

West Nile virus and other arboviral surveillance in Wisconsin, 2006 – Final Report

Introduction

A West Nile virus (WNV) surveillance program has been in place in Wisconsin since 2001. This surveillance program involves the effort and cooperation of numerous partners, including local, state, and federal agencies. The program has been supported by a federal Expanded Laboratory Capacity (ELC) cooperative agreement from the U.S. Centers for Disease Control and Prevention (CDC).

Human Case Surveillance

During 2006, human case surveillance was conducted statewide for WNV and other arbovirus illnesses, including those resulting from infection with La Crosse virus (LAC), eastern equine encephalitis virus (EEE), and St. Louis Encephalitis virus (SLE). For WNV, commercial laboratories and the Wisconsin State Laboratory of Hygiene (WSLH) conducted ELISA-based screening tests of serum and cerebral spinal fluid (CSF) specimens to detect the presence of WNV IgM antibody, an indicator of acute WNV infection. Fee-exempt testing at the WSLH was subsequently conducted on WNV-positive specimens using a WNV IgM antibody capturing assay (MAC-ELISA). In addition, the American Red Cross and other blood banks screened donated blood units for presence of WNV markers. Testing for other arboviruses was conducted at commercial laboratories and the WSLH, and positive specimens were sent to CDC for confirmation. In addition, statewide surveillance was conducted for travel-associated arbovirus illnesses, such as those resulting from Dengue (DEN) infections, identified by commercial and CDC laboratories.

Reported WNV illnesses in humans

A total of 21 cases of WNV illness were reported among Wisconsin residents during 2006, which was the highest number reported in Wisconsin since 2002, the first year human WNV illnesses were reported in the state. Prior annual human WNV case totals reported in Wisconsin residents include 17 in 2005, 12 in 2004, 17 in 2003, and 52 in 2002.

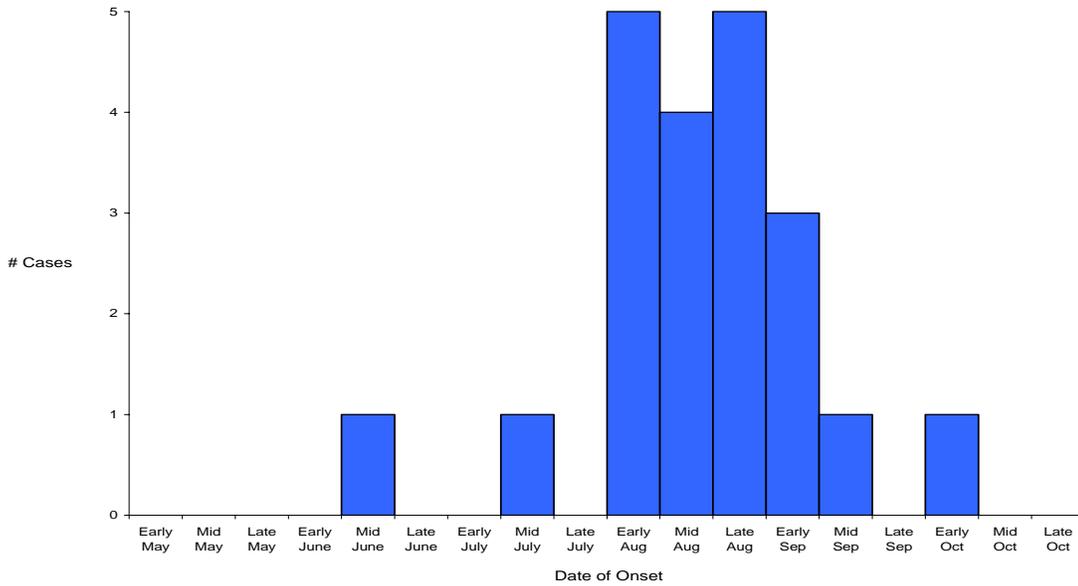
Eleven (52%) of the 21 cases involved neuroinvasive disease (NID), 14 (67%) case patients were hospitalized, and one case patient died (a 67 year-old male) from complications due to WNV illness. During 2006, the incidence rate for WNV NID among Wisconsin residents was 2.6 cases per million persons. One case patient likely acquired WNV infection outside of Wisconsin.

Fourteen (67%) of the 21 case patients were male and case patient ages ranged from 23 to 81 years (median = 55 years). Age of NID case patients ranged from 46 to 81 years; 3 (27%) of the 11 NID case patients were <50 years of age.

Two of the 21 cases occurred in blood donors whose viremic infections were detected when their donated blood units were tested. In addition, 8 asymptomatic blood donors were identified with acute WNV infections.

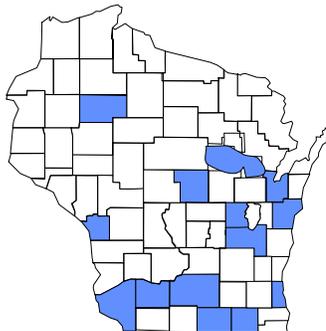
Illness onsets in 2006 for WNV case patients occurred from June 14 to October 5, with most occurring between early August and early September [Figure 1].

Figure 1. Cases of human West Nile virus illness by date of onset – Wisconsin, 2006



The 21 cases occurred in residents of fourteen different counties: Milwaukee (5), Dane (3), Grant (2), Portage (1), Brown (1), Fond du Lac (1), Iowa (1), La Crosse (1), Manitowoc (1), Rock (1), Rusk (1), Shawano (1), Walworth (1), and Winnebago (1) [Figure 2].

Figure 2. Counties with human West Nile virus cases – Wisconsin, 2006



Nationally, as of January 3, 2007, 4,180 human cases of West Nile illness were reported with onsets in 2006, up from 2,819 cases during 2005. Of the 4,180 cases reported nationally, 1,410 (34%) involved neuroinvasive disease; 149 deaths were attributed to West Nile illness (3.6% case-fatality ratio).

Other arbovirus infections in humans

Three confirmed human cases of LAC virus illness in Wisconsin residents were reported during 2006, the same number (3) as were reported statewide during 2005. Eight illnesses from infection with Dengue viruses were reported during 2006 in Wisconsin residents traveling to Dengue-endemic areas outside of the United States, including Central America,

the Caribbean Islands, Southeast Asia, and Pakistan/Arabia. One case of Chikungunya illness was also reported in a traveler returning from India. One case of Powassan encephalitis, resulting from infection with a tick-borne Powassan arbovirus, was reported in a Wisconsin resident. There were no human cases of illness from infection with SLE, EEE, or Western Equine Encephalitis (WEE) virus reported in Wisconsin residents during 2006.

Corvid Surveillance

Statewide monitoring of sick or dead corvid species (crows, ravens, blue jays) continued from May through October of 2006. A West Nile virus information hotline (WNV Dead Bird Reporting hotline) and specimen submission system was operated by USDA Wildlife Services to assist with this monitoring.

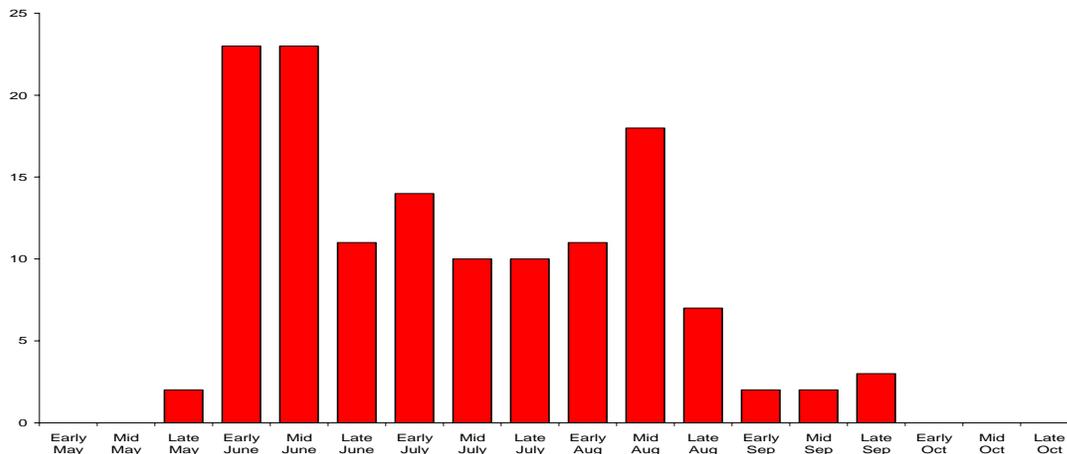
A total of 3,592 sick or dead bird reports were received by the WNV Dead Bird Reporting hotline, local health departments and other cooperating partners as reported on the Health Alert Network (HAN) during the monitoring period. The number of reports more than doubled from the 1,449 received during 2005. Some of this increase may be attributed to heightened public concern related to potential avian influenza.

The USDA Wildlife Services extracted and submitted skin tissue for testing from 260 (84%) of the 308 corvids collected during the surveillance period. WNV testing was conducted between May and October at the University of Wisconsin Veterinary Diagnostic Laboratory (WVDL). Testing results were updated at least weekly on the HAN and the Wisconsin Division of Public Health (DPH) website. Once two birds from a county were positive for WNV, testing was discontinued for corvids in that county as two positives were deemed sufficient evidence for circulating virus among the bird population in that county.

Of the 260 tested birds for WNV at the WVDL, 136 (52%) were positive for WNV, up substantially from the 47 positives (of 163 birds tested) during the 2005 season.

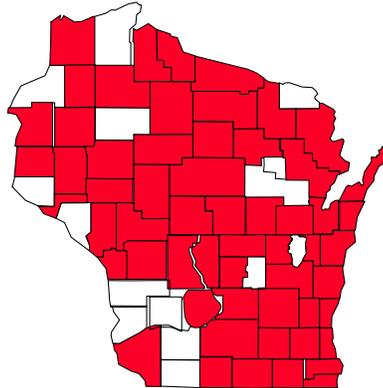
During 2006, WNV-positive corvids were collected in 58 (81%) of 72 Wisconsin counties from late May to late September; most positive birds were collected between early June and mid-August [Figure 3].

Figure 3. Corvids testing positive for West Nile virus illness by date of collection – Wisconsin, 2006



The detection of WNV in corvids from 81% of Wisconsin counties during the 2006 season was a strong indication of widespread WNV activity among mosquitoes and bird populations throughout the state [Figure 4].

Figure 4. Counties with birds testing positive for West Nile virus – Wisconsin, 2006



Equine Testing

West Nile virus testing was available to veterinarians treating horses with neurologic signs and symptoms. Specimens were submitted to and tested at the WVDL; 21 horses were positive for WNV (up from 15 equine cases in 2005 and 19 in 2004) and 7 (33%) of the 21 died. WNV-positive horses were from 14 different counties: Barron (4), Clark (2), Dane (2), Marathon (2), Racine (2), Dunn (1), Grant (1), Jackson (1), La Crosse (1), Manitowoc (1), Taylor (1), Trempealeau (1), Washburn (1), and Waukesha (1). Equine case illness onsets occurred from late July through mid-September. None of the WNV-positive horses had received WNV vaccine in 2006 prior to their illness. With no equine WNV cases among WNV-vaccinated horses during 2005 and 2006, coupled with a substantial reduction in overall equine cases since 2003 when there were 47 reported cases, there is strong evidence indicating the effectiveness of the WNV equine vaccine and the need for continuing to promote its use in horses in Wisconsin.

During 2006, testing for EEE and Western Equine Encephalitis (WEE) viruses was available at the WVDL upon request; no horses tested positive for EEE.

Mosquito Testing

Nine Wisconsin communities (Brown Co., Eau Claire, Franklin, Kenosha Co., City of Milwaukee, Madison/Dane County, Racine Co., Waukesha Co., and West Allis) conducted mosquito collection and testing of *Culex* mosquitoes from July to September as part of a mosquito pool surveillance program focused on urban areas in Wisconsin. The Marshfield Clinic Medical Research Foundation performed pooling and testing of *Culex* mosquito traps placed in the participating communities. Data provided to the DPH as of October 10, 2006 reported 611 *Culex* pools were collected and tested, with 115 (19%) positive for WNV. Ninety-two (80%) of the positive pools were obtained from 17 of 20 trap sites within the City

of Milwaukee. Other positives were obtained from traps in Brown Co. (4), Franklin (8), Racine (5), and Waukesha Co. (6). The vast majority of positive mosquito pools were collected during August and early September. The City of Milwaukee had the most *Culex* pools tested (367), followed by Franklin (90), and Brown Co. (38). More efficient *Culex* yields were reported for gravid traps by several participating communities, possibly due to a new and enhanced medium used in the traps this season.

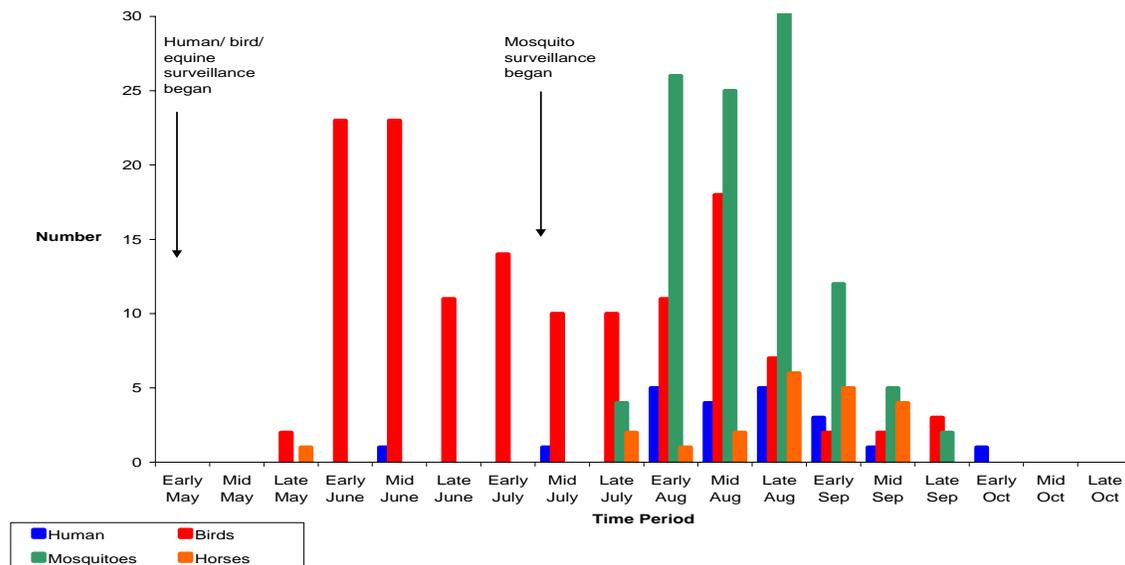
Other Species Testing

Testing of 135 specimens collected from 42 non-corvid bird and mammal species is being performed by the cooperative efforts of the Wisconsin Department of Natural Resources, the University of Wisconsin Veterinary Diagnostic Lab-Madison, and Marshfield Clinical Research Foundation. Of the 135 individuals sampled, 48 have been tested to date for WNV including 15 cranes, 12 mammals, nine songbirds, five shorebirds, three raptors, two loons, one corvid, and one game bird. Evidence of WNV exposure was detected in six specimens: one whooping crane, one coyote, one bald eagle, one red-tailed hawk, one blue jay, and one wild turkey. An additional whooping crane tested positive for antibodies after being vaccinated for WNV. Results for the remaining 87 specimens for 2006 are pending. In addition, results from a three-year study examining prevalence of WNV antibody in wild mammals of southern Wisconsin conducted by researchers at the U.S. Geological Survey and the University of Wisconsin, Madison and supported by the WNV surveillance program was published in the *Emerging Infectious Diseases* journal in December, 2006 [Docherty DE et al., EID 2006;12(12):1982-4].

Combined Surveillance Data

Examining the combined surveillance data reveals that the early and consistent detection of WNV-positive corvids preceded human and equine cases, the vast majority of which had onsets from early August to mid-September [Figure 5]. The detection of positive mosquito pools largely corresponded with onsets of illness in both humans and horses.

Figure 5. West Nile Surveillance, combined data by dates of collection/onset – Wisconsin, 2006



Public Outreach

The DPH, with assistance from the West Nile Virus Working Group, developed and distributed a pocket-size mosquito-borne disease information card, “Use Protection, Avoid Infection – Mosquito-borne disease in Wisconsin,” to be used for public outreach and education [Figure 6]. This new information card provides the most recent information regarding mosquito-borne illnesses in Wisconsin, particularly WNV and La Crosse virus, and is more updated than the previous “Fight the Bite – West Nile Virus in Wisconsin” brochure developed for the 2002 season. In addition, the pocket-size format was selected because providers and local health departments reported that recipients were more likely to keep a smaller pocket-size pamphlet than a larger brochure. The new pocket-size card was made available in early July, 2006 and 17,291 of the 100,000 printed cards were distributed to local health departments, providers, and the public by December, 2006. This card will be available during 2007 and subsequent seasons.

Figure 6. “Use Protection, Avoid Infection – Mosquito-borne disease in Wisconsin” information card

CLEAN OUT MOSQUITO BREEDING SITES
A small amount of standing water can be enough for a mosquito to lay her eggs. Look around for possible mosquito breeding places.

DRAIN OR REMOVE STANDING WATER Be sure to empty water from buckets, cans, pool covers, flower pots, wheelbarrows, boats, trash cans, and other items that may hold water.

MAINTAIN WATER BOWLS AND BIRDBATHS Clean pet water bowls weekly. Change water in water bowls and birdbaths regularly.

UNCLOG RAIN GUTTERS Ensure that your rain gutters remain unclogged and drain properly.

DISCARD OR STORE USED TIRES Throw away or cover up stored tires that aren't being used.

MORE INFORMATION
Wisconsin Department of Health and Family Services
Division of Public Health
<http://dhs.wisconsin.gov/communicable/westNilevirus/>
US Centers for Disease Control and Prevention
<http://www.cdc.gov/ncidod/dvbid/westnile/index.htm>
Wisconsin Department of Natural Resources
<http://www.dnr.state.wi.us/ora/land/wildlife/health/issues/wnvbackground.htm>
Wisconsin Department of Agriculture, Trade, and Consumer Protection
<http://www.datcp.state.wi.us/arm/environment/insects/west-nile/index.jsp>
or contact your local health department.

USE Protection AVOID Infection
mosquito-borne disease in Wisconsin

LA CROSSE VIRUS
La Crosse (LAC) virus is found in Western Wisconsin, mostly in counties near the Mississippi River.
LaCrosse virus is spread to humans by the bite of eastern treehole mosquitoes, which breed in objects that hold water over a prolonged period (such as basal tree holes and unrimmed tires). Like WNV, infection with LAC virus may cause severe disease, including encephalitis, which may be life-threatening, even fatal. Although persons of all ages may develop severe disease, serious illness is more common in children. Symptoms of severe illness after LAC virus infection may include: fever, headache, drowsiness, and convulsions. See your doctor if you develop ANY of these symptoms and have been in areas where LAC virus is present.

PROTECT Yourself against mosquito bites
The best way to reduce your risk of getting diseases from mosquitoes is to reduce your risk for mosquito bites.

COVER UP
Wear long sleeve shirts, long pants, and socks when outdoors. Since mosquitoes may bite through clothes, spraying clothes with a repellent will provide extra protection.

USE REPELLANT
Apply insect repellent when you go outdoors. The U.S. Environmental Protection Agency (EPA) has registered several active ingredients for use in repellents that can be applied to skin and/OR clothing, including:
• DEET (N,N-diethyl-m-toluamide)
• Picaridin (KBR 3023)
• Oil of lemon eucalyptus (p-menthan 3,8-diol)
• Permethrin (DO NOT APPLY DIRECTLY TO SKIN; only for use on clothes, camping gear, etc.)

ALWAYS FOLLOW REPELLANT LABEL INSTRUCTIONS
Repellents have different age restrictions, shelf lives, and application limitations. Do not put repellent on children's hands because it may get into their mouth. Do not spray repellent containing DEET on the skin underneath clothing.

AVOID MOSQUITOES
The mosquitoes that carry West Nile virus bite between dusk and dawn so if possible limit your time outdoors during these hours.

MOSQUITO-PROOF YOUR HOME
Keep mosquitoes outside by fixing or installing window and door screens.

In addition, “Fight the Bite” and CDC education materials were also distributed during the 2006 mosquito season. Press releases pertaining to WNV disease and means of protection were distributed prior to and during the spring and summer 2006 at both the state and local levels. Numerous local health departments in Wisconsin conducted public outreach programs specifically to prevent mosquito-borne illness in Wisconsin. DPH staff continued to maintain a website devoted to West Nile virus surveillance activities in Wisconsin: <http://dhfs.wisconsin.gov/communicable/westNilevirus/>. The website contains real-time statewide human, corvid, equine, and mosquito testing and surveillance data, information on

personal protection against WNV exposure, and a link to the CDC WNV website <http://www.cdc.gov/ncidod/dvbid/westnile/index.htm>.

WNV Working Group

The West Nile Virus Working Group, a multidisciplinary body that focuses on WNV surveillance issues in Wisconsin, was convened in August 2001 and met most recently in April, 2006 to discuss WNV surveillance-related activities for the 2006 season. The working group is scheduled to meet in February, 2007 to discuss planned activities and the direction of the WNV surveillance program for the 2007 and subsequent mosquito seasons. The reduction in federal ELC funding for WNV surveillance activities in Wisconsin, down from \$300,000 in 2006 to \$170,000 in 2007, and how these cuts will affect current and future arbovirus surveillance activities in Wisconsin will be discussed by the group at this meeting.

Contact Information

This report represents work conducted statewide during 2006 by many individuals from numerous agencies and organizations. Any questions or comments regarding this report or West Nile surveillance activities within Wisconsin may be directed to Mark Sotir PhD, MPH, at: (608) 267-9000 or sotirmj@dhfs.state.wi.us.