in Cuba, with two epidemics reported, the first, of Classical Dengue, in 1977 (DEN-1) and the second (DEN-2) in 1981 of Dengue Hemorrhagic Fever Dengue Shock Sindrome (DHF/DSS), the lack of evidence of a wide circulation of these viruses prior to 1977 and the complete control of the outbreak since October 10 1981, allows the performance of retrospective studies on the basis of a very well defined epidemiological situation. For these reasons we consider that the retrospective seroepidemiological study carried on in an urban municipality of Havana city (El Cerro) will give us relevant information about the infection rates, related with sex, age and race; will also help to establish the proportions between the number of Classical Dengue and DHF/DSS cases, as well as the relation ,both in children and adults, between the severe picture of the disease and the primary or secondary type of serological response. We will be able to validate some data obtained in differente previous studies, and to go deeper in the epidemiological analysis of the disease.

To this end, we selected a representative sample of 1944 persons from whom a blood sample, in filter paper, and a filled questionaire was obtained. In each sample we determined the presence of neutralizing antibodies to Dengue 1 and D_2 viruses. In those individuals that reported a severe clinical picture, the clinical charts were reviewed at the hospitals.

THE MAIN RESULTS OBTAINED WERE:

- During the Dengue 1 epidemic (1977) 868 persons(45%) were infected and 652 (33.5%) during the Dengue 2 epidemic in 1981. This indicates the wide viral circulation occured in both epidemics, which is a very important factor for the development of DHF/DSS outbreaks.

- The population at risk of infection was approximatly the same in both epidemics. In table 1 we can see that 50% of those persons infected in 1977 had a second infection in 1981, while in those non infected during the first epidemic only a 20% of infection rate could be proved in 1981. When we made the same kind of analysis but considering the houses in which some inhabitant was infected, similar results were obtained (table 2). We consider that these facts depend on the presence of the mosquitoes in the houses, and that the infection within the house, at least in this municipality, was of utmost importance.

- In both epidemics, the infection rates in female were significantly higher (table 3), when we related this rates with age, this difference was only evident in adults. In table 4 we show the relation between infection with Dengue2 virus and employment. The infection rates were similar in those who worked outside the house with independance to sex; aditionally most of non infected adults (72%) were employees (worked outside the house). This again point out the importance of the house as the infecting site. The most the time a person stays in the house, the higher the probability of been bited by th vector. We consider that the rate of infection was not dependant of sex but of the time of permanence in the house.

- In previous studies of our group, the white race was identified as a risk factor for DHF/DSS. In this study we demonstrated that in both epidemics whites and blacks were equally infected (table 5).

The ratio between clinical and subclinical diseas was 1 to 4 in whites and 1 to 8 in blacks, this may indicate a higher frecuency of asymptomatic disease in black people and could be related to a natural resistance of this race, to the disease. It must be emphasize that none of the DHF/DSS cases found in this study was black.

- DHF/DSS was found in four persons (table 6), with secondary type of serological response. This finding supports Halstead's hypothesis of the sequential infection as a risk factor for DHF/DSS.
- Whenwe analyzed the ratio of severe cases in relation to age we found that one out of every 34.5 children and one out of every 183.5 adults had DHF/DSS. This indicates the higher frequency of the severe disease in childhood. The probability of a children to suffer DHF/DSS was 0.03 and that of adults 0.005 (six times lower).

Dra. María G. Guzmán
Prof. Gustavo Kouri
Dr. José Bravo
Lic. Maritza Soler
Lic. Luis Morier
Lic. Susana Vázquez

TABLE 1: POPULATION AT RISK IN BOTH EPIDEMICS

Susceptible individuals in 1977: 1944

1977 Epidemic	868/1944 (45%) infected	1076/1944 (55%) non infected
RISK OF	SECOND INFECTION	FIRST INFECTION
1981 Epidemic	436/868 (50%) 1X2	216/1076 (20%) 1X5

TABLE 2: HOUSES AT RISK OF INFECTION IN BOTH EPIDEMICS

Total number of houses: 706

1977 Epidemic	444/706 (63%) some person infected	262/706 (37%) none person infected
RISK OF	some person SECOND INFECTION	some person FIRST INFECTION
1981 Epidemic	302/444 (68%) 1X1.4	94/262 (36%) 1X2.7

TABLE 3: INFECTION AND SEX

	1977 Epidemic infection rate	1981 Epidemic infection rate
FEMALE	526/1122(47%)	410/1122(36.5%)
MALE	344/822(42%)	242/822(29%)

TABLE 4: <u>INFECTION AND EMPLOYMENT</u>

	Employees	Non employees
FEMALE	136/451(30%) infected with Dengue 2.	213/408(52%) non infected
MALE	138/473(29%) in fected with Dengue 2	62/115(54%) non infected

TABLE 5: <u>INFECTION AND RACE</u>

	1977 Epidemic	1981 Epidemic
WHITE	468/1076(43%)	382/1076(35.5%)
BLACK	166/342(48.5%)	115/342(34%)

TABLE 6: <u>SEVERE CASES</u>

CASE	TYPE OF Infection	SEX	AGE	RACE	C.D.*
1	second	M	25	white	-
2	second.	M	10	white	-
3	second.	F	9	Mulatto	Asthma
4	second.	F	17	Mullato	Asthma

* Chronic Disease

SOME CLINICAL ASPECTS OF FATAL CASES OCCURED IN DHF/DSS CUBAN EPIDEMIC

INSTITUTO DE MEDICINA TROPICAL "PEDRO KOURI". LA HABANA, CUBA.

During the DHF/DSS epidemic occured in Cuba in 1981, 158 fatal cases were reported (101 children and 57 adults). The analysis of these fatal cases is of utmost importance since this is the first epidemic reported in America.

In 98 clinical charts (76 children and 26 adults), the evolution of the disease from the first symptoms to death, was analyzed. Fever and/or vomiting were the most frequently reported chief complainment both in children and adults, followed by the hemorraghic manifestations. The 3 to 5 years age group was the most affected, being 4 the modal age. As compared with the cuban population we could not find sex predominance ($p>0.05$).

In relation to race, 80% were whites, 11% mulattos and 8% blacks were reported, this distribution shows a significant predominance of the white race as compared with the distribution of the cuban population ($p<0.05$)

23% of children and 13% of adults had personal antecedents of Bronchial Asthma; there was a family history of Diabetes Mellitus in 24% of the fatal cases in children, and personal history in 4% of adults. Sickle cell anemia had also a significant higher prevalence as compared with the prevalence in the cuban population. The white race, as well as the chronical diseases mentioned above were considered as individual risk factors for **DHF/DSS**, and were identified for the first time during the cuban outbreak.

Hematemesis was the most frequently reported mayor hemorrhagic manifestation, both in children and adults (Table 1). As there was an official policy of early admittance to the hospital, most of the mayor hemorrhages were recorded during the evolution in the hospital, in contrast with the minor hemorrhagic symptoms (purpura) that were more frequently seen before admittance. In general, 99% of children and 65% of adults had some hemorrhagic manifestation. Gastrointestinal bleeding was very frequently observed.

Fever, nausea, vomiting and abdominal pain were the most relevant sings and symptoms in children and adults. Hepatomegaly was reported in 78% of children and 35% of adults and with the abdominal pain were considered sings of bad clinical prognosis.

Shock was observed in 82% of children and in 100% of adults In adults fatal cases, the evolution of the disease was almost always toward death, when shock was present.

In table 2 we can see the frequency of hemoconcentration and thrombocytopenia, both in children and adults, these two signs were of utmost importance for the diagnosis of the disease.

Dr. José Bravo
Prof. Gustavo Kourí
Dra. María G. Guzmán

TABLE 1 : MAYOR HEMORRHAGIC SYMPTOMS IN FATAL CASES.

SYMPTOMS	CHILDREN	ADULTS
Hematemesis	43/72 (60)	9/26 (35)*
Melena	14/72 (20)	1/26 (4)
Enterorrhagia	6/72 (8)	2/26 (8)
Metrorrhagia**	1/39 (3)	4/16 (25)

* cases with the symptom / total (%)
** female cases.

TABLE 2 : HEMOCONCETRATION AND THROMBOCYTOPENIA IN FATAL CASES.

	CHILDREN	ADULTS *
Hemoconcentration	69/72 (96)	22/24 (92)
Thrombocytopenia	70/72 (97)	17/24 (71)

* Two cases not reported.

THE LAPSE BETWEEN THE TWO INFECTIONS WITH DENGUE VIRUS AS A RISK FACTOR FOR FHD/SSD.

INSTITUTO DE MEDICINA TROPICAL "PEDRO KOURI". LA HABANA, CUBA.

Homologous neutralizing antibodies developed after an infection with Dengue viruses lasts all live span, on the contrary, the heterologous neutralizing antibodies, that are also produced disappears in a very short time.

Halstead reported the presence of neutralizing and enhancing antibodies in inmune individuals to one of the four dengue serotypes. When these individuals are infected by a different serotype (secondary infection) DHF/DSS may appear if the inmunenhancement phenomenon takes place.

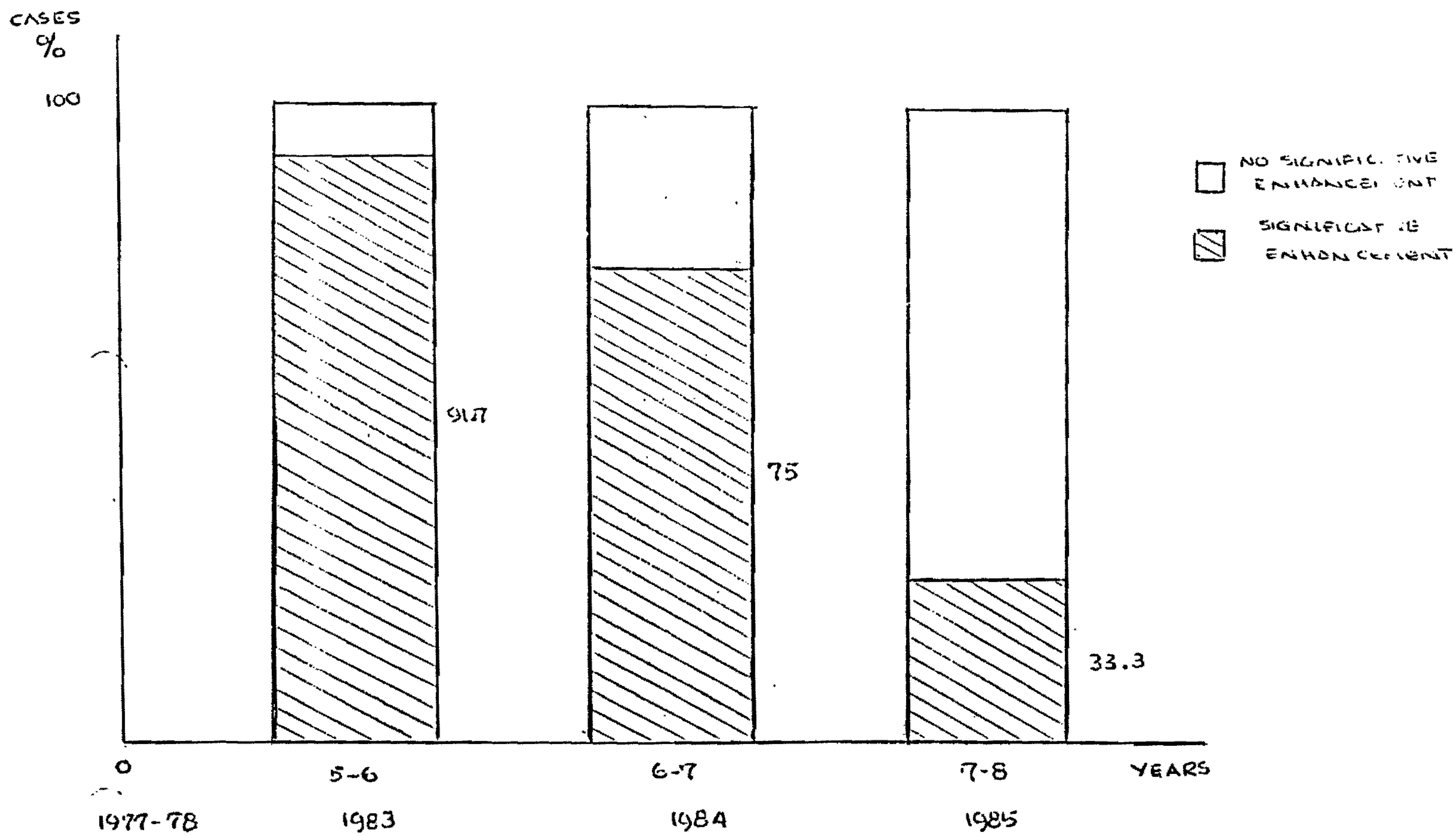
In order to know the influence of time interval between the primary and secondary infections upon the enhancing capacity of the antibodies, we selected 18 persons infected by DEN 1 virus in 1977/78. Two blood specimens were taken in filter paper in 1983, 1984 and 1985 from each person. One of the samples, from each year, was eluted and tested in growing dilutions with DEN 2 (cuban strain) in order to determine the Neutralizing Index. This index decreased with time.

To determine the enhancing capacity of anti DEN 1 antibodies towards DEN 2 virus, the other filter paper from each individual by year eluted and serial dilutions, from 1/30 to 1/1222880 were made. Appropriate amounts of these dilutions, together with the DEN 2 cuban strain (low passage) in a multiplicity of 0.01 were inoculated in the P388D1 murine macrophage cell line. The viral concentration was determined in order to calculate the enhancing titre. Furthermore, by using the Detre and White's formula, the significance of the enhancement level obtained was determined. A decrease in the enhancing capacity of anti DEN 1 antibodies when tested with DEN 2 virus during the studied lapse was observed. In graph 1 we can see the number of individuals that exhibited, by year, a significant enhancement.

A high percentage of tested sera showed a significant enhancement level five years after the first infection, which means that at that moment they had the possibility to develop the severe clinical picture of the disease. The percentage diminished from 91.3% in 1983 (5 years) to 75% in 1984 (six years) and finally to 33% in 1985, seven years from the first infection. The results obtained indicate that those persons previously infected by a certain serotype of Dengue virus (in our case DEN 1) had the highest risk to develop DHF/DSS if they are infected with a different serotype within the next five years. This risk decreases with time but still exist at least until 7 years after the primary infection.

Lic. Luis Morier
Dra. Maria G. Guzmán
Prof. Gustavo Kourí
Lic Maritza Soler
Lic. Maria R. Alemán

GRAF. I.- PER CENT OF CASES WITH SIGNIFICATIVE ENHANCEMENT BY YEAR



REPORT FROM THE PASTEUR INSTITUTE,
P.o.B.923, BANGUI
(CENTRAL AFRICAN REPUBLIC)

FIRST HUMAN YELLOW FEVER VIRUS ISOLATION IN C.A.R.

Two strains of Yellow Fever (HB1504, HB1782) have been isolated from two fatal human cases in December 1985 and February 1986 in the Central African Republic (CAR).

The first case occured in a 36 year-old male who presented an hemorrhagic syndrome and died a few hours after his hospital admission. He used to live in Berberati in the damaged wet tropical forest environment.

The second case, a 25 years old male, originated from near Bangui (Kapou, 20 Km south of the capital), in a similar ecosystem of a Congo-Crimean phytogeographical domaine. The clinical picture was a severe hepatonephritis syndrome. The patient died 2 days after his hospital admission.

Both cases happened at the end of the rainy season beginning of the dry season.

We performed an environment investigation in Kapou area. At the same time a Yellow Fever immunization campaign was performed by the Public health department. 65 young children were bled for an antibodies survey, 60 % of the 0-9 age group showed antibodies against Yellow Fever. A previous survey in 1978 showed that 16 % or less were positive by HIA against Yellow Fever in the age group 0-9 year. However the last immunization campaign was performed in 1982. 62 mosquito monospecific pools caught in Kapou area and 37 tick pools were used for virus isolation in suckling mice after intra-thoracic (Aedes aegypti) and intracoelomic (Amblyomma variegatum) inoculation for virus enhancement. No virus were isolated. 19.5% of the mosquitoes collected on the field belong to Mansonia genus, 78.3% are distributed among 11 mosquito groups not known as potential vectors of Yellow Fever Virus.

Since 1955 no fatal human case of Yellow Fever has been reported in CAR, furthermore these human strains are the first isolated in CAR.

Up to now, Yellow Fever was considered as enzootic in

CAR and seroconversion in human population was observed without any epidemic manifestation nor severe clinical picture.

These virus isolates show active circulation of the Yellow Fever virus in CAR. Moreover another human case of Yellow Fever has been identified by specific IgM immunocapture assay without virus isolation; the patient came to the hospital for severe hepatitis with a quick evolution into renal failure and deep coma, death occuring at day 6 following the onset (A.J.Georges, unpublished). It is usual to isolate Yellow Fever Virus in CAR at the end of the rainy season, beginning the dry season. Concerning Kapou,no virus isolation were made from the environment survey probably because of the delay due to technical difficulties after notification of the case. The high prevalence of <u>Mansonia</u>, potential vector of Yellow Fever, can incriminate it in such observation; but in the absence of mosquito virus isolation nothing can be included for sure.

Nevertheless it is unusual to have Yellow Fever human cases in such an ecosystem. These can be explained by the fact that the "emergence zone", previously described seems to be displaced closer from the rain forest. The reason is anthropic deforestation transforming the moist forest into a forest-savannah mosaic favoring Yellow Fever Virus passage from its selvatic cycle to the human environment.

(A.J.GEORGES, M.GERMAIN, M.C.MADELON, G.GRESENGUET, J.M.DIEMER, J.L.LESBORDES and J.P.GONZALEZ)

Report from NERC Institute of Virology, Mansfield Road, Oxford, UK

VIRUS OF BEDBUGS

The bedbug, *Cimex lectularius* (Cimicidae:Hemiptera), is a cosmopolitan ectoparasite which is an obligatory haematophagous bug. It is associated with overcrowded insanitary habitation of man. Until recently there had been no evidence that *Cimex lectularius* harbours any virus. While examining the development of a bat trypanosome *Trypanosoma (Megatrypanum) incertum* in the bedbug we found large numbers of cytoplasmic arrays of virus-like particles in the epithelial cells of the ventriculus of this insect (Eley *et al*, 1987). The virus particles which were present in both adult and immature stages purified on 10-50% (w/v) sucrose gradients. The virions had a diameter of 56nm and appeared to be composed of an outer and inner shell. Nucleic acids contained within the virions was found to consist of 11 segments of dsRNA with a size range of 2.75 to 0.15 x 10. These particles, while having the morphology of reovirus are obviously somewhat smaller and they contain one segment too many to be members of the reovirus genus. The virions are possibly "misplaced" rotaviruses, although current dogma states that no arthropod vectors are involved in the transmission of rotaviruses. We were unable to cultivate the purified virions in suckling mice brain and a variety of insect and mammalian cell lines. Hence it is impossible to say if the "extra" dsRNA is the result of a mixed infection as the virus cannot as yet be plaque purified.

While this virus could be restricted to bedbugs the site of infection could make it transmissible during blood meals. The surface antigen of hepatitis B virus was detected in the bedbugs *Cimex hemipterus* from bedding in West African villages (Wills *et al*, 1977).

Further investigations of the aetiology of this virus is rendered more significant by a recent report (Lyons et al 1986) that Human Immunodeficiency Virus (HIV) can survive for 1 h in *Cimex lectularius* after feeding on blood-virus mixtures; these authors suggested that mechanical transmission by bedbugs was a possible route of transmission although Piot and Schofield (1986) have argued that the possibility of vector borne HIV infection is remote.

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REPORT FROM THE VIROLOGY PROGRAM
STATE OF NEW JERSEY DEPARTMENT OF HEALTH
TRENTON, NEW JERSEY

Arbovirus Surveillance in New Jersey, 1986

During the 1986 surveillance period from June into October, 3812 mosquito pools containing up to 100 mosquitoes each were tested for viruses in day old chicks. There were twenty-two (22) mosquito pools positive for Eastern encephalitis (EE) and Western encephalitis (WE) was isolated from thirty-five (35).

Table 1 summarizes the collection area totals, species of mosquito and time of collection for the EE isolates. Activity began with the mid August collections and continued into October. All twenty-two (22) isolates were from pools containing Culiseta melanura mosquitoes at four (4) sites.

WE mosquito activity is summarized in Table 2. The July collections yielded the first isolates with continued observation of WE activity into October. There were thirty-five (35) isolates from Culiseta melanura at four (4) sites.

An EE isolate was also made in September from a horse in Atlantic County.

Sentinel chicken flocks of six (6) cockerals were placed at five (5) sites. The flocks were bled weekly and St. Louis encephalitis hemagglutination inhibition tests were conducted. There were no conversions observed in the 320 sera tested.

(Shahiedy I. Shahied, Bernard F. Taylor, Wayne Pizzuti)

Virology Program
State of New Jersey, Department of Health
Trenton, N.J. 08625

Table 1
1986
EE MOSQUITO POOL ISOLATES
FOR WEEK ENDING

AREA COLLECTED	MOSQUITO SPECIES	8/15	8/22	8/29	9/5	9/12	9/19	9/26	10/3	10/10	10/17	AREA TOTALS
Bass River	Cs.melanura		1									1
Dennisville	Cs.melanura		1	1		1			1			4
Green Bank	Cs.melanura	3	2	5	2		1		1	1	1	16
Ocean City	Cs.melanura								1			1
WEEKLY TOTALS		3	4	6	2	1	1	0	3	1	1	22

Table 2
1986
WE MOSQUITO POOL ISOLATES
FOR WEEK ENDING

AREA COLLECTED	MOSQUITO SPECIES	7/4	7/11	7/18	7/25	8/1	8/8	8/15	8/22	8/29	9/5	9/12	9/19	9/26	10/3	10/10	AREA TOTALS
Bass River	Cs.melanura							1	1	1		1	1				5
Centerton	Cs.melanura							1	1				2	1	1		6
Dennisville	Cs.melanura	1			3	4	1	5	2	1					1	1	19
Green Bank	Cs.melanura							1	1	1			1		1		5
WEEKLY TOTALS		1	0	0	3	4	1	8	5	3	0	1	4	1	3	1	35

REPORT FROM WHO COLLABORATING CENTER FOR ARBOVIRUS REFERENCE AND RESEARCH, INSTITUTE OF VIROLOGY, BRATISLAVA, CZECHOSLOVAKIA

The detection of the antigen and antibodies to the eastern subtype of hemorrhagic fever with renal syndrome /HFRS/ in small rodents in Slovakia

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In 1984 we detected the antigen of hemorrhagic fever with renal syndrome /HFRS/ in the lungs of small rodents in Eastern Slovakia. It was found by the complement-fixation reaction that the antigens were closely related to the western subtype of HFRS. Antibodies to HFRS were detected in sera of Clethrionomys glareolus, Apodemus agrarius, Pitymys subterraneus collected in Eastern Slovakia and in the sera of Clethrionomys glareolus, Apodemus sylvaticus, Microtus arvalis and Microtus economus collected, in western Slovakia. In the present study we used the ELISA technique for the detection of HFRS antigen which is less time consuming than immunofluorescence procedure.

During 1985-1986 years small rodents were captured alive in Eastern and Western Slovakia. In the laboratory, the animals were autopsied and the lung specimens were collected;

148 specimens were collected in Western Slovakia and 47 specimens in Eastern Slovakia.

For the detection of HFRS antigen from the lungs of small rodents, enzymo-immunoassay /ELISA/ tests were used to select positive specimens. Out of 195 samples of small mammals of following species: Apodemus flavicollis /51 samples/, A. sylvaticus /48 samples/, Clethrionomys glareolus /74 samples/, Microtus arvalis /16 samples/, Apodemus agrarius /6 samples/, four antigens were detected by the ELISA method /Table 1/. The HFRS antigen was detected in the lungs of Apodemus agrarius, collected in Eastern Slovakia and Microtus arralis, collected in Western Slovakia. The HFRS antigen detected in the lungs of A. agrarius was closely related to the eastern subtype of HFRS; the antigens detected in the lungs of M. arralis were closely related to the western subtype of HFRS /Table 2/. The results of serological survey on 47 sera of small rodents collected in Eastern Slovakia with the antigen of HFRS indicate the existence of natural focus of eastern subtype of HFRS in Eastern Slovakia. Antibodies were found in the following free-living rodents: Apodemus flavicollis and A. agrarius.
A total 5 out of 47 small rodents trapped in investigated localities of Eastern Slovakia had antibodies to HFRS antigen /Table 3/. The higher titers of antibodies were detected with the eastern subtype of HFRS antigen.

It is of interest that in Apodemus agrarius No 317 and No 320, the viral antigen of HFRS was detected in the lungs simultancously with antibodies.

Table 1

Detection of viral antigen of HFRS in the lung suspension of small rodents by enzyme-immunoassay /ELISA/

Species	No of examined species	No of positive by ELISA
Apodemus flavicollis	51	0
Apodemus agrarius	6	2^{+}
Apodemus sylvaticus	48	0
Clethrionomys glareolus	74	0
Microtus arvalis	16	2^{++}

\+ = The eastern subtype of HFRS

++ = The western subtype of HFRS

Table 2

Comparison of antigens of hemorrhagic fever with renal syndrome /HFRS/ with eastern and western type of antiserum

Strain No./isolated from	Western type of HFRS antiserum	Eastern type of HFRS antiserum
317/ Apodemus agrarius	0	+
320/ Apodemus agrarius	0	+
141/ Microtus arvalis ≁	+	0

≁ One antigen detected in M. arvalis was not sterile, therefore it was not used in the experiments

Table 3

Comparison of antibody titres to HFRS in small rodents by IF tests with the eastern and western subtypes of HFRS antigen

IF antibodies in species No	IF titres with	
	Eastern type of HFRS antigen	Western type of HFRS antigen
Apodemus flavicollis No 291	64	16
A. flavicollis No 294	128	16
A. flavicollis No 313	32	< 16
Apodemus agrarius No 317	64	< 16
A. agrarius No 320	128	< 16

HFRS = Hemorrhagic fever with renal syndrome

IF = Immunofluorescence

REPORT FROM THE ARBOVIRUS UNIT, NATIONAL INSTITUTE FOR VIROLOGY, PRIVATE BAG X4, SANDRINGHAM 2131, SOUTH AFRICA.

THE HUT TAMPAN, ORNITHODOROS MOUBATA MURRAY (ARACHNIDA : ARGASIDAE) AS VECTOR OF HEPATITIS B VIRUS IN NAMIBIA.

Two earlier studies showed that the human population of the territories of Northern Namibia bordering on Angola had a high positivity rate for hepatitis B virus (HBV) (Bersohn et al, 1974, Botha et al, 1984). In 1985 further observations were reported in regard to one of these territories, the Kavango region, situated in the north eastern corner of the country. These showed that only 1.9% of the subjects tested were negative for all the HBV markers used indicating that infection had been present at some stage in 98.1% of the sample (Joubert et al, 1985[1]). Since none of the usual transmission methods for HBV seemed to explain this high positivity rate in Kavango, the hut tampan tick, Ornithodoros moubata Murray, came under consideration as a possible vector. This argasid tick was found to be very prevalent occurring in about 80% of the huts of the local people where it also acts as a vector of Borrelia duttoni, the cause of relapsing fever (Joubert et al, 1985[2]). Samples of tampans were collected in huts and infection rates of 150.4 and 26.4 per 1000 ticks were demonstrated for the HBsAg and HBeAg respectively in these ticks (Joubert et al, 1985[2]). These high infection rates suggested the tampan probably acted as a mechanical vector of HBV in a similar manner to that in which the bedbug, Cimex lectularius, probably acts in the northern Transvaal (Jupp et al, 1983). It was therefore decided to assess the vector competence of O. moubata in the laboratory to see whether such experiments would provide further evidence incriminating it as a vector of HBV.

Wild-caught and colonized tampan ticks (Ornithodoros moubata) were fed on Hepatitis B virus (HBV) - positive blood-meals in a series of four experiments. HBsAg persisted in nymphal and adult ticks for up to 779 days, while HBeAg persisted in mature nymphs up to 13 days, in adult males up to 11 days and in adult females up to 16 days. HBsAg was transmitted trans-stadially through two moults during the life cycle but transovarial transmission did not occur. The surface antigen was transmitted by two out of 15 single ticks into 0,4 ml aliquots of HBV-negative blood, although 6 groups of ticks failed to transmit into 5,5 ml aliquots of blood: this antigen was not transmitted to hamsters. HBsAg was detected in samples of the ticks' coxal and rectal fluid secretions always at the infecting feed and usually at the second feed. HBeAg was only detected in one of 2 samples of coxal fluid collected at the infecting feed. The results as a whole indicate that no biological multiplication of virus occurs in O. moubata but that mechanical transmission from ticks to man could occur by: (i) contamination of a person when crushing infected ticks; (ii) infection by bite; (iii) contamination with coxal fluid, especially by scratching bites. This is thought to take place among the Kavango tribe in their village huts in north eastern Namibia where infestations of infected O. moubata occur.

This work was done in co-operation with J.J. Joubert, C. Swanevelder and O.W. Prozesky of the Institute for Pathology, Pretoria University.

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ARBOVIRUS ANTIBODY SURVEY ON SERA FROM POTENTIAL DENGUE REGIONS

Dengue has not been confirmed in South Africa since 1926-7, but outbreaks in East Africa, the most recent being in Mozambique in 1984, have caused concern that the virus could be re-introduced. A survey was carried out on human serum samples collected from Natal, Kwazulu and eastern Transvaal. These sera were tested against various arbovirus antigens including dengue to provide up to date information on arthropod-borne virus activity in these regions.

A total of 2233 sera were collected from 5 main sources: employees at Cato Ridge Abattoir in Durban, Natal hospitals, Kruger National Park, inpatients and outpatients at 4 Kwazulu hospitals and routine specimens submitted to the laboratory. The sera were screened using the fluorescent antibody technique on multispot slides. Positives were tested by the haemagglutination-inhibition (HAI) method with the following results:-

Source	No.	HAI Positive ($\geq$1:20)					
		SIN	CHIK	WSL	WN	DEN	RVF
Cato Ridge	604	2	0	1	18	3	8
Natal hospitals	866	13	0	3	29	0	0
Kruger Nat. Park	481	16	9	12	18	0	3
Routine specimens	107	10	2	8	14	6	0

Source	No.	HAI Positive								
		SIN	CHIK	WSL	WN	DEN	RVF	YF	ING	GERM
Hospital Patients Kwazulu	178	2	2	0	7	0	5	5	2	19

Any dengue HAI positives were tested by the more specific complement fixation (CF) test.

The results of CF tests on dengue HAI positive sera were as follows: one from Cato Ridge was positive for dengue, this person resided in Durban at the time of the 1926-27 epidemic. Four of the six routine sera were suspicious but because of the cross reactivity with other flaviviruses could not be confirmed as dengue, one was confirmed by isolation of dengue type 1 virus and one was negative. All of these routine sera were from patients who had recently returned from India where dengue is endemic.

The conclusion from this survey was that there had been relatively low arbovirus activity in the areas tested and the population would probably be susceptible to dengue virus infection. Dengue virus was introduced into Durban by an individual returning from an endemic region, fortunately it does not appear that the virus has become established.

PRESENCE OF ARBOVIRUS ANTIBODIES IN DOGS

Dog sera from the eastern Free State and from Pretoria North were tested for the presence of arbovirus antibodies. A selection of negative sera were submitted for virus isolation.

Haemagglutination inhibition results on dog sera.

Number with HI titre >1:20

No. tested	West Nile	Wesselsbron	Sindbis	RVF
377	174	57	46	0

All of the dogs with antibodies to Wesselsbron virus had higher titres to West Nile virus, so these are unlikely to be as a result of Wesselsbron virus infection. Seventy-nine per cent of the WN HI positive sera and 28 per cent of the SIN HI positive sera were positive by the neutralisation test. Because of the high incidence of WN antibodies in dogs and the particularly high titres in some cases, virus isolation was attempted on 110 WN HI negative sera. West Nile virus was isolated from the serum of one of these dogs.

MONOCLONAL ANTIBODIES AGAINST CRIMEAN-CONGO HAEMORRHAGIC FEVER

Seven monoclonal antibodies were prepared against a South African strain of Crimean-Congo haemorrhagic fever (CCHF) virus and were found to be directed against viral nucleocapsid protein. Five of the monoclonal antibodies reacted to high titre in indirect immunofluorescence (IF) tests and enzyme-linked immunosorbent assays with 22 strains of CCHF virus and failed to cross-react with the closest antigenic relative of CCHF, Hazara virus, or with 4 other nairoviruses which need to be distinguished from CCHF virus in Africa. These antibodies, used in the IF technique, readily detected antigens induced by all strains of CCHF virus included in the study in cell culture monolayers and mouse brain tissue, which represent the systems commonly used for isolation of CCHF virus. The IF technique with monoclonal antibodies constitutes a rapid and specific means of identifying newly isolated strains of CCHF virus.

ANTIGENIC RELATIONSHIP OF WEST NILE STRAINS

The antigenic relationship of several South African WN isolates to each other and to the two main WN antigenic groups was assessed. The method used was the calculation of titre ratios or 'R' values from heterologous and homologous neutralisation titres, using the formula $R = 100\sqrt{r_1 \times r_2}$, R is expressed as a percentage.

Titre ratio or 'R' value between the South African, Indian and Egyptian WN strains expressed as a percentage.

West Nile Virus Strains

		EG101	G2266	H442	735	730	739	778
	EG101	100						
	G2266	27	100					
West	H442	16	25	100				
Nile	735	32	7	50	100			
Virus	730	50	10	11	46	100		
Strains	739	33	27	21	30	42	100	
	778	30	21	23	38	65	56	100

None of the local isolates in this group were significantly closely related to either EG101 or G2266. AR20735 and AR20730 were much closer to the Egyptian strain than to the Indian. Contrary to the findings of other workers, H442 was shown to be antigenically distinct from the Egyptian strain with an 'R' value of only 16 per cent. This is probably due to the NT test being more specific than the modified haemagglutination inhibition test used in that study.

(N.K. Blackburn, P.G. Jupp, T.G. Besselaar, G.M. Meenehan and A.J. Cornel)

REPORT FROM THE VIRUS LABORATORY, FACULTY OF MEDICINE, BP 815, 29285 BREST CEDEX, FRANCE

ARBOVIRUSES AND SMALL WILD MAMMALS IN WESTERN TURKEY: A SEROSURVEY.

Turkey is located in the oriental mediterranean bassin, Palearctic region. This country is concerned by biannual palearctic-ethiopian migrations of birds and the local climatic conditions are a priori favourable to the circulation of some arboviruses. However, relatively few arbovirus studies were so far performed here (Radda, 1971 - Tesh et al, 1976 - Serter, 1980).

During entomological surveys carried out in 1981, in the Western part of the country, 53 wild small mammals (rodents, insectivora) were caught alive and their sera collected. They were studied for antibody against 17 different arboviruses belonging in 8 different genera.

The results gave good evidence of the possible activity of a Phlebovirus in the surveyed area.

MATERIAL AND METHODS

Small wild mammals were trapped in May 1981 in the vicinity of Gölcük, near Odemis, Vilayet Izmir, about 70 km in the south-east of Izmir town (map). The mean altitude was about 1,100 meters.

Sera were obtained on blotting paper strips from 33 Apodemus sylvaticus, 6 Mus musculus, 16 Pitymys majori, 2 Microtus epiroticus and 2 Crocidura suaveolens.

Sera were studied by hemagglutination inhibition (HI) and complement fixation (CF) tests using micromethods. We used 12 antigens in HI tests: Sindbis (SIN), Chikungunya (CHIK), West Nile (WN), Dengue type 2 (DEN2), Wesselsbron (WSL), European tick-borne encephalitis (TBE), Meaban (MEA), Bhanja (BHA), Tahyna (TAH), Sandfly fever Sicilian (SFS) and Arumowot (AMT). In CF, five antigens were tested: Qalyub (QYB), Quaranfil (QRF), Tribec (TRB), Essaouira (unregistered, Chenuda complex, Orbivirus), and Soldado. Essaouira and Soldado have been isolated previously in Morocco from Ornithodoros (A.) maritimus ticks infesting herring gull'nests (Larus cachinnans) on Essaouira island (Chastel et al, 1981, 1982).

RESULTS

By HI tests, 3 sera (or 5.7%), all from field mice (A. sylvaticus), were found positive for the Arumowot (AMT) antigen only. Two sera reacted with a titer of 1:20 and the third was a titer of 1:40. No cross reaction was observed with SFS virus, another phlebovirus. All other HI and CF tests were negative (Table 1).

COMMENTS

Previous serosurveys were performed in human beings by Tesh et al (1976) on Antalya area and by Serter (1980) on the Turkish coasts of Egean sea (map).

Tesh et al demonstrated neutralizing (NT) activity to Sandfly fever Naples virus (62% of sera) and to SFS virus (22%).

Serter used another phleboviruses as antigens and found antibody to Salehabad virus (0.46% of sera), a phlebovirus giving cross serological reaction with AMT virus. Serter also found antibody to SIN, WN, Dengue type 1, TBE, SFS and TAH viruses.

Radda (1971) examined sera from domestic animals and wild rodents from Ankara area in Anatolia, and from Iskenderun and Antakya areas near the northern border of Syria. He found antibody to flaviviruses (WN, Murray Valley encephalitis, DEN2) in sheep,cattle and 'field mice' (species not recorded).

Our results gave evidence of the possible circulation of a phlebovirus, AMT or a virus very close to it, in the Gölcük area, Vilayet Izmir.

AMT virus is a widely transmitted phlebovirus circulating in Africa among mosquitoes (*Culex antennatus*, *C. rubinotus*) and rodents or insectivora: *Tatera kempii* (Gerbillidae), *Arvicanthis niloticus*, *Thamnomys macmillami*, *Mastomys* sp. (Muridae) and *Crocidura* sp. (Soricidae).

New entemological and virological studies are needed in order to confirm the actual circulation of this ubiquitous virus in Western Turkey.

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MAP OF TURKEY

Studied species	Number of positive reactions /Number of sera studied
Rodents:	
Muridae	
Apodemus sylvaticus	3/33
Mus musculus	0/6
Arvicolidae	
Pitymys majori	0/11
Microtus epiroticus	0/2
Insectivora:	
Soricidae	
Crocidura suaveolens	0/1
TOTAL	3/53 (5.7%)

Table 1. Animal species studied and positive reactions to Arumowot virus Western Turkey (1981).

ARBOVIRUS SURVEILLANCE IN CALIFORNIA DURING 1986

Viral and Rickettsial Disease Laboratory, California Dept. of Health Services

Following an unprecedented occurrence of epidemic St. Louis encephalitis in urban and suburban areas of southern California during 1984, when 26 cases (1 fatal) were confirmed, expanded surveillance and control measures were taken in this region as well as in the traditional endemic areas of the Sacramento, San Joaquin, and Imperial Valleys. Data from 1984 and the early part of 1985 were given in previous issues of this Exchange. Fortunately, 1985 and 1986 seasons were not so severe as in 1984. During 1985, only 3 human cases of SLE were detected: a 17 year old boy from Riverside County; a 31 year old man from San Bernardino County, with exposure most probably along the Colorado River near Needles; and a 61 year old woman from the North Hollywood area of Los Angeles County. No equine or human cases of WEE were found. From 4,417 mosquito pools tested, 30 SLE, 28 WEE, 18 CEV group, 48 Turlock, 122 Hart Park, and 2 Main Drain virus isolates were recovered. All isolates were from Culex tarsalis, except for 15 CEV group from Aedes melanimon, 1 Turlock and 2 Hart Park from C. pipiens complex, 1 Turlock from C. erythrothorax, 2 Main Drain from Aedes taeniorhynchus, and 1 SLE from C. peus. Of 55 sentinel chicken flocks sampled monthly in the state, seroconversions for WEE and SLE occurred only in 6 flocks in southern California sites.

The program during 1986 was carried out as in previous years, but was expanded further. As usual, it represented collaborative efforts by local mosquito abatement agencies; local health departments; the California State Department of Health Services (Viral and Rickettsial Disease Laboratory, Vector Surveillance and Control Branch, Infectious Disease Branch, and Veterinary Public Health Unit); the Arbovirus Research Unit, Department of Biomedical and Environmental Health Sciences, School of Public Health, University of California, Berkeley; The California Department of Food and Agriculture; many private physicians and veterinarians; and the Microbiology Reference Laboratory, Cypress, Ca.

Only 3 human SLE cases were detected: (1) a 59 year old man from Covina, Los Angeles Co., with onset July 3, who was a truck driver with routes over a wide area of southern and central California and parts of Nevada, so source of mosquito exposure could not be decided; (2) a 66 year old man from Norwalk, Los Angeles Co., onset July 13, with mosquito exposure at his home; and (3) a 37 year old man from El Monte, Los Angeles Co., onset September 20, source of mosquito exposure most likely at his home site. Diagnoses were confirmed in these cases by CF, IFA, and IFA-IgM serologic tests. Two cases of WEE were found: (1) an infant girl, born May 12, 1986, who became ill August 7. The home environment near Sacramento was the likely site of exposure; and (2) a 37 year old woman from Yolo Co., with aseptic meningitis August 18, and likely exposure either at her home site or on a trip to Sierra Co. 8-10 days earlier. The CF, IFA, and IFA-IgM tests were helpful diagnostically in these cases also. Only 1 WEE case in an equine was confirmed: a 2 year old unvaccinated mare from Shasta Co., with onset September 1.

From 4,536 mosquito pools tested in cell culture systems and/or suckling mice there were 305 virus isolates: 51 SLE, 35 WEE, 47 CEV group, 133 Turlock, 38 HP, and 1 unidentified virus. All WEE and SLE isolates were from C. tarsalis, except 1 WEE from C. erythrothorax, 1 WEE from C. peus, 2 SLE from A. dorsalis, 1 SLE from C. peus, and 5 SLE from C. pipiens complex. There were 59 sentinel chicken flocks bled monthly during the season. Seroconversions for WEE were seen in June (Westside District) and August (Butte and Turlock Cos.), then fairly high seroconversion rates in September and October in northern and central counties. As usual, WEE activity was also seen in southern California (Coachella Valley, Imperial Co., and the Colorado River) beginning in July. Seroconversion for SLE was seen in Imperial Co., the Coachella Valley, Orange Co., Los Angeles Co., Kern Co., a Westside flock, and a Sacramento/Yolo Co. flock. Details of this summary are published each year in the Proceedings and Papers of the annual Conference of the California Mosquito and Vector Control Association, Inc.

R.W.Emmons, M.D.,Ph.D.

REPORT FROM THE DEPARTMENT OF EPIDEMIOLOGY, SCHOOL OF PUBLIC HEALTH, UNIVERSITY OF SÃO PAULO, BRAZIL.

Host feeding patterns and domiciliarity development of Ribeira Valley mosquitoes, S. Paulo, Brazil.

Blood-meals identification, from mosquitoes collected in 5 different Ribeira Valley environments, were made through precipitin tests. Sources of 1444 blood-meals were identified showing that *Aedes* fed chiefly on mammals, while *Culex* (*Culex*) showed feeding patterns directed to avian hosts. *Ae. scapularis* presented preference for cattle and horses. On the whole, *Culex* (*Melanoconion*) showed large ecletic pattern including amphibian, avian, mammals and reptilian. Anthropophily was observed for several species, mainly *Ae. scapularis*, *Cx. sacchettae* and *Cx. ribeirensis* who showed high human blood rates in the indoor collections. Endophily studies were made through collections searching resting mosquitoes at the early morning, from all domiciliary and peridomiciliary environments. The use of diversity index and similarity quotient allows to reach some insight about resources and its distribution. So these endophily studies gave data that suggests some degree of endophilic evolution by *Ae. scapularis*, *Cx. ribeirensis* and *Cx. sacchettae*. This behaviour is submited to the influence of extrinsic factors as cattle density and human behaviour for the environment management.

(Forattini, O.P.; Gomes, A.C.; Natal, D.; Kakitani, I and Marucci, D.).

REPORT FROM THE SPECIAL PATHOGENS UNIT, NATIONAL INSTITUTE FOR VIROLOGY, SANDRINGHAM, 2131, REPUBLIC OF SOUTH AFRICA.

1. CRIMEAN-CONGO HEMORRHAGIC FEVER IN SOUTHERN AFRICA.

1.1 Human disease and distribution of the virus.

From February 1981 to December 1986 42 cases of Crimean-Congo hemorrhagic fever (CCHF) were diagnosed in 29 outbreaks in various locations in South Africa. A further 2 cases which were imported, arose in Zaire and Tanzania while 3 cases were diagnosed in Namibia. 13 patients were infected by tickbite, 16 had contact with livestock tissues, 8 gained nosocomial infection and of the remaining 10 it is merely known that they resided in or visited a rural environment.

The clinical features of infection conformed to the classical descriptions of CCHF in the Soviet Union. Following an incubation period of usually less than a week, patients suffered sudden onset of fever, nausea, prostrating headache and myalgia. Early leukopenia, thrombocytopenia and elevated serum transaminases were followed on days 3 to 5 of illness by a petechial rash and epistaxis, hematemesis and melena. The occurrence of 13/47 deaths indicates that the African disease is no less severe than that which occurs in Eurasia.

Antibody to CCHF virus was detected by reversed passive hemagglutination-inhibition (RPHI) in 2,460/8,667 (28%) cattle sera (140/180 herds) tested in South Africa, as well as in 347/763 (45%) cattle sera (32/34 herds) in Zimbabwe. It is inferred that the virus will yet be found to be widespread in all countries in Africa and Eurasia which lie within the limits of world distribution of ticks of the genus _Hyalomma_.

1.2 Antibody to CCHF virus in wild mammals.

Sera from 3,772 wild mammals of 87 species and from 1,978 domestic dogs collected in South Africa and Zimbabwe between 1964 and 1985 were tested for antibody to CCHF virus by RPHI and/or by indirect immunofluorescence (IF). Antibody was found to be highly prevalent in large mammals in the Orders _Artiodactyla_ and _Perissodsctyla_ such as giraffe, _Giraffe camelopardalis_ (3/3 positive), rhinoceros, _Ceratotherium simium_ and _Diceros bicornis_ (7/13), eland, _Taurotragus oryx_ (59/127), buffalo, _Syncerus caffer_ (56/287), kudu, _Tragelaphus strepsiceros_ (17/78), and zebra, _Equus burchelli_ (16/93). In small mammals antibody was found in the sera of 40/293 hares, 22/1,305 rodents and 1/74 wild carnivores but not in 522 primates, 176 insectivores or 129 hyrax. Antibody was also found in the sera of 118/1,978 domestic dogs. The fact that some of the sera had been in storage for over 20 years, indicates that CCHF virus became disseminated in southern Africa a long time ago. The species of wild mammal in which antibody was distributed (with highest antibody prevalence in hares and large herbivores) reflects the feeding preference of immature and adult ticks of the genus Hyalomma, suggesting that Hyalomma sp. are the principal CCHF vectors in the wild. The results of the study implicate several mammalian species as possible amplifying hosts, but whether they are capable of acting in this regard awaits further study.

1.3 CCHF infection in 13 mammal and 7 tick species.

Thirteen species of domestic and wild mammals were infected with CCHF virus in order to determine the potential role of each in the virus transmission cycle. Low-titered viremia (maximum 4.0 $\log_{10}$ LD_{50}/ml) followed by development of antibody occurred in sheep, calves, scrub hares (Lepus saxatilis), and 5 rodent species [the white-tailed rat (Mystromys albicaudatus), the bushveld gerbil (Tatera leucogaster), the red veld rat (Aethomys chrysophilus), the striped mouse (Rhabdomys pumilio) and the Cape ground squirrel (Xerus inauris)]. Antibody response only was detected in hedgehogs and a further 4 rodent species [the South African hedgehog (Erinaceus frontalis), the highveld gerbil (Tatera brantsii), the Namaqua gerbil (Desmodillus auricularis) and both species of multimammate mouse Mastomys coucha 2N=36 and M.natalenis 2N=32)].

Ticks failed to become infected when fed on viremic sheep and rodents, but the virus was detected transiently in a few of the Hyalomma truncatum, Amblyomma hebraeum, Rhipicephalus evetsi evertsi, Rh.appendiculatus and Boophilus decoloratus ticks which fed on calves and hares. However, transovarial transmission of virus did not occur.

The virus failed to replicate in 3 argasid tick species (Argas walkerae, Ornithodoros savignyi and O.porcinus porcinus) inoculated intracoelomically, but multiplied to high titer (maximum 6.3 $\log_{10}LD_{50}$/ml) in 4 ixodid tick species (H.truncatum, H.marginatum rufipes, Rh.evertsi mimeticus and A.hebraeum) and persisted in the ticks for up to 205 days. Three of the ixodid tick species (H.truncatum, H.m.rufipes and Rh.e. mimeticus) transmitted CCHF infection to sheep by bite, but transovarial transmission of virus to the progency of infected females was not detected.

1.4 CCHF infection in birds.

In November 1984, a case of CCHF occurred in a worker who became ill after slaughtering ostriches (Struthio camelus) on a farm near Oudtshoorn in the Cape province of South Africa. The diagnosis was confirmed by isolation of CCHF virus from the patient's serum and by demonstration of a specific antibody response. It was suspected that infection was acquired either by contact with ostrich blood or by inadvertantly crushing infected Hyalomma ticks while skinning ostriches. Reversed passive hemagglutination-inhibition antibody to CCHF virus was detected in the sera of 22/92 ostriches from farms in Oudtshoorn district, including 6/9 from the farm where the patient worked, but not in the sera of 460 birds of 37 other species. In pathogenicity studies domestic chickens proved refractory to CCHF infection, but viremia of low intensity (maximum titre 2.5 log_{10} mouse ic LD_{50}) followed by a transient antibody response occurred in blue-helmeted guinea fowl (Numidia meleagris). These results constitute the first direct evidence that some bird species are susceptible to CCHF virus infection.

1.5 Isolation and titration of CCHF virus.

Fluorescent focus assay and plaque assay in CER cells were compared with mouse inoculation for isolation and titration of CCHF virus. Fluorescent focus assay and plaque assay were of similar sensitivity but both produced 10 to 100-fold lower titers than mouse inoculation. In specimens tested from 26 CCHF patients, virus was isolated from 20 in mice and from only 11 in cell culture. Although cell cultures were less sensitive for isolation of virus from clinical specimens they produced diagnostic results much more rapidly.

1.6 Antigen detection in diagnosis of CCHF fever.

Enzyme-linked immunosorbant assay (ELISA) and reversed passive hemagglutination (RPHA) tests were evaluated for rapid detection of CCHF virus antigens. Both RPHA and ELISA detected CCHF antigen in the brains of infant mice 2 to 3 days after infection; several days before the animals sickened and died. Antigen was also detected after 1 to 2 days in infected cell culture extracts and after 2 to 4 days in culture supernatant fluids. Both tests detected CCHF antigen at threshold values of approximately 10^3 tissue culture infective doses per ml of infectivity and were more sensitive than complement fixation, immunodiffusion or IF. In a comparative study on specimens from CCHF patients, virus was isolated from 38/49 sera and from 23/28 patients. Antigen was detected in 20/49 sera (15/28 patients) by RPHA and in 29/49 sera (18/28 patients) by ELISA. Antigenemia was detected more frequently in fatal cases (9/11) than in non-fatal cases (9/17). The results suggest that RPHA and ELISA may be of use in rapid diagnosis of CCHF infection, particularly in severe cases where the danger of nosocomial spread is greatest.

2 ARENAVIRUSES IN SOUTHERN AFRICAN RODENTS.

Sera of 4023 rodents collected over a period of 16 years in South Africa and Zimbabwe for unrelated purposes, were tested by IF for antibody to African arenaviruses using cells infected with Lassa fever and Mopeia viruses as antigen. Antibody was found in 15/28 species; most frequently in Aethomys namaquensis [20/136 (14.7%) positive; titers 1:8 - 2048], Mastomys natalensis (2N=32)[311/637 (48.8%) positive; titers 1:32 - 16384], Otomys irroratus [46/213 (21.6%) positive; titers 1:8 - 8192] and Otomys unisulcatus [33/164 (20.1%) positive; titers 1:8 - 2048]. In contrast, only 6/620 (1.0%) Mastomys coucha (2N=36) had antibody. 832 serum and organ specimens from 713 individuals of 4 species were tested in cell cultures and 17 arenavirus isolations were obtained: 10 from

M.natalensis, 5 from O.unisulcatus and 1 each from O.irroratus and A.namaquensis. Preliminary characterisation, including tests with monoclonal antibodies, suggest that the M.natalensis viruses correspond to Mopeia virus while the other isolations appear to comprise two new arenaviruses.

The medical significance of the arenaviruses in southern Africa has yet to be determined.

(R Swanepoel, A J Shepherd, P A Leman, T Whistler, D E Gill, L Searle and J C Abbott)

REPORT FROM THE MEDICAL RESEARCH COUNCIL OF NEW ZEALAND'S VIRUS RESEARCH UNIT, UNIVERSITY OF OTAGO, DUNEDIN, NEW ZEALAND.

DENGUE TYPE 3 ON NIUE ISLAND:

Niue Island is situated some 1300 km north east of Auckland, New Zealand, and has a population of approximately 2,500 persons living in 13 separate villages. In January 1986, the Department of Health, Niue, became aware of cases resembling dengue fever occurring in Alofi, the main business centre for the island. The island had experienced major epidemics of dengue type 2 in 1972 (90% attack rate, 12 deaths) and dengue type 4 in 1980 (attack rate 33%, 4 deaths). Of 157 paired sera from suspected cases received from the Health Department, Niue, in this Unit, 137 had flavivirus HI antibody in one or both specimens. Twenty-four of these had relatively low antibody levels (1:10-1:40) and did not show diagnostic rises between acute and convalescent specimens. Of the remainder, 20 showed high antibody levels in both, but not diagnostic rises, while the remaining 93 all showed four-fold or greater increases in antibody level. Forty-nine of these had increases of equal to or greater than 64-fold and 19 had rises of 512-fold or greater when dengue was used as the HA antigen.

Acute phase sera were inoculated into cultures of *Aedes albopictus* cells (C6/36 clone) and three identical haemagglutinating agents were isolated from three different patients of 69 tested. These agents agglutinated goose erythrocytes at pH 6.0 and this agglutination was inhibited by dengue-specific rabbit antiserum. Positive identification of these viruses as dengue type 3 was accomplished by fluorescent antibody staining of infected C6/36 cells with type-specific dengue monoclonal antibodies (kindly supplied by the Centers for Disease Control, Atlanta) and by biotin-streptavidin enzyme-linked immunosorbent assay. Reisolation of virus from the original specimens was positive in each case.

Dr C.F. Tukuitonga, Acting Director of Health, Niue, reported that retrospective studies indicated that the epidemic began in November 1985 and that some 544 cases were reported (attack rate 21%) with two patients showing DSS. No deaths were recorded. Both sexes were equally affected. The epidemic ended in the first week of April, 1986.

(T Maguire)

REPORT FROM MICROBIOLOGY SECTION, CSIRO, DIVISION OF TROPICAL ANIMAL SCIENCE, LONG POCKET LABORATORIES, INDOOROOPILLY, BRISBANE, AUSTRALIA.

Isolation of Arboviruses from Cattle and Insects at Sentinel sites in Queensland, Australia, 1979-1985.

Isolations from Cattle

Arboviral infections of cattle were monitored in and near 2 sentinel herds, 1 located in the north of the state at Kairi (145°33'E, 17°13'S) 60 km W of Cairns and 1 in the southeast at Peachester (152°53'E, 26°51'S) 70 km N of Brisbane. The sentinel herds consisted of 10-20 heifers introduced into the group during Jul-Aug, when 8-9 months old. Animals were bled monthly or more frequently until the following July-August when a fresh group was substituted. Isolations are shown in Tables 1 and 2.

TABLE 1. Isolation of Arboviruses from Sentinel Cattle - Kairi, Queensland, Australia, 1979-1982.

Summer	No. of Isolates	Virus	Period of Collection
1979-1980	31	Bunyip Creek	December-March
	4	CSIRO Village	January-February
	4	D'aguilar	January-March
	1	Peaton	January
1980-1981	2	Bunyip Creek	February-March
	5	CSIRO Village	February-March
	4	Akabane	January-February
	2	BEF	December, February
	3	BLU-1	March
	3	EHD-7	March
1981-1982	2	Bunyip Creek	February-March
	1	CSIRO Village	March
	3	D'aguilar	January-February
	1	Douglas	December
	3	EHD-5	January, March
	1	EHD-7	April

The BLU group viruses were only isolated through Aedes albopictus C6/36 cells (AA). The Simbu group viruses (Akabane, Peaton and Douglas), the Palyam group viruses (Bunyip Creek, CSIRO Village and D'aguilar) and the BEF group virus, Kimberley, were only isolated in BHK21 cells. The Simbu group virus, Aino was isolated in suckling mice, (first record from cattle). The EHD serotype 6 and serotype 7 viruses (EHD serotype numbers proposed by C.H. Campbell and T.D. St.George) and 11/13 EHD serotype 5 viruses were isolated through AA cells. The remaining two EHD-5 viruses were isolated in BHK21 cells. BEF virus was isolated in all 3 systems, 18 isolations through AA cells, 2 isolations in BHK21 cells and 1 isolation in suckling mice. Serology confirmed that cattle were infected with all viruses.

TABLE 2. Isolation of Arboviruses from Sentinel Cattle - Peachester, Queensland, Australia, 1979-1985.

Summer	No. of Isolates	Virus	Period of Collection
1979-1980	4	Bunyip Creek	February, April
	12	CSIRO Village	January-February
	1	D'aguilar	April
	1	Aino	December
	4	Akabane	December
	2	BEF	February
1980-1981	11	Bunyip Creek	December-April
	18	D'aguilar	November-January
	2	Akabane	December, March
	7	EHD-5	January-February
	4	EHD-6	February-April
1981-1982	2	Bunyip Creek	March
	119	CSIRO Village	December-February
	2	D'aguilar	March
	2	Akabane	November, January
	11	BEF	January
	1	Kimberley	January
	1	EHD-5	March
1982-1983	1	Bunyip Creek	April
	1	CSIRO Village	December
1983-1984	1	CSIRO Village	March
	3	BEF	January
1984-1985	17	Bunyip Creek	January
	8	Akabane	December
	2	EHD-5	April

Isolations from Biting Midges and Mosquitoes

During an outbreak of bovine ephemeral fever at Peachester, in Jan/Feb 1984, biting midges and mosquitoes were collected over a 3 week period by means of truck traps, light traps and cow baited collections. A total of 14338 midges of 4 species was processed in 156 pools, and 9030 mosquitoes of 27 species were processed in 232 pools. Each pool was processed in parallel in BHK21 tissue cultures, and by intrathoracic inoculation of Ae. aegypti mosquitoes which were then held alive for a period of 10 days at 20°C then assayed in BHKs. All pools inoculated into BHKs were passaged twice before being discarded as negative. Of the 388 pools, 90 were also processed in Ae albopictus tissue cultures then passaged twice in BHKs.

TABLE 3. Isolation of Arboviruses from Insects - Peachester, Queensland, Australia, Jan/Feb 1984.

Species	Virus Group	Virus	Isolation system			
			BHK only	BHK and Ae aeg.	Ae aeg. only	AA only
C. brevitarsis (11025 insects/ 109 pools)	Simbu	Akabane	5	5**	-	-
	Palyam	D'Aguilar	8	-	-	-
		Bunyip Ck	4	-	-	-
		CSIRO Village	3	1	-	-
	Orbi	EHD5	-	-	4	-
	Rhabdo	BEF	-	-	1	-
		Tibrogargan	-	-	3	-
	Undetermined		1	-	-	-
C. wadai (2811/38)	Simbu	Akabane	1	-	-	-
Cx edwardsi (1829/37)	Alpha	Sindbis	-	1*	-	-
	Corriparta		-	1*	-	-
	Maputta Gp		-	1*	-	1
	Rhabdo	Oakvale	1*	6**	2	-
	Undetermined		-	-	1*	-
Cx bitaeniorhynchus (362/9)	Alpha	Sindbis	-	1*	-	-
	Undetermined		-	-	-	1
Cx orbostiensis (3898/78)	Corriparta		-	-	-	1
	Undetermined		-	-	1	-
Cx annulirostris (928/24)	Undetermined		-	-	-	1
Ae (Ver) No. 52 (920/23)	Barmah Forest		1*	-	-	
	Undetermined		-	-	2*	-
An bancroftii (92/5)	Rhabdo	BEF	-	-	1	-

* Each asterisk denotes a parallel isolation in AA tissue cultures.

Table 3 shows the viruses which were isolated and the insect species from which they were isolated. The different isolation systems produced different virus groups from Culicoides brevitarsis. Palyam group viruses were isolated in BHKs but not in Ae aegypti. Orbiviruses (EHD) and rhabdoviruses (BEF, Tibrogargan) were isolated after passage through live Ae aegypti but not by direct inoculation into BHKs. The isolation of BEF virus is the first isolation of this virus from biting midges in Australia. The isolation of Akabane virus from C. wadai is the first isolation of a virus from that species.

The mosquito, Cx edwardsi produced 9 isolations of a new rhabdovirus tentatively called Oak Vale virus (BEF serogroup). No antibodies to this virus were found in the cattle, nor was Cx edwardsi abundant in cow bait collections. BEF was isolated from An bancroftii which had been collected feeding on a febrile cow and held for 10 days before processing. This was the second isolation of BEF from this species.

On 2 occasions pools of C. brevitarsis yielded D'Aguilar virus in BHKs and Tibrogargan virus after processing through Ae aegypti mosquitoes. The pool of C. brevitarsis which produced BEF through Ae aegypti also produced D'Aguilar in BHKs.

(T.D. St.George, H.A. Standfast, M.J. Muller, H. Zakrzewski, D.H. Cybinski, D.S. Gibson)

Vector/Host Index for Australian Arboviruses

This table has been developed to update the virus/host lists in Arbovirus Information Exchange, June 1986.

Virus	Isolated from Species	Reference
Ross River	Aedes vigilax	44
"	**Grallina cyanoleuca**	37
"	**Microeca fascinans**	37
"	Anopheles amictus	8
"	Aedes normanensis	8
"	Mansonia uniformis	36
"	**Horse**	47
"	Coquilletidia linealis	45
"	**Macropus agilis**	25
"	Culex annulirostris	25
"	Aedes flavifrons	56
"	**Human**	46
Sindbis	Culex squamosus	8
"	Aedes vittiger	8
"	Aedes theobaldi	8
"	Culex pullus	8
"	Culex edwardsi	57
"	Culex australicus	43
"	Aedes normanensis	24
"	Aedes vigilax	24
"	Mansonia septempunctata	24
"	Culex annulirostris	24
"	Culex bitaeniorhynchus	57
Getah	Anopheles amictus	24
"	Culex bitaeniorhynchus	24
Barmah Forest	Culex annulirostris	43
"	Aedes procax	28
"	Aedes vigilax	55
"	Aedes (Verrallina) spp.	57
"	Culicine mosquitoes	63
"	Aedes normanensis	8
Saumarez Reef	Ornithodoros capensis	33
"	Ixodes eudyptidis	33

Virus	Isolated from Species	Reference
Kokobera	Culex annulirostris	24
"	Aedes vigilax	25
"	Aedes normanensis	8
"	Culex annulirostris	24
"	**Oriolus flavocinctus**	37
"	Culex squamosus	38
"	Aedes tremulus	14
Kunjin	Culex australicus	39
"	Culex quinquefasciatus	8
Edge Hill	Aedes normanensis	8
"	Anopheles meraukensis	24
"	Anopheles amictus	8
"	Culex annulirostris	24
"	Aedes vigilax	24
Stratford	Aedes vigilax	24
Alfuy	Culex pullus	8
"	Aedeomyia catasticta	38
Gadgets Gully	Ixodes eudyptidis	51
Murray Valley Enceph.	Culex annulirostris	24
"	Culex australicus	43
"	Culex bitaeniorhynchus	24
"	**Ardea novaehollandiae**	43
"	Culex quinquefasciatus	14
"	Aedes normanensis	24
"	**Human**	52
"	**Domestic fowl**	53
Dengue	**Human**	64
Koongol	Culex annulirostris	24
"	Anopheles bancroftii	24
"	Anopheles farauti	24
Wongal	Culex annulirostris	24
"	Coquilletidia crassipes	35
Akabane	Culicoides brevitarsis	1
"	**Cattle**	26,57
"	Culicoides wadai	57
Aino	Culicoides brevitarsis	1
"	**Cattle**	2,57
Peaton	Culicoides brevitarsis	4
"	**Cattle**	4,57
Douglas	**Cattle**	5,57
"	Culicoides brevitarsis	6
Tinaroo	Culicoides brevitarsis	5
"	**Cattle**	6
(Facey's Paddock)	Culex annulirostris	8
"	Aedes normanensis	8
"	Culicoides spp.	9
"	Culicoides austropalpalis	28
Thimiri	Culicoides histrio	7

Virus	Isolated from Species	Reference
Kao Shaun	Argas robertsi	41
Taggert	Ixodes uriae	48
Precarious Point	Ixodes uriae	51
Trubanaman	Culex annulirostris	36
"	Anopheles annulipes	38
"	Coquilletidia linealis	63
Kowanyama	Anopheles annulipes	38
"	Anopheles amictus	38
"	Culex annulirostris	43
Belmont	Culex annulirostris	1
"	Culicoides marksi	9
"	Culicoides bundyensis	28
Mapputta	Anopheles meraukensis	24
"	Anopheles amictus	9
"	Anopheles annulipes	36
"	Mosquitoes (mixed pool)	34
Gan Gan	Aedes normanensis	8
"	Aedes theobaldi	8
"	Culex annulirostris	8
"	Aedes vigilax	39
"	Culex spp.	55
Upolu	Ornithodoros capensis	49
"	**Puffinus pacificus chlororhyncus**	40
Nugget	Ixodes uriae	48
(Mudjinbarry)	Culicoides marksi	32
Wallal	Culicoides dycei	34
"	Culicoides marksi	34
Warrego	Anopheles meraukensis	8
"	Culicoides dycei	34
"	Culicoides marksi	34
"	Culex annulirostris	9
"	Culicoides actoni	28
Mitchell River	Culicoides spp.	34
Eubanangee	Anopheles farauti	9
"	Culex annulirostris	9
"	Mosquitoes (mixed pool)	35
Tilligerry	Anopheles annulipes	39
Ibaraki (EHD 2)	**Cattle**	29,60
EHD 5, 6, 7, 8	**Cattle**	29,60,57
EHD 5, 6	Culicoides brevitarsis	29,60
BLU 20	Culicoides spp.	22
BLU 1	Culicoides fulvus	20
BLU 1	Culicoides brevitarsis	21

Virus	Isolated from Species	Reference
BLU 1,21, 23	**Cattle**	19,23,57
Corriparta	Culex annulirostris	24
"	**Charadrius melanops**	37
"	Culex orbostiensis	57
"	Aedeomyia catasticta	14
"	Culex edwardsi	57
CSIRO Village	Culicoides spp.	11
"	Culicoides brevitarsis	11
"	**Cattle**	11,57
Marrakai	Culicoides spp.	9
"	**Cattle**	27
"	**Water buffalo**	27
Bunyip Creek	Culicoides brevitarsis	11
"	Culicoides oxystoma	9
"	**Cattle**	11,57
D'Aguilar	Culicoides brevitarsis	1
"	**Cattle**	10,57
Paroo River	Culex annulirostris	43
Berrimah	**Cattle**	17
Adelaide River	**Cattle**	18
Bovine Ephemeral Fever	**Cattle**	12,57
"	Anopheles bancroftii	13
"	Culicine mosquitoes	13
"	Culicoides brevitarsis	59
Kimberley	Culex annulirostris	14
"	**Cattle**	15,57
"	Culicoides brevitarsis	16
(Oakvale)	Culex spp.	57
"	Culex edwardsi	57
Almpiwar	**Ablepharus boutonii virgatus**	42
Kununurra	Aedeomyia catasticta	14
"	Culicoides austropalpalis	28
Charleville	Phlebotomus spp.	34
"	**Gehyra australis**	34
Tibrogargan	Culicoides brevitarsis	.61
(Coastal Plains)	**Cattle**	62
Parry's Creek	Culex annulirostris	14
Lake Clarendon	Argas robertsi	58
Wongorr	Aedes lineatopennis	34
"	Culex annulirostris	8
"	Culicoides pallidothorax	9
"	Aedes normanensis	14
Ngaingan	Culicoides (C) spp.	34,54
(Beatrice Hill)	Culicoides peregrinus	9
Yacaaba	Aedes vigilax	39
Picola	Culex annulirostris	43

Virus	Isolated from Species	Reference
(Leanyer)	Anopheles meraukensis	50
(Parkers Farm)	Culex annulirostris	8
"	Culicoides marksi	9
Umbre [Little Sussex]	Culex annulirostris	8
Termeil	Aedes camptorhynchus	39
"	Aedes vigilax	39
"	Culex annulirostris	39
(Humpty Doo)	Lasiohelea spp.	9
"	Culicoides marksi	9
Johnston Atoll	Ornithodoros capensis	49

(Unregistered viruses are in parenthesis.) **Bold** = Vertebrate

Listed in Vector Index in "Arthropod-Borne Virus Information Exchange" June 1986. Reference unknown.

D'Aguilar virus	Culicoides oxystoma
Ross River "	Culex quinquefasciatus
Wallal "	Aedes lineatopennis
" "	Culicoides brevitarsis

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REPORT FROM ARBOVIRUS LABORATORY, INSTITUT PASTEUR, 97306 CAYENNE CEDEX, FRENCH GUIANA.

I. ARBOVIRUS SURVEILLANCE in French Guiana, Martinique and Guadeloupe during 1986.

A) VIRUS ISOLATION.

During this year 42 specimens, all from French Guiana, were inoculated on A.P.61 cells.

8 were found positive : 19%.

Most of the positive results occurred during the second quarter (April, May, June) i.e. long rainy season.

All the strains have been identified to dengue virus type 2 using fluorescent monoclonal antibodies tests.

It is of interest to notice that among the first symptoms of dengue disease, pulmonary symptoms were often reported, as it was already mentioned in dengue surveillance summary (D.J.GUBLER).

No case of D.H.F./D.D.S were recorded.

B) SEROLOGICAL STUDIES.

During this year, 1191 serum specimens were studied :

998 from French Guiana
135 from Martinique
68 from Guadeloupe.

The results are reported in Table I.

The serums were tested by C.F. and H.I.Tests.

These results include only the C.F. Tests.

The antigen battery of Alphavirus includes : Mucambo, Pixuna, Cabassou and Tonate.

The antigen battery of Flavivirus : Yellow Fever, S.L.E, DEN 2, DEN 3, Ilheus.

1) IN FRENCH GUIANA.

- Most of the significant results for the Flavivirus were also found during the second quarter.

Considering the two percentage of isolation and the serological results of presumptive recent infection, which are similars≈ 20%, even if several Flavivirus have been isolated in French Guiana in the past (Dengue, S.L.E, Ilheus), it seems that these results indicate a dengue 2 virus circulation only.

- For the Alphavirus, there is no evidence of recent human infection, but we can see that the main activity of these viruses occurs during the short rainy season (December, January).

2) IN MARTINIQUE AND GUADELOUPE.

The results seem to be similar, but the number of samples is not significant.

It is interesting to observe that antibodies for Alphavirus were detected in one case in Martinique.

II. VIROLOGICAL RESULTS OF AN OUTBREAK OF DHF/DDS LIKE SYNDROMS IN SURINAME IN SEPTEMBER 1984.

The results can be separated in two rubrics.

A) ONE CASE OF YELLOW FEVER.

The patient died of hepatonephritis with hemorrhagic symptoms.

From the blood sample, a yellow fever strain was isolated on A.P.61 cells incubated at 33°C.

This strain was confirmated to be a wild South American strain of Yellow Fever by the Institut Pasteur Dakar using S.D.S polyacrylamide gel electrophoresis and Fingerprinting (Vincent DEUBEL : personal communication).

This result was reconfirmated by N.KARABATSOS at C.D.C. Fort Collins using a neutralization Test.

B) TWO CASES OF MAYARO VIRUS FEVER.

Caracterised by fever, headhache, retro-orbital pain and myalgia.

The isolations were positive on suckling mice.

The identification was performed at C.D.C. Fort Collins.

After passage in vero cells, a high titered hemagglutinin (1/4000 at p.H.6,1) was obtained.

The antigen was inhibited by Mayaro hyper immune mouse ascitic fluid only.

During the isolation process in Cayenne a Laboratory contamination by accidental inoculation of the Mayaro containing material was observed.

After an incubation period of 5 days, the onset was brutal with fever (38°5, 39°C) asthenia, headhache, arthralgia, myalgia, retro-orbital pain, photophobia during 3 days.

Rash and fever desappear on day 3.

(L. Niel, Y. Robin, Institut Pasteur).

MONTHS	J	F	M	A	M	J	J	A	S	O	N	D	TOTAL YEAR
FRENCH GUIANA													
N° OF SAMPLES	76	72	62	84	84	146	111	72	52	79	43	107	**988**
FLAVIVIRUS ≥64	17	15	13	27	19	37	24	18	4	13	8	7	**202**
FLAVIVIRUS <64	19	12	22	25	26	37	41	25	17	27	12	12	**275**
ALPHAVIRUS <64	13	3	3	2	4	4	2	1	1	6	6	11	**56**
MARTINIQUE													
N° OF SAMPLES	1	1	3	16	1	18	4	2	1	10	4	74	**135**
FLAVIVIRUS >64			1	5		3				2		1	**12**
FLAVIVIRUS <64	1	1	2	8	1	7	4	1	1	3	2	22	**53**
ALPHAVIRUS <64			0	0		0		0		0	0	1	**1**
GUADELOUPE													
N° OF SAMPLES	0	0	8	5	0	28	7	8	1	6	0	5	**68**
FLAVIVIRUS >64			2			15	1						**18**
FLAVIVIRUS <64			3	3		7	2	5		1		2	**23**
ALPHAVIRUS <64			0	0		0	0	0		0		0	**0**

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