

West Nile Virus (WNV) and Arbovirus

2008 Wisconsin Summary Report 04/15/09

Diep Hoang Johnson - Wisconsin Division of Public Health

The Wisconsin Arbovirus Surveillance Program began in 2001, involving local, state, and federal agencies. The program has been supported by the CDC Epidemiology Laboratory Capacity (ELC) cooperative agreement.



Arbovirus surveillance

During 2008, the Wisconsin Division of Public Health (WDPH) conducted statewide human case surveillance for mosquito-borne and tick-borne arbovirus infections. Illnesses native to Wisconsin that are transmitted by mosquitoes include West Nile Virus (WNV), La Crosse/California encephalitis virus (LAC/CA), eastern equine encephalitis virus (EEE), St. Louis encephalitis virus (SLE) infection, and western equine encephalitis (WEE). Surveillance for several travel associated mosquito-transmitted infections including dengue fever (DEN) and Chikungunya fever (CHIK). Enhanced surveillance and testing of arboviral specimens in Wisconsin have identified Powassan virus (POWV), a tick-borne *Flavivirus* transmitted by deer ticks. POWV infections are rare and symptoms are similar to other arboviral illness, ranging from mild onset of fever to encephalitis or meningitis. Other non-arbovirus tick-borne infections included Lyme and anaplasmosis/ehrlichiosis are more common in WI.

WDPH follows the 2004 CDC arbovirus case definition. Arboviral diseases are classified as neuroinvasive (encephalitis or meningitis) or non-neuroinvasive (fever) and reported as either confirmed or probable. All specimens with positive or equivocal IgM results from commercial laboratories must be confirmed at WSLH or CDC. A confirmed arbovirus infection must have a positive laboratory that meets the CDC criteria and supportive clinical symptoms. All specimens with positive or equivocal IgM results from commercial laboratories that have not been confirmed at the WSLH and have supportive clinical symptoms will be classified as probable. A detail description of the arbovirus CDC case definition can be found at this link www.cdc.gov/ncphi/diss/nndss/casedef/arboviral_current.htm

Arbovirus result

Nineteen cases of mosquito-borne arboviral infections were reported in 2008 compared to 31 cases in 2007. There were no tick-borne arbovirus illnesses reported in 2008. WNV and LAC/CA viruses have been the two most commonly reported arboviruses in Wisconsin, resulting in 84% of the arbovirus illnesses in 2008 and 68% in 2007 (Table 1). A 70% decrease in dengue fever illnesses was seen in 2008.

Table 1. Human arbovirus illnesses in Wisconsin 2008

Arbovirus	2008		2007	
	Confirmed	Probable	Confirmed	Probable
WNV	8	0	12	2
LAC/CA	6	2	4	3
EEE	0	0	0	0
SLE	0	0	0	0
DEN	0	3	0	10
Total	14	5	16	15

Figure 1 depicts the 2008 arbovirus infections in Wisconsin counties. In 2008, human WNV illnesses were reported in 7 Wisconsin counties. LAC/CA infections were seen mostly in the western Wisconsin regions whereas WNV infections occurred throughout the state. Onsets of illness for LAC/CA infections were reported from June through September and dengue fever onsets of illness were reported from February through November (Figure 2). All three dengue cases traveled to Central America or the Caribbean during the 2 weeks before illness.

Figure 1. WI 2008 Arbovirus human infections by county of residents

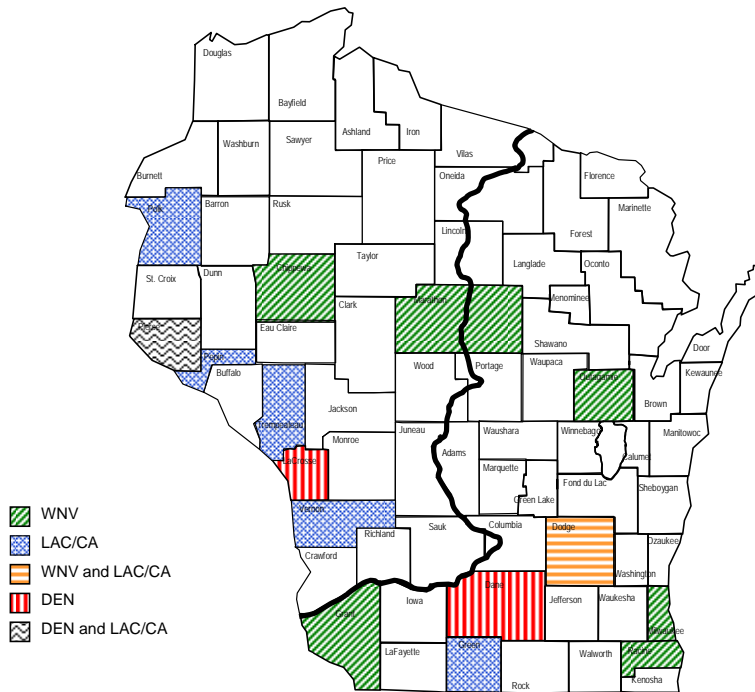
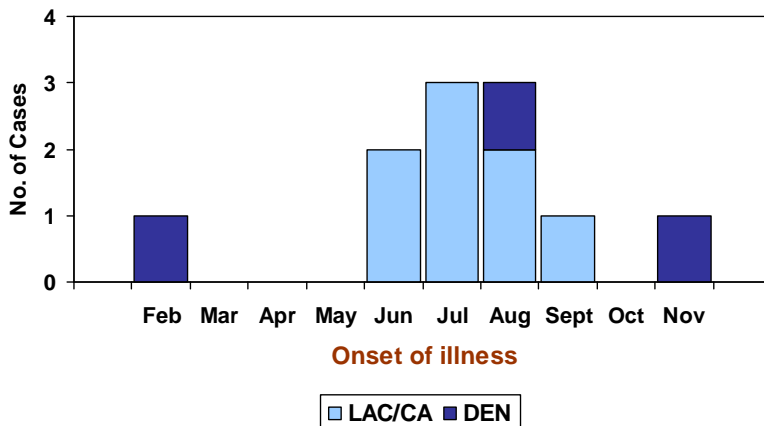


Figure 2: WI 2008 The number of LAC/CA and Dengue fever infections per months of illness



LAC/CA surveillance

From 2002 to 2008, a total of 68 cases of LAC/CA infections were reported in Wisconsin, averaging 10 cases per year (Table 2). Beginning 2007, WDPH investigated and reported both confirmed and probable cases to CDC. Prior to this, only confirmed cases were reported to CDC. Historical data indicated that the high risk age group was in children less than 10 years old. A recent significant finding in our surveillance identified LAC/CA infections equally affected both children and adults. In 2008, 50% of the cases were reported in children less than 10 years old and in adults over 45 years old (Table 3). In 2007, 29% of the infections were less than 9 years of age and 29% were above 45 years. In 2008, 75% of ill cases were males, 75% were hospitalized, and no deaths occurred. In 2007, all ill cases were male, 43% were hospitalized, and no deaths occurred.

Table 2. LAC/CA cases with age characteristics, WI 2002- 2008

Year	Total cases	Age range (yrs)	Average (yrs)	Median (yrs)
2002	27	0-52	14	9
2003	12	4-79	15	7
2004	8	1-67	19	10
2005	3	8-57	32	30
2006	3	6-23	12	7
2007*	7	4-64	33	34
2008*	8	4-61	32	31

*Confirmed and probable cases were both reported in the total case count

Table 3. LAC/CA cases described by age category from 2002-2008, WI

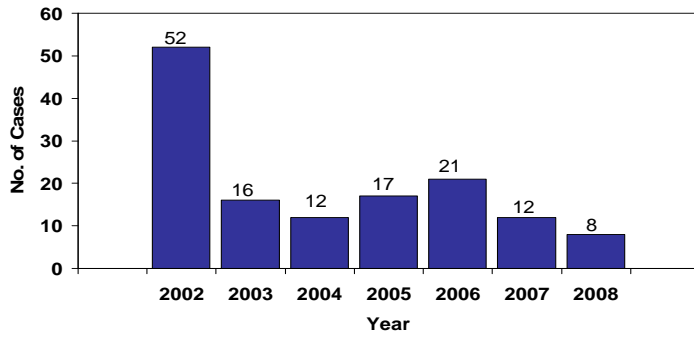
Age groups	2008	2007	2002 - 2006
0-4	2	1	13
5-9	2	1	14
10-24	0	0	15
25-44	0	3	5
>45	4	2	6
Total	8	7	53

WNV human surveillance

Approximately 80% of people infected with WNV do not become ill. Twenty percent develop a mild illness characterized as West Nile fever (WNF), and a <1% develop a neuroinvasive disease (NID). Mild signs and symptoms that may include fever, headache, eye pain, muscle aches, joint pain, a rash (frequently on the trunk), swollen lymph nodes, nausea and vomiting typically occur 3 to 14 days after an infected mosquito bite. WNV neuroinvasive disease is characterized by headache, stiff neck, CSF pleocytosis, paralysis, cranial nerve palsies, and altered mental status ranging from confusion to coma.

Human WNV disease was first identified in Wisconsin in 2002 (Figure 3). From 2002 to 2008, a total of 138 WNV infections have been reported with an average of 14 cases per year. The incidence of WNV in Wisconsin was 1.4/million population for 2008, compared to 2.1/million population in 2007. Table 4 compares the characteristics of WNV infections in Wisconsin for 2007 and 2008. WNV illnesses occurred July to September in 2008 with the highest number of human infections reported in August (Figure 4). In 2007, illness onsets for confirmed WNV cases occurred July through October with the highest cases reported in September (Figure 4).

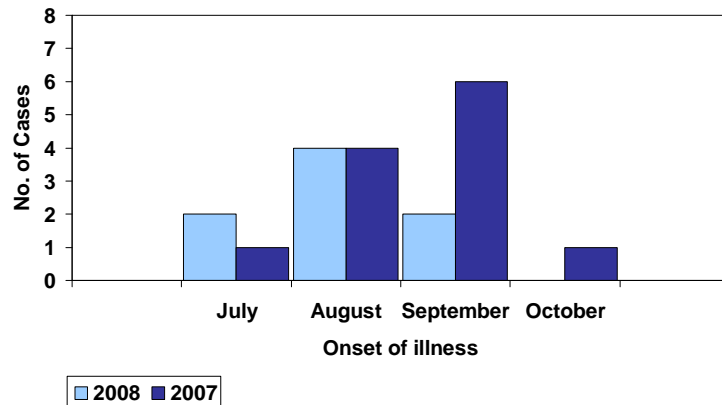
**Figure 3. Annual comparison of WNV infections
WI Residents 2002 to 2008**



**Table 4. Comparison of WNV characteristics
Wisconsin cases 2008 and 2007**

WNV characteristics	2008	2007
Total (confirmed and probable)	8	14
Neuroinvasive	3	6
Non-neuroinvasive (fever)	5	6
Age range (years)	17-69	22-84
Median Age (years)	48	58
Mean Age (years)	42	59
Hospitalizations (%)	4 (50%)	8(67%)
Deaths	1	1
Viremic Blood donations	0	1
Males/Females	7/1	6/6

**Figure 4. WI WNV confirmed human cases
Month of infection in 2007 and 2008**



Animal Surveillance

The WDPH collaborated with DNR and USDA Wildlife Services to provide a “dead bird reporting hotline” service (1-800-433-1610) at the beginning of the WNV season. This hotline allows citizens to report dead bird sightings and inquire about WNV diseases in birds and dead bird testing procedure. Statewide testing for WNV infection in sick or dead corvids (crows, ravens, and blue jays) and equines are performed at the Wisconsin Veterinary Diagnostic Laboratory (WVDL). WNV infection in animals can be an early indicator of virus circulation in a geographic area.

From May 1 through October 31, the dead bird reporting hotline received a total of 1,531 calls, with the highest number of calls being recorded in June and July. A total of 44 out of 75 (45%) corvid birds tested were found to be positive for WNV (Table 5). The first positive WNV bird identified by WVDL was collected in June 2008, a month before the first human case was detected (Figure 5). In 2007, WNV infections were detected in 66 birds and equines samples in 36 different counties from between May through October (Table 5). The first positive bird was identified in May 2007, two months before the first human case was detected.

The WVDL confirmed 5 equines positive for WNV and one positive for EEE virus in 2008 (Figure 5). A positive WNV horse was also identified in June on the same day as the first positive bird. WNV activities (humans and animals) occurred in 28 different counties (Figure 6).

Table 5. Animal samples positive for WNV and EEE virus Wisconsin 2007 and 2008

Arbovirus	2008		2007	
	Bird	Equine	Bird	Equine
West Nile	44	5	49	17
EEE	NA	1	NA	0
Total	44	6	49	17

Figure 5. WNV Human onset dates, avian collection dates, and equine onset dates – WI 2008

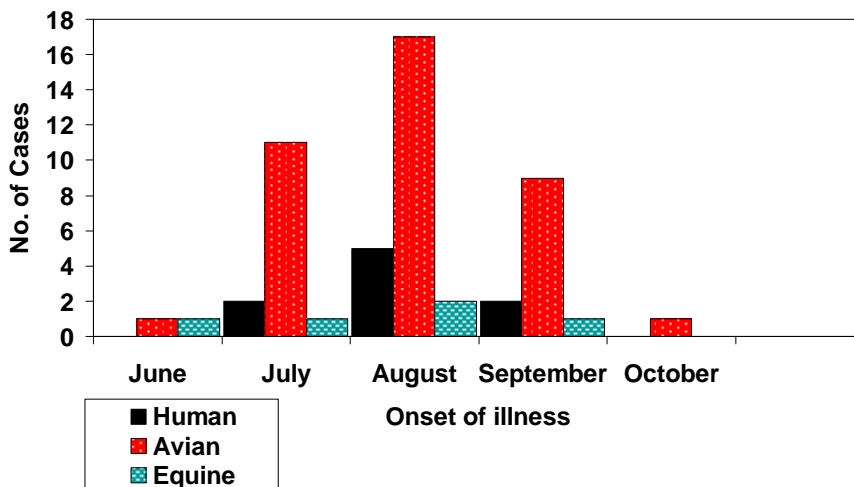
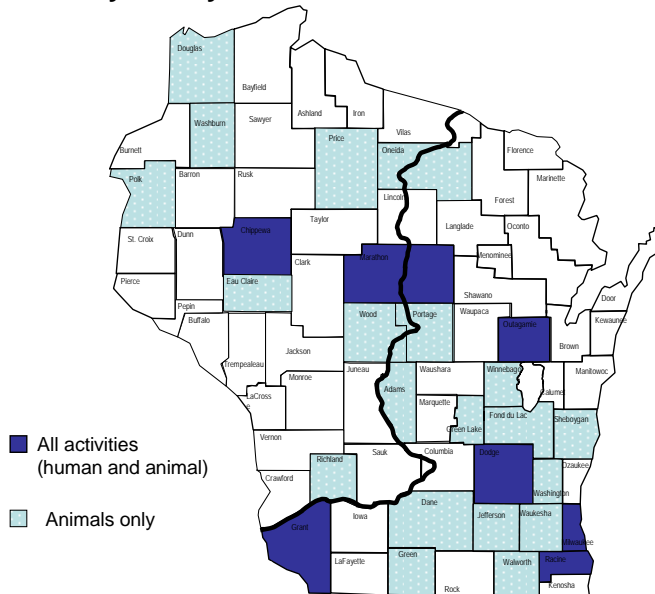


Figure 6. WNV human and animal infections by county of residence – WI 2008



Mosquito Surveillance

In 2008, mosquito surveillance data were available from three local health departments (Madison/Dane, La Crosse, and Milwaukee City/County) and the UW-Madison Department of Entomology. Heavy rainfall in June caused flooding which affected most of the mid and southern regions of Wisconsin.

Dane County

The UW-Madison Department of Entomology collaborated with Madison and Dane County Public Health Departments to conduct mosquito surveillance at 8 different sites. Traps were placed weekly from May 21 through July 15 throughout the city of Madison. The total weekly mosquito counts increased rapidly from May 21 (8 mosquitoes) to June 24 (31,257 mosquitoes) and gradually decreased to 3,222 mosquitoes on July 15. Mosquito pools testing identified *Aedes vexans*, a common backyard nuisance mosquito as the predominant species. In August 2008, Dane county and the UW-Madison Department of Entomology reported the first positive WNV in a pool of mosquito (out of 6 pools of tested) were *Culex pipiens/restuans*. The *Culex* sp. is the main vector for transmitting WNV in Wisconsin.

Milwaukee City

In 2008, Milwaukee City Health Department collected mosquito pools using gravid traps, performed mosquito species identification, and tested mosquito pools for WNV using the Vectest antigen assay. Gravid traps were placed in 20 different sites per night per week, throughout the city. From June through October 2008, a total of 318 traps were used to catch 50 pools of mosquitoes (approximately 5,400 mosquitoes). The highest count of mosquitoes occurred in August. Ninety-two percent of mosquitoes were identified as *Culex* sp. Two pools of *Culex pipiens/restuans* collected on August 29 were positive for WNV.

La Crosse County

Ochlerotatus japonicus was found in La Crosse County for the first time in 2008. Previously, *O. japonicus* has been found in Wisconsin in 2005 near Fort McCoy and in 2007 in Madison. This species of mosquito, an aggressive human biter, and have been know to carry viruses that cause encephalitis including Japanese Encephalitis, LAC, SLE, and WNV. However, testing of *O. japonicus* in all three instances demonstrated negative results for arboviruses. The La Crosse Health Department continued to monitor and control mosquito habitat in 14 surrounding counties. In 2008, over 4,915 ovi traps were placed to monitor for mosquito species and samples were sent to Colorado State University, Fort Collins, Colorado for viral testing. Sites with high viral activities were treated with bacterial larvacide throughout the mosquito season to abate hatching.

WNV national surveillance, United States

WNV surveillance data among the 43 states that reported to CDC-ArboNet demonstrated a 63% decreased in WNV cases from 2007 to 2008 (Table 6). In 2008, onset of illness was year-round with the highest number of infections reported from July through September. In 2007, onsets of illness were reported from January through November with the highest months of illness reported from July through September.

Table 6. National WNV surveillance data by CDC

WNV characteristics	2008	2007
Total cases/States	1,333/43	3630/43
Neuroinvasive	676	1217
Non-neuroinvasive (fever)	624	2350
Age range (years)	1-94	1-97
Median Age (years)	53	51
Deaths	43	124
Viremic blood donations	178	352
Males/Females	792/541	1997/1634

For more WNV national surveillance information, please visit CDC website:
www.cdc.gov/ncidod/dvbid/westnile/Mapsactivity/surv&control08Maps.htm