MOSQUITO-BORNE DISEASES IN TEXAS

J. V. IRONS, Sc.D.
Director of Laboratories, State Health Department, Austin, Texas

In this report I will consider dengue, yellow fever, malaria and encephalitis, the principal mosquito-borne diseases which have been of public health importance in Texas.

The last outbreak of dengue fever in Texas was in 1941, when several thousand cases occurred in the Lower Rio Grande Valley. Cases occurred as far up as the vicinity of Laredo, Alice, and Corpus Christi. Approximately 100 cases of dengue were reported to Texas physicians the following year, but as nearly all these cases occurred in January and February it would seem most likely that some other disease was mistaken for dengue. In more recent years sporadic cases have been reported but it is not believed that any of these were true cases of dengue fever, on basis of occasional laboratory tests. With the appearance of the 1941 outbreak there was considerable hysteria in some parts of the state since many of the older natives remembered that dengue fever had been in times past an unwelcome harbinger of yellow fever. Since *Aedes aegypti,* the mosquito vector, has not been eradicated, the threat of dengue remains; the virus of yellow fever would have to be imported as there is no evidence of the presence of the agent in a Texas reservoir.

It is difficult for us today to realize what a dreadful disease yellow fever once was. Some years ago I uncovered an old unpublished manuscript on yellow fever by the late Dr. J. M. Reuss, Cuero, Texas. Dr. Reuss wrote of the difficulty in distinguishing yellow fever or "black vomit" from severe types of dengue or malaria. He described the "black vomit" of yellow fever as copious and serous with epithelial flakes floating on it; he said it also had a sweet taste and smell. In other diseases the "black vomit" was more mucoid and tinged with black streaks. Dr. Reuss said that he considered the copious perspiration and the pronounced yellow fever smell even more characteristic than the "black vomit." He said that quinine was out of the question in treating yellow fever, as it caused furious delirium; he felt sure that the use of quinine had caused many deaths. Dr. Reuss told of the dead lying unburied, since the well had fled and only the sick remained, during an outbreak at Indianola. Dr. Reuss saw cases of yellow fever at Cuero as late as 1905.

In his official report for 1902, the State Health Officer wrote "In 1900 the Chief Surgeon of the United States Army in Cuba appointed a commission to determine the true cause of yellow fever. In 1901 Surgeon Ross made similar experiments and the conclusions of both were that yellow fever is not conveyed by fomites. . . . I cannot accept these conclusions. . . . I agree that the mosquito *can* convey the disease, but I do not concede that it is the sole distributor thereof."

The reports of the early Texas State Health Officers were replete with details of quarantines against New Orleans and other cities of Louisiana as well as Mexico, in combatting yellow fever. Indeed, Texas cities and counties frequently imposed "shot gun" quarantines against each other. One of the last and most distressing was the Nueces county quarantine against Duval county which impeded the use of the Texas-Mexican railway in shipping food and medical supplies from Corpus Christi to Laredo where yellow fever was rampant in the summer of 1903. When Laredo was quarantined a large part of the populace became obsessed with the idea that the physicians and the authorities were in a conspiracy to extort money. In fact, the State Health Officer in his official report to the Governor wrote, "They went even further and it was generally believed that the physicians poisoned their patients —to end the epidemic. Patients not only

refused treatment but—refused to permit use of a clinical thermometer, thinking this too was poisoned. This was certainly an amazing state of affairs, and it was difficult to believe that such perversion and gross ignorance could exist within the confines of the Republic." One thousand fifty-one yellow fever cases with 103 deaths were recorded in the outbreak at Laredo. The Governor of Texas at the request of the State Health Officer even imposed a quarantine on San Antonio where 36 cases and 18 deaths were reported and many more were rumored.

Some years ago when I was spending much of my time examining thick blood films for malaria, I would not have believed that I would be an eye witness to the virtual extinction of malaria in the U. S. In fact, practically the only focus which remains is in the Lower Rio Grande Valley of Texas along the Mexican border. Only two cases (both *P. vivax*) were diagnosed in the San Benito Regional Laboratory of the State Health Department last year. Perhaps three or four additional cases were diagnosed by physicians in other laboratories of the Lower Valley, but it is uncertain that any of these infections were acquired on the U. S. side of the river. No doubt many factors have contributed in recent years to the decline of malaria and evidently these factors have concerned the parasite, the anopheline vector and human host. As long as the *Anopheles quadrimaculatus* remains in our midst, the threat of malaria cannot be entirely dismissed. This would particularly be true in time of war or disaster.

Outbreaks of "sleeping sickness" or encephalomyelitis in equines wrought great havoc on the farms and ranches of Texas in years gone by. It had been presumed that the infections were all of the western type until 1941 when the eastern type virus was recovered and identified in South Texas. When it became evident that both equine types and St. Louis encephalitis virus were present in South Texas a cooperative research project was set up by the State Health Department and the University of California in the Rio Grande Valley at San Benito. Several thousand mosquitoes were taken and identified in 1942 and later tested for virus. This was particularly a poor year, evidently because none of the viruses were recovered. It should be mentioned in passing that several of these mosquito pools were tested for polio virus. Relatively few of the mosquitoes taken were *Culex tarsalis* which was believed to be the principal vector of encephalitis. Occasional widely scattered cases of St. Louis or western equine infection in man were confirmed by laboratory tests during the next few years. In 1952 when several human cases of encephalitis occurred in the Texas South Plains area, a special project was undertaken by the State Health Department and the Communicable Disease Center. Some of these cases were confirmed as western type infections on the basis of the complement fixation test. A preliminary survey of the mosquito population and the factors involved in their production was made in the Lubbock-Plainview area in August and October, 1953, but a virus was not recovered from any of the mosquitoes collected. The study was continued in 1954 when western equine virus was recovered from two pools of *Culex tarsalis* in the Plainview area and one pool each of *C. tarsalis* and *quinquefasciatus* in the Lubbock area. In this general area 23 human infections due to the western virus were confirmed by the complement fixation test during the three year period, 1952 to 1954. In addition, in 1954 ten cases of St. Louis encephalitis were confirmed. It seems likely that some of the St. Louis cases were not confirmed because of inexperience and unexpected difficulties with the laboratory test. A considerable outbreak of St. Louis encephalitis occurred in the Lower Rio Grande Valley, particularly in Hidalgo county, in the summer and fall of 1954. St. Louis encephalitis virus was recovered repeatedly from pools of *Culex quinquefasciatus* during and once after the outbreak. St. Louis virus was recovered from brain tissue of one of the fatal cases, and a considerable number of cases were con-

firmed by complement fixation tests. A few scattered cases of St. Louis and western type infections also occurred in Texas in 1955. While there has been evidence of eastern type virus activity, at least in Southeast Texas, there has been little or no evidence of human infection in recent years. Although many of the proved infections have been mild, it should be pointed out that mosquito-borne viral encephalitis frequently is a very serious disease. Mortality has been confined almost solely to older people.

In view of the many viruses which have been recovered from mosquitoes in recent years in various countries, it should not be surprising if a fourth mosquito-borne viral encephalitis would be uncovered in Texas.

Also, in view of the newer knowledge of the importance of viremias in the pathogenesis of many of the virus diseases, one should not overlook the possibility that some of our poorly understood viral diseases are mosquito-borne. At any rate, I should like to instill in the minds of the younger men that great discoveries in the field of mosquito-borne diseases remain to be made.