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# West Nile Epidemic in Louisiana in 2002

Gary Balsamo, DVM, MPH; Andrea Vicari, DVM, PhD; Sarah Michaels, MPH; Theresa Sokol, MPH; Karen Lees, MPH; Mona Mehta, MPH; Susanne Straif-Bourgeois, PhD, MPH; Stacy Hall, MSN; Nevin Krishna, MPH; Gita Talati PhD; Raoult Ratard, MD, MS, MPHTM

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## ABSTRACT

In 2002, 329 cases of West Nile illness were reported in Louisiana, including 204 cases of West Nile meningoencephalitis and 125 cases of West Nile fever. Clinical presentation of meningoencephalitis or of West Nile fever was confirmed serologically. There were 24 deaths. Age group distribution showed predominance among persons aged 45 years or older. The epidemic curve, based on date of diagnosis, showed numerous foci progressing in successive waves. The first cases occurred in mid-June. A peak was reached by the first week of August, after which the epidemic progressively subsided.

**W**est Nile encephalitis, an infection due to an arbovirus, more specifically a flavivirus, was imported into the United States in 1999. It was first described in 1937 in the nation of Uganda. For years, West Nile was known as a common cause of fever in Africa. Several epidemics were described in Northern Africa (Egypt), the Middle East (particularly in Israel), and Southern and Eastern Europe (1). In 1999, this virus caused an outbreak in New York City and by 2000 it had spread throughout the northeastern United States (2).

West Nile virus (WNV) reached Louisiana in the Fall of 2001. In August 2001, a crow infected with WNV was identified in Kenner (Jefferson Parish), the first indication of WNV transmission within the state. By the end of the year, five additional birds (crows and blue jays) in Jefferson Parish, eight horses from Calcasieu, Vermillion, and Plaquemine Parishes, and one human case in a homeless man from Kenner were reported.

## POPULATION AND METHODS

The Louisiana Office of Public Health began evaluation of the 2002 WNV outbreak using a variety of clinical methods. Both spinal fluid and serum were tested. Using the date of onset as a guide, sera were classified as acute (collected less than 8 days after onset) or convalescent (convalescent serum collected at least 15 days after onset). Sera collected between 8 and 15 days had to be recollected after 15 days. Serologic tests done included an enzyme immunoassay (EIA) from the Centers for Disease Control and Prevention (CDC) performed by the Office of Public Health and the CDC laboratory at Fort Collins, CO. This test was used to test for IgM and IgG antibodies. The plaque reduction

neutralization tests (PRNT) were all performed at the CDC laboratory in Ft. Collins, CO.

The following case definitions were used to differentiate infection from disease, to differentiate West Nile fever from West Nile meningoencephalitis and to allow a consistent method to evaluate the progress of the outbreak (3).

### West Nile Meningoencephalitis

Meningoencephalitis was clinically defined as a febrile illness of variable severity with neurologic signs and symptoms of aseptic meningitis or encephalitis:

- At least two of the signs or symptoms of meningitis: photophobia, stiff neck, physical signs associated with meningeal irritation, abnormal results from the cerebrospinal fluid (CSF), e.g. pleiocytosis, elevated protein or
- One or more signs or symptoms of encephalitis: cranial nerve palsies, paresis or paralysis, sensory deficits, convulsions, tremors, abnormal movements, acute flaccid paralysis, confusion or other alteration of mental status, coma of varying degrees.

### West Nile Fever

West Nile fever was clinically defined as a febrile illness with headache. The classification as a probable or confirmed case was based on laboratory results.

### Probable

- WNV EIA IgM-positive in acute serum or
- WNV IgG-positive in convalescent serum with four-fold elevation relative to acute serum and PRNT-positive

**Confirmed**

- WNV EIA IgM-positive in acute CSF or
- WNV EIA IgM-positive and WNV EIA IgG-positive and PRNT-positive or
- Four-fold change in PRNT antibody titer to WNV in paired, appropriately timed, acute and convalescent serum samples, and PRNT-positive or
- WNV virus isolation in blood, CSF, other body fluid or tissue or
- WNV genomic sequence in blood, CSF, other body fluid or tissue or
- WNV antigen in blood, CSF, other body fluid or tissue

A West Nile case of meningoencephalitis or West Nile fever was required to meet both the clinical definition and the laboratory case definition.

Reported deaths were described as deaths due to a disease occurring within 6 months of diagnosis of WNV infection. No attempt was made to confirm that West Nile disease was the main contributing factor for death.

Epidemic curves were used to monitor the progress of the outbreak. The epidemic curve is based on the date of sample collection as a surrogate for date of diagnosis. The data presented are based on the data collected by the last week of December 2002.

**RESULTS AND COMMENTS**

**Cases**

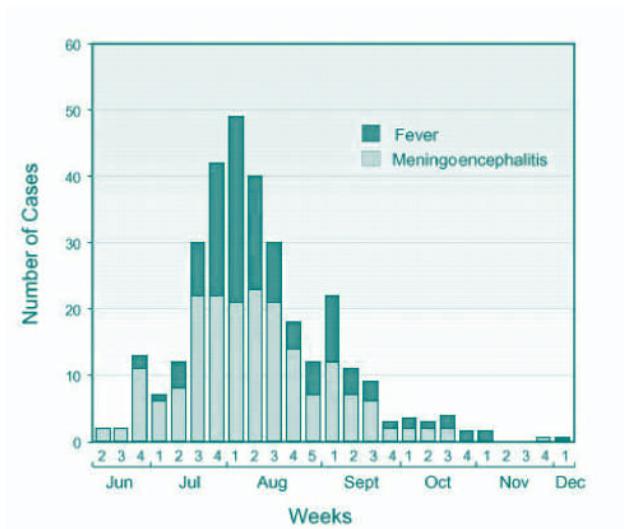
There were a total of 329 cases of West Nile diseases in Louisiana in 2002: 204 cases of meningoencephalitis and 125 cases of West Nile fever.

**Epidemic curves**

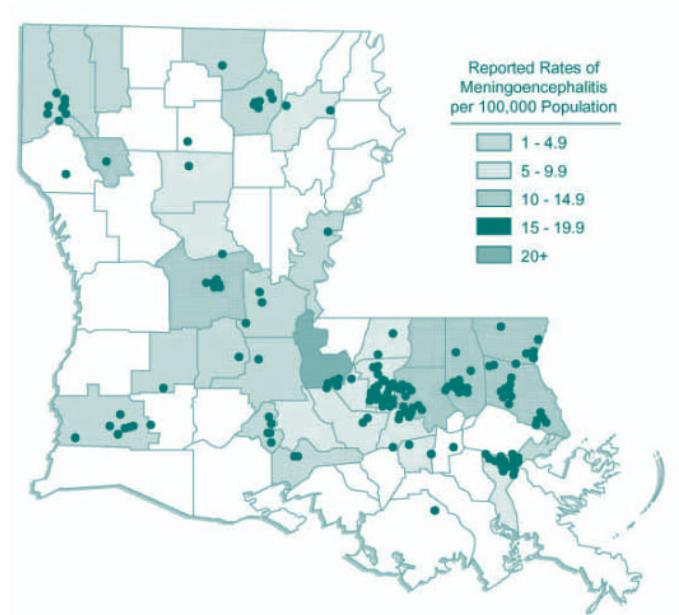
The first cases were diagnosed during the second week of June in St. Tammany and Tangipahoa Parishes. The weekly number of cases increased rapidly to reach a peak during the first week of August (7th week after the beginning of the outbreak). The weekly number of cases then decreased very progressively until the first week of December (17 additional weeks). The epidemic curve is presented in Figure 1.

The curve representing the meningoencephalitis cases is the most significant tool in tracking the epidemic. Testing and confirmation of West Nile fever cases were discouraged in order not to overwhelm laboratory capacity. However, sera that were submitted from West Nile fever suspects and received at the laboratory were tested and their results were reported and integrated in the surveillance system. Figure 1 shows the minimal number of confirmed cases of West Nile fever at the beginning of the outbreak.

**Figure 1.** Cases of West Nile-associated fever and meningoencephalitis.



**Figure 2.**



**Geographical Distribution**

West Nile infections occurred in most of Louisiana’s parishes (41 out of 64). Including other mammals (particularly horses) and birds, the West Nile infections were found in 60 of the 64 parishes. However, West Nile exhibited a very focal distribution: 12 parishes reporting 10 cases or more comprised 274 cases out of a total of 329 cases (83% of cases) (Figure 2). Within these parishes the distribution was also very focal.

The 2002 West Nile epidemic was characterized by a combination of small foci concentrated within cities or limited rural areas, and sporadic cases in rural areas (Table 1, Figure 2). These foci were staggered in time. The first outbreaks occurred north of Lake Pontchartrain in St. Tammany, Tangipahoa, and Livingston Parishes during June. At the end of June, foci appeared to the west in East Baton Rouge and Ascension Parishes. In July, new foci appeared in Calcasieu and Ouachita (southwestern and northeastern corners of the state). In mid-July, foci were initiated south of the lake in the New Orleans metropolitan area (Orleans and Jefferson Parishes) and west of Baton Rouge in Pointe Coupee Parish. In mid-August, a focus began in the central Louisiana parish of Rapides.

**Table 1:** Temporal distribution of the main foci of West Nile infection in Louisiana, 2002.

Parish	Timing	Continuous Weeks	%
St. Tammany	June 2-August 2	9	95%
Tangipahoa	June 2-August 3	10	88%
Livingston	June 4-August 4	9	94%
East Baton Rouge	June 4-September 2	12	98%
Ascension	June 4-September 2	10	93%
Calcasieu	July 2-August 3	6	70%
Ouachita	July 2-August 3	6	100%
Jefferson	July 2-September 1	9	83%
Washington	July 3-August 3	5	90%
Orleans	July 4-September 4	10	91%
Pointe Coupee	July 4-August 4	5	100%
Rapides	August 3-October 2	8	95%

- Timing in weeks: June 2 = second week of June
- Continuous Weeks = Number of weeks with continuous cases with interruption of less than 2 weeks
- % = Proportion of cases in the focus occurring during the continuous weeks

### Age, Race, and Gender Distribution

The age and gender distribution of cases is presented in Table 2. All age groups exhibit a preponderance of males. The ratio of males to females was 1.24:1. The incidence of new cases of meningoencephalitis increased progressively from 0.3 /100,000 in the 0-14 age group to 9.0/100,000 in the 60-74 year old age group, and increased dramatically to 32.2/100,000 in the over-75 age group.

Thirty two percent of West Nile meningoencephalitis cases were African American, a percentage not significantly different from the percentage of the African American population in Louisiana.

### Death

The distribution of death by age group shows a similar pattern with very low mortality rates (0.0 to 0.7/100,000) in those younger than 75 and a dramatic increase to 10.7/100,000 in the 75 and over age group.

**Table 2:** Age and gender distribution of West Nile cases and deaths in Louisiana, 2002.

Age Group	Cases by Gender			Clinical Classification			ME /100K	Death	Death /100K
	M	F	Total	ME	Fever	Unk			
0-14	3	7	10	3	7		0.3	0	0.0
15-29	26	29	55	31	24		3.6	1	0.1
30-44	49	28	77	35	40	2	4.1	1	0.1
45-59	39	33	72	44	28		6.8	2	0.3
60-74	35	23	58	40	17	1	9.0	3	0.7
75+	30	27	57	51	6		32.2	17	10.7
Total	182	147	329	204	122	3	5.3	24	0.6

ME = Meningoencephalitis, Unk = Unknown, /100K = Rate per 100,000

### DISCUSSION

WNV was recently imported into the US and made its way to Louisiana in the Fall of 2001. It was unknown how much WNV would impact the southern states. Experience shows that WNV found a very favorable ecological niche throughout Louisiana. The ease of spread of the epidemic is an ominous sign for the future.

The description of this epidemic raises many of questions that would need to be answered to refine preventive measures. The reasons that lead to an area becoming a focus of human WNV infection are far from being completely understood. There seem to be some populated areas with intense WNV transmission in birds but not in humans.

A WNV human focus may fade for three theoretical reasons: naturally changing ecological conditions, mosquito control activities, and personal protection measures. The respective importance of these three reasons is not yet understood.

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