

# Epidemiological Bulletin

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## Public Health Impact of Arthropod- and Rodent-borne Viral Diseases in the Americas<sup>1</sup>

Several arthropod- and rodent-borne viral diseases cause significant public health problems in the Americas. Their impact varies greatly: some are responsible for severe mortality, while others are associated with extensive morbidity, leaving, at times, various sequelae. Three arboencephalitides are also considered major problems in veterinary public health. The following summary of these diseases was prepared for the Meeting of the WHO Scientific Group on Arthropod- and Rodent-borne Viral Diseases, held in Geneva 28 February-5 March 1983.

<sup>1</sup> Prepared by Francisco P. Pinheiro, Meeting of the WHO Scientific Group on Arthropod- and Rodent-borne Viral Diseases (Geneva, 28 February-5 March 1983).

### Arthropod-borne Viral Diseases

The distribution of the arboviral diseases in the Americas varies considerably. Dengue is by far the most widely distributed, affecting North America (United States and Mexico), Central America, northern South America, and the Caribbean. Yellow fever is endemic in many countries of South America and has been responsible for epidemics in Trinidad and Bolivia. Although human infection due to St. Louis encephalitis virus occurs in many parts of the Americas, thus far outbreaks of encephalitis caused by this agent have been recorded only in North America. Oropouche fever is a significant public health problem in the Amazon region of Brazil where it has caused extensive epidemics. The best example of an important arbovirus disease of focal

### IN THIS ISSUE . . .

- Public Health Impact of Arthropod- and Rodent-borne Viral Diseases in the Americas
- Program for Diarrheal Disease Control in Cali, Colombia
- Diseases Subject to the International Health Regulations
- The Tuberculosis Situation in Argentina
- Infections due to Penicillinase-producing *Neisseria gonorrhoeae* in Florida, United States
- Development of a Leprosy Vaccine
- The Health Field Concept—A Canadian Perspective
- WHO Collaborating Centers for Viral Diseases

incidence in the Americas is Rocio encephalitis, which has been recognized only in the coastal region of southern São Paulo, Brazil.

## Dengue

All four serotypes of dengue virus occur in the Americas. Extensive outbreaks due to dengue types 2 and 3 were reported in the Caribbean and northern South America in the 1960s and 1970s. Conservative estimates indicate that at least 650,000 cases occurred in Colombia during the outbreaks caused by serotypes 2 and 3, in 1971-1972 and 1977, respectively.

In 1977 a type 1 pandemic began in Jamaica and spread from there clockwise around the Caribbean causing epidemics in almost every island. In late 1977 it reached South America causing epidemics in the Guianas and Venezuela. In 1978 it reached Colombia and Central America. By the end of 1978 the virus crossed the Mexican border where it continued to spread through 1979, and in 1980 it reached Texas where it caused the first autochthonous cases recorded in the United States since 1945. Approximately 550,000 cases were registered in Cuba and an estimate made in Colombia indicated that 770,000 cases occurred. Nevertheless, the countries notified PAHO of only 702,000 dengue cases during 1977-1980.

Two important events were registered in 1981: the introduction of dengue 4 in the Americas and the first outbreak of dengue hemorrhagic fever (DHF) in the Hemisphere. Dengue 4 activity was documented in many islands of the Caribbean during 1981-1982 (PAHO *Epidemiological Bulletin* Vol. 3, No. 5, 1982). Outbreaks were also recorded in Suriname, Brazil, and Colombia in 1982. Both dengue 1 and 4 were isolated in the Brazilian outbreak, which occurred in the town of Boa Vista, northern Brazil; this is the first time that dengue viruses have been isolated in that country. During the Suriname outbreak three males over the age of 45 developed dengue shock syndrome (DSS) without hemorrhagic manifestations but all had thrombocytopenia and hemoconcentration; all three had serologic evidence of unspecified dengue infection and one died a month later from bleeding of esophageal varices. Illness associated with dengue type-4 viral infection has been self-limited and generally mild. Virus activity has been low to moderate, and, in spite of a widening dissemination of the virus, has not caused serious outbreaks in the Hemisphere.

From May to October 1981, Cuba experienced a widespread outbreak of dengue-2 during which 344,203 cases were notified (PAHO *Epidemiological Bulletin* Vol. 3, No. 1, 1982). In addition to the classic benign febrile syndrome, serious hemorrhagic and shock manifestations were also present. A total of 116,143 cases was

hospitalized, of which some 10,000 were cases of DHF/DSS. A total of 158 deaths was recorded, one-third of which were among persons over 15 years of age. An intensive *Aedes aegypti* eradication program was initiated soon after the outbreak was identified and, as a result, it was quickly brought under control. No additional dengue cases have been identified in Cuba since the end of 1981.

## Yellow Fever

Jungle yellow fever (YF) continues as a major threat in endemic areas of South America. Ten countries reported a total of 1,204 cases of YF in the past decade—Bolivia, Brazil, Colombia, Ecuador, Panama, Paraguay, Peru, Suriname, Trinidad and Tobago, and Venezuela. A 63 per cent increase in the number of reported cases was observed in the second half of the 1970s as compared with those of the first half of the same decade. A total of 489 cases was notified from 1980 to 1982, 80 per cent of which occurred in Bolivia and Peru. Colonists and temporary agriculture workers from nonendemic areas, together with natives from endemic zones engaged in forest activities, were the main target of the disease. The virus is enzootic in tropical forests of South America, such as those of the Amazon region and the Orinoco (Venezuela) and Magdalena (Colombia) valleys. The periodic occurrence of YF outbreaks in central Brazil, at intervals of five to nine years may be due to virus excursions from the Amazon region. Although transovarial transmission of YF virus in *A. aegypti* and in *Haemagogus* has been documented in the laboratory, limited field studies undertaken in the Americas do not yet give support to the occurrence of this phenomenon in nature. Notably, YF virus is able to reappear in areas after being silent for long periods of time. The outbreaks in the Tarra River area and in Sierra Nevada, Colombia, and in Trinidad in 1978-1979 after 19 or more years of silence, demonstrate the potential of resurgence of the virus. Similarly, the 1981 outbreak in the Andrés Ibáñez Province, Department of Santa Cruz, Bolivia, occurred after more than a three-decade absence of the disease. Of special concern was the occurrence in some countries of cases in close proximity to areas infested with *A. aegypti*, and the consequent risk of urbanization of YF. Most cases of YF continue to occur in the first half of the year, peaking in March-April. The great majority of cases in the Americas is in males over the age of 15. Children in the 1-4 age group were affected in the Rincón del Tigre area, eastern Bolivia, in 1981, although in this outbreak most information was collected retrospectively and was based mainly upon clinical grounds.

## Oropouche Fever

During the period 1961-1981, at least 250,000 persons were infected by Oropouche virus in the Amazon region of Brazil. Patients usually develop a febrile illness and sometimes aseptic meningitis. A rash is occasionally observed. Although not fatal and free of sequelae, the infection may cause severe manifestations, including one or more episodes of recurrence of symptoms, and may require hospitalization. Some outbreaks are explosive and may cause temporary disruption of community activities. Epidemics occur in urban settings, where the virus is biologically transmitted from man-to-man through the bite of the *Culicoides paraensis* midge. Oropouche virus is the only arbovirus of public health importance that affects man known to be transmitted by *Culicoides*. The mosquito *Culex quinquefasciatus* may act as a secondary vector. Since *Culicoides paraensis* is widely distributed throughout South America, Central America, Mexico, and the eastern United States, Oropouche fever has the potential to spread to some of these areas.

## Mayaro Fever

Immunity to Mayaro virus is widely distributed in human populations of rural areas of tropical South America. In some localities up to 60 per cent of the population have demonstrable antibodies to this alfavirus. Nevertheless, only a few outbreaks due to this agent have been described. No fatalities due to Mayaro infection have been reported, but patients may exhibit severe arthralgia, particularly of the extremities, which may cause temporary incapacitation.

## Arboviral Encephalitis

Arboviral encephalitis in the Americas is mostly associated with six arboviruses.

*St. Louis encephalitis (SLE)*. Although SLE virus is widely distributed in the Hemisphere, only in North America is the disease recognized as a major public health problem. It is estimated that as many as 10,000 cases of encephalitis and about 1,000 deaths have been recorded since the SLE virus was discovered in 1933. The great majority of them were registered in the United States. The largest epidemic in the history of the disease occurred in 1975, when 1,815 cases were recorded in this country. Outside the United States and Canada, a single outbreak was recorded in Mexico in 1974, when 51 cases were diagnosed. Seven cases with serologic evidence of SLE virus infection were reported from Argentina, Jamaica, Suriname, and Trinidad between 1953 and 1965. The few cases of SLE virus infection confirmed by isolation of the agent in Central and

South America have generally been characterized by relatively mild febrile illness. In the continental United States all but six states have reported cases of SLE. Several important urban outbreaks have occurred in some of these states. The incidence of disease in persons over 60 years of age is 5-40 times higher than that in the 0-9 years age group.

*California encephalitis (CE)*. CE is usually associated with La Crosse virus infection. This virus is responsible for 30 to 160 cases annually in the United States. Isolated cases have been reported from Canada. La Crosse virus principally affects children under 12 years of age and has a case fatality rate under 1 per cent. The disease is highly focal in distribution, depending on the presence of hardwood forests with tree holes, one of the main breeding sites of its prime vector, *Aedes triseriatus*. In recent years, however, foci of infection have consistently been located around tire dumps and playgrounds, where the mosquito has been found breeding in tires.

*Eastern equine encephalitis (EEE)*. EEE is a rare but severe disease of man in the Americas. The overall case fatality rate among clinical cases in North America approaches 70 per cent. Outside the United States, one outbreak was recorded in the Dominican Republic in 1948-1949, and one in Jamaica in 1962; two cases were reported from Trinidad and one from Brazil. Several outbreaks have been registered among horses, quails, pheasants, peking ducks, and partridges. Among these exotic birds, attack rates of up to 50 per cent and serious economic losses have been recorded in North America.

*Western equine encephalitis (WEE)*. WEE virus disease in man is basically an exclusive problem of the United States and Canada. A total of 897 cases of WEE were recorded in the United States during the period 1955-1976. The highest incidence was observed in 1965, when 172 cases were recorded. The only case registered in Latin America and the Caribbean was diagnosed on clinical and serologic grounds in Rio de Janeiro, Brazil, in 1961. Epizootics among equines have been documented in the United States, Argentina, Brazil, and Guyana. Flocks of pheasants and partridges have also been stricken by the agent, but the outbreaks are not as devastating as those caused by EEE virus.

*Venezuelan equine encephalitis (VEE)*. VEE virus is endemic in northern South America, Central America, Trinidad, Mexico and Florida. Periodically, it appears as epizootics and epidemics, as observed during 1967-1971, when the virus spread from South America through Central America and into the United States. It is estimated that over 100,000 equine deaths and hundreds of thousands of human infections occurred

during this period. About 1 per cent of infected persons develop clinical encephalitis. The case-fatality rate is usually very low, but may reach 3.6 per 100 in the absence of adequate medical care. Virus activity has been silent in recent years, probably due to intensive horse vaccination control programs.

*Rocio encephalitis.* Rocio encephalitis is a focal disease which has occurred exclusively in the southern coast of São Paulo State, Brazil. The virus apparently emerged for the first time in 1975 and for two consecutive years caused outbreaks during which about 1,000 clinical cases were diagnosed. The overall case fatality rate among hospitalized patients was about 5 per cent. Approximately 20 per cent of the survivors exhibited significant residual impairment of cerebral functions. Transmission was associated with forest contact and most cases were seen in persons over 15 years of age. No additional clinical cases have been observed since 1976.

### Rodent-borne Viral Diseases

Argentine and Bolivian Hemorrhagic fevers are the two rodent-borne viral diseases of public health importance presently recognized in the Americas. Recent evidence indicates that a virus similar to Hantaan virus, the causative agent of hemorrhagic fever with renal syndrome occurs in some parts of the Americas.

#### Argentine Hemorrhagic Fever (AHF)

Since the early 1950s AHF has been recognized as a major public health problem in certain agricultural areas of Argentina. Over 18,000 cases were reported in that country from 1958 to 1980, with a fatality rate of 10-15 per cent in untreated patients. A gradual increase of the endemic area of AHF has been observed since 1958; it currently encompasses approximately 100,000 km<sup>2</sup> including parts of the Provinces of Buenos Aires, La Pampa, Santa Fe, and Córdoba, and contains over one million inhabitants. The infection occurs

almost exclusively among corn and wheat field workers. The disease has a marked seasonal variation, with highest incidence of cases in April, May, and June. A live attenuated candidate vaccine is presently under development and it is hoped that it will be available for protection of persons at risk in the near future.

#### Bolivian Hemorrhagic Fever (BHF)

The first outbreak of BHF was identified in 1962 and subsequently several others were detected, all in the 1960s. The two main outbreaks occurred in the community of Orobayaya and in the town of San Joaquín, in the Provinces of Iténez and Mamoré, respectively, and the Department of Beni, but hamlets and farms of that Department experienced sizable epidemics. Altogether it is estimated that 2,000 to 3,000 persons were affected by the disease with a case fatality rate of about 20 per cent. A small nosocomial outbreak involving six persons, five of whom died, was reported in Cochabamba in 1971. This town is located outside the endemic region, but apparently the index case contracted the disease in an infected area of Beni. An effective rodent control program against infected *Calomys callosus*, the host of BHF virus, has been undertaken by the Bolivian authorities, and as a result no human cases of BHF have been registered since 1975.

#### Hemorrhagic Fever with Renal Syndrome (HFRS)

Antibodies to Hantaan virus have been found recently among urban rats collected in some cities of the United States. Unpublished observations indicate that immunity to the same agent exists among human and urban rat populations of the Amazon region of Brazil. Further investigations are underway to identify the agent and to define the disease pattern in these regions.

(Source: Epidemiology Unit, Health Programs Development, PAHO.)