

# Venezuelan Equine Encephalitis Epidemic in Texas, 1971

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AN OUTBREAK of equine encephalitis occurred in Venezuela in 1936, and a virus—later designated as Venezuelan equine encephalitis (VEE) virus—was isolated from the brain of an infected horse (1,2). Since that time, VEE virus has been implicated in many outbreaks of equine and human disease in South and Central America (3,4).

In late winter and spring of 1969, an outbreak of VEE that affected human beings and equines occurred in Ecuador. In May and June 1969, fatal cases among equines were reported from the Pacific coastal regions of Guatemala. VEE

isolates from equines, human beings, and mosquitoes in these outbreaks were subtype IB (4-6). By November 1969, VEE had been observed in El Salvador and southern Mexico (7), and in 1970 the epidemic moved north. At the International Round Table on VEE in Mexico City in May 1971, co-sponsored by the Mexican Ministry of Agriculture and Livestock and the Pan American Health Organization, it was reported that VEE had been active in the northern part of the Mexican State of Veracruz in April and that between January 1970 and May 1971, 700,000 equines had been vaccinated with a live-virus vaccine. This vaccine, which had already been used in more than a million equines in Central America (4,8), was developed by the U.S. Department of Defense (9).

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When it appeared likely that the virus would enter the United States in early summer 1971, plans for joint action were made by agriculture and health authorities of Texas, the United States, and Mexico, and by the U.S. Department of Defense. In mid-June, intensive mosquito and equine surveillance was established in southern Texas by a task force representing the U.S. Government and Texas. Planned control measures were based on the premises that a barrier of vaccinated equines would halt the progression of the epidemic and that mosquito control would buy the time needed to establish the immune barrier.

By late June, equine and human cases compatible with VEE were being reported along the Gulf of Mexico just south of Brownsville, Tex. On June 23, the U.S. Department of Agriculture and the Texas Animal Health Commission approved

use of the VEE vaccine in 13 of the southernmost counties of Texas. Equine owners were encouraged to vaccinate their animals, but vaccination was not mandatory. Vaccination was started on June 25, 1971.

### Outbreak in Texas

The first confirmed case of VEE in Texas was in Live Oak County, 150 miles north of the lower Rio Grande Valley. Virus was isolated from blood drawn from a sick horse on June 30; no secondary cases stemmed from this early infection.

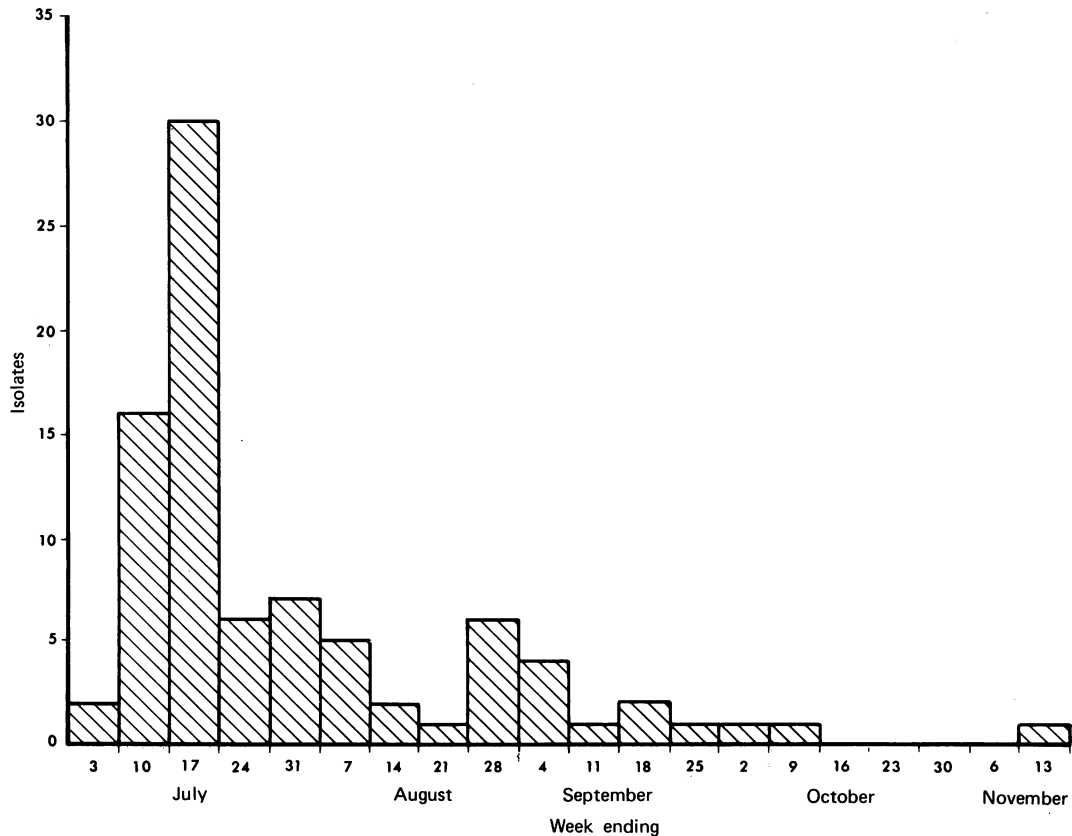
In the first week of July, surveillance teams observed encephalitis fatalities among horses in Cameron County, and VEE virus was isolated from a blood sample of a horse near Brownsville on July 1. The virus was first isolated from mosquitoes collected June 28 just west of Brownsville. The first confirmed case in man also occurred near Brownsville; the symptoms began on July 5, and the virus was isolated from a blood sample drawn on July 8.

Despite strong encouragement from the U.S.

Department of Agriculture and the cooperation of all the local veterinarians, only about 65 percent of the equines in Cameron County had been vaccinated by July 10. On July 17, a mandatory, free vaccination program was started by the Department and by the end of July, about 90 percent of the equines in the lower Rio Grande Valley had been vaccinated (personal communication, Dr. H. E. Metcalf, U.S. Department of Agriculture).

During the first 3 weeks of July, the equine epidemic was restricted to Cameron and Hidalgo Counties in the lower Rio Grande Valley and the Corpus Christi-San Patricio County area on the Gulf coast. The epidemic peaked in these areas in the second and third weeks of July and then declined rapidly as more equines were vaccinated (fig. 1) and ultra-low-volume malathion was sprayed over a large area by airplane. The epizootic continued through the summer and early fall, with cases occurring farther west along the Rio Grande until October. In the Cameron and Hidalgo County area, an estimated 10 percent of

**Figure 1. Isolations of VEE virus from equines, by date of collection, Texas, 1971**



the equine population died of VEE, and more than 1,500 equines are believed to have died of VEE in the State (10).

Attempts were made to obtain blood or tissue specimens, or both, from ill animals for virus isolation and to obtain followup blood specimens from recovered animals to test for neutralizing antibody. The tests were performed at the Center for Disease Control in Atlanta and at the Department of Agriculture's Animal Disease Laboratory at Denver. Isolation and identification of the epidemic strain of VEE virus in suckling mice or in duck embryo cell cultures constituted a laboratory confirmation. Also, detection of VEE antibody in a 1:5 or 1:50 dilution of serum in a plaque reduction (90 percent) test in duck embryo cell cultures was considered proof of infection in animals not vaccinated against VEE more than 4 days before blood collection and with titers lower against Eastern equine and Western equine encephalitis viruses than against VEE.

Equine cases in Texas were detected through cooperative efforts of veterinarians and local, State, and Federal personnel. USDA veterinarians, epidemiologists, and pathologists investigated on the premises. The Center for Disease Control provided the services of field veterinarians and established an equine surveillance system in Texas in cooperation with county extension agents. In addition, the USDA investigated reports of equine encephalitis throughout the country, and the CDC Arbovirology Section was the main laboratory resource for the USDA in ruling out VEE as the cause of disease in nonepidemic areas.

Epidemic VEE virus was isolated from 87 horses representing 75 infected herds in 26 Texas counties (fig. 2). Of the 87 isolates, 61 were from specimens collected between June 30 and July 31 (fig. 1); 23 of the 87 were from Cameron or Hidalgo, and 10 were from San Patricio. Most of the isolates were from a two-countywide band along the Gulf of Mexico or the Rio Grande. Also, 105 equine cases were identified as VEE by serum neutralization tests. All but 3 of these 105 cases were from counties where the virus had been isolated from horses; in those 3 cases the VEE antibody titer was  $\geq 1:150$ , and Eastern and Western equine encephalitis titers did not exceed 1:5.

The farthest-west county where virus was isolated was Presidio. The isolation was from a

nonvaccinated foal whose blood was sampled on September 13. The last equine case recorded in Texas was from Starr County; it was confirmed by virus isolation from a nonvaccinated horse on November 7.

Soon after the first cases in horses were reported, a VEE surveillance system for human beings was established by CDC and the Texas State Department of Health in Cameron and Hidalgo Counties. These two counties have a combined population of about 350,000, which is served by seven hospitals. Surveillance consisted of daily reporting of all patients hospitalized with illness compatible with VEE. Virus isolation or serologic tests, or both, were carried out at CDC or the Texas State Health Department. The surveillance system was expanded to cover 39 hospitals in 14 counties in Texas. Reports and blood specimens were submitted daily.

All but 2 of the 88 laboratory-confirmed cases of human-epidemic VEE documented in the United States in 1971 occurred in July. The majority occurred in Cameron and Hidalgo Counties (fig. 2). The most common symptoms were fever, headache, and myalgia. Vomiting and drowsiness were less common, and sore throat and gastrointestinal illness were less frequent. The frequency for teenage males was somewhat higher than expected. No deaths or cases of frank encephalitis were documented.

In late August, in a coastal town of about 3,000 persons in southern Texas, histories were obtained from 32 percent of the population and blood specimens from 19 percent. Serologic tests revealed that 3.3 percent had antibody to VEE; 91 percent of these had been symptomatic. The most common symptoms were again fever, headache, myalgia, and vomiting. Since VEE was unknown in this town before July 1971, we assumed that antibody indicated infection during the epidemic. Attack rates were similar for males and females. A higher attack rate was noted for both sexes in the age group 10 to 19 years.

### **National VEE Emergency**

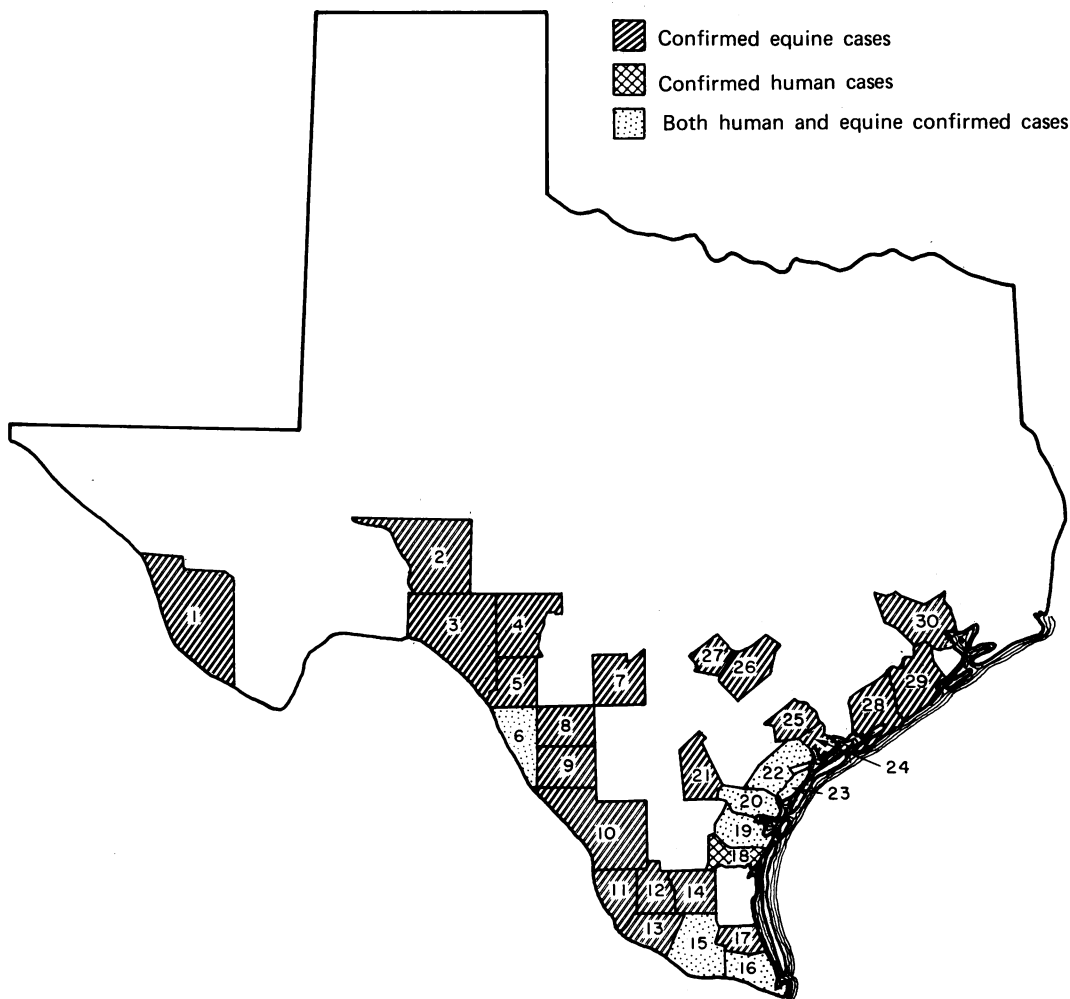
On July 16, the U.S. Secretary of Agriculture declared a national VEE emergency, and on July 17, VEE vaccine was made available to veterinarians throughout Texas, Arkansas, Oklahoma, New Mexico, and Louisiana, with a Federal fee-basis program to pay veterinarians for vaccinating

horses. On July 25, the program was extended to California, Arizona, Mississippi, Alabama, Georgia, and Florida and on August 24, to Kentucky, Tennessee, North Carolina, South Carolina, Virginia, Maryland, Delaware, New Jersey, and the District of Columbia. Approximately 2.8 million

horses—90 percent of the total in these States—were vaccinated. VEE vaccine became commercially available in September 1971, under a special license granted by the Veterinary Biologics Division, USDA.

On July 9, the Texas Animal Health Commis-

**Figure 2. Counties with confirmed equine and human cases of VEE, Texas, 1971**



**Counties**

- |              |              |             |                  |               |
|--------------|--------------|-------------|------------------|---------------|
| 1. Presidio  | 7. Medina    | 13. Starr   | 19. Nueces       | 25. Victoria  |
| 2. Crockett  | 8. Zavala    | 14. Brooks  | 20. San Patricio | 26. Gonzales  |
| 3. Val Verde | 9. Dimmit    | 15. Hidalgo | 21. Live Oak     | 27. Guadalupe |
| 4. Edwards   | 10. Webb     | 16. Cameron | 22. Refugio      | 28. Matagorda |
| 5. Kinney    | 11. Zapata   | 17. Willacy | 23. Aransas      | 29. Brazoria  |
| 6. Maverick  | 12. Jim Hogg | 18. Kleberg | 24. Calhoun      | 30. Harris    |

tion began prohibiting the movement of horses in Texas, and on July 13, the quarantine was extended to all of Texas. Exempted from the quarantine were owners who had certificates showing that their animals had been vaccinated against VEE at least 14 days earlier. On July 19, a Federal quarantine was established in Texas, Arkansas, Louisiana, New Mexico, and Oklahoma.

The Arbovirology Section of CDC began vector studies on June 21 to determine whether mosquitoes were infected with VEE virus and to evaluate the relative importance of the various species as vectors. More than 130,000 mosquitoes were collected, and more than 250 isolations were made of VEE virus. The species primarily involved were *Aedes sollicitans*, *Psorophora discolor*, and *Psorophora fonninis*.

The USDA asked for Air Force planes to spray the lower Rio Grande Valley, and spraying began on July 11. Commercial aircraft were also used. Between July 11 and August 14, approximately 10.5 million acres along the Gulf coast of Texas and Louisiana were sprayed with ultra-low-volume malathion or dibrom. About 3 million acres were sprayed twice.

Vector studies were continued in the Brownsville area from mid-August through October as a postepidemic followup. More than 100,000 mosquitoes were collected; none were infected.

Vertebrate studies were started in mid-July. Sampling continued until spring of 1972. More than 3,000 serum samples from wild and domestic birds and mammals were tested. In July, VEE virus was isolated from an opossum collected east of Brownsville and from a gray fox and a sandwich tern collected near Corpus Christi. In the last 2 weeks of July in an area with many equine fatalities, VEE infection in the small wild mammal population was low (less than 5 percent). In contrast, antibody incidence in cows, goats, and sheep sampled in the same general area was very high (more than 50 percent).

### Summary and Conclusions

An epidemic of Venezuelan equine encephalitis (VEE) occurred in Texas in the summer and fall of 1971. An extensive surveillance program network was established to detect equine and human disease and mosquito infection. VEE virus was isolated from horses, human beings, mosquitoes, and small vertebrates. Control measures included vaccination and quarantine of horses and aerial

spraying of insecticide to reduce mosquito populations.

Results of various investigations support the following conclusions. VEE disease was limited to the southern half of Texas; cases occurred in human beings only in areas in which there were cases in horses and were more likely to occur in areas having large numbers of infected horses. None of the human infections were fatal, and the equine vaccination and quarantine programs and mosquito control efforts limited the epidemic.

No equine cases of VEE were reported in 1972, nor were isolations of the virus made from mosquitoes. The only ill persons (two) were thought to have been exposed in Mexico.

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