

## West Nile Virus (WNV) and Arbovirus Summary Report - 12/11/07

The Wisconsin WNV and Arbovirus surveillance program began in 2001, involving numerous partners including local, state, and federal agencies.

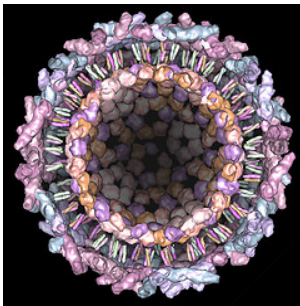
The program has been supported by the CDC Epidemiology Laboratory Capacity (ELC) cooperative agreement.



### Human Surveillance

During 2007, the Wisconsin Division of Public Health (WDPH) conducted statewide human case surveillance for all mosquito-borne and tick-borne arbovirus infections. Illnesses that are transmitted by mosquitoes include West Nile Virus (WNV), La Crosse encephalitis (LAC), eastern equine encephalitis virus (EEE), St. Louis encephalitis virus (SLE) infection, and western equine encephalitis (WEE). A rare case of Powassan virus (POW), a North American tickborne flavivirus was also identified as part of the arbovirus panel testing. Other mosquito-transmitted infectious diseases were also monitored. These included dengue fever (DEN) and Chikungunya fever (CHIK), mainly seen in residents traveling to countries where the illnesses are endemic.

### Chikungunya Fever Virus

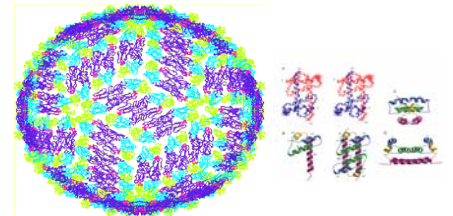


Chikungunya (CHIK) virus, an *Alphavirus* in the *Togaviridae* family, is transmitted to humans by the bite of infected mosquitoes (species *Aedes aegypti* and *Ae. Albopictus*). Symptoms include fever, chills, headache, nausea, vomiting, joint pain, low back pain, and rash. Clinical illness is similar to dengue fever but hemorrhagic fever is not usually seen.

There is no vaccine available, therefore travelers to all tropical and subtropical areas should take precautions against mosquito bites. One case of CHIK was reported to WDPH in 2007.

### Dengue Fever Virus

Dengue fever (DEN) is one of the most common causes of fever in travelers returning from tropical areas such as the Caribbean, South and Central America, Southeast Asia, Northeastern Australia, and Africa. Dengue fever virus, a flavivirus with four different serotypes, is usually transmitted by the bite of an infected mosquito (*Aedes aegypti*).



Symptoms include fever, severe frontal headache, retro-orbital eye pain, arthralgia, myalgia, nausea, vomiting, and maculopapular rash, often accompanied by leukopenia and thrombocytopenia.

Illness can be mild to severe and in some cases can cause fatal hemorrhagic fever that may rapidly progress into dengue shock syndrome (DSS) and death. There is no vaccine available. Travelers should protect themselves from mosquito bites to avoid the risk of infection. Nine cases of DEN were reported to WDPH in 2007.

## **West Nile Virus (WNV)**

West Nile Virus, a flavivirus, was first identified in 1937 in Uganda, Africa and subsequently detected in other part of the world including Europe, the Middle East, and Asia. In 1999, the virus was first detected in the United States when 62 cases of illness and 7 deaths were reported in New York City. Since then the virus has spread across the U.S, Canada, and Latin America. The first documented human WNV infection in Wisconsin was in 2002.

Generally, the WNV is spread to people by the bite of infected mosquitoes, usually of the *Culex* species. Most people (about 80%) infected with WNV do not become ill; the other 20% develop a mild illness characterized as West Nile fever (WNF), and a small percentage (1%) of infected people develop a neuroinvasive disease (NID) that usually involves severe central nervous system illness such as encephalitis and meningitis. Mild signs and symptoms typically occur 3 to 14 days after an infected mosquito bite; they can include fever, headache, eye pain, muscle aches, joint pain, a rash (frequently on the trunk), swollen lymph nodes, nausea and vomiting. WNV Neuroinvasive disease is characterized by headache, stiff neck, CSF pleocytosis, paralysis, cranial nerve palsies, and altered mental status ranging from confusion to coma.

There is no vaccine or specific treatment for WNV but a past infection will offer life long immunity to the virus. The best protection from becoming infected with WNV is to decrease mosquito exposure and prevent mosquito bites. For more information visit our WNV website link at <http://dhfs.wisconsin.gov/communicable/westNilevirus/>

## **WNV in Blood Donors**

Because WNV can be transmitted to people by blood transfusions, the American Red Cross and other blood banks screen donated blood units for presence of WNV markers. All blood donors who are positive by the nucleic acid-amplification test (NAT) are reported to the CDC as presumptive viremic donors (PVDs) and may or may not subsequently develop WNV illness. A symptomatic blood donor with a history of illness 2 weeks before or after date of blood donation is considered as an acute case of WNV. All acute PVD cases with confirmed laboratories results (CDC laboratory criteria) are included in the total confirmed human cases.

## **WNV in Organ Transplants**

WNV infection transmission can occur through organ transplants. Studies indicate that organ-transplant recipients have a 40 times higher risk than the general population for neuroinvasive disease after WNV infection. Organ donors can be screened using the WNV NAT testing but it is uncertain how well the test is able to identify the risk of WNV infection in organs. The national organ-procurement organizations are not currently requiring testing of organs on a routine basis due to factors such as the length of turn around time in testing, investigation into different type of tests that may be more effective, and further research on the potential biological differences between blood, tissues, and organs that may affect the results . National guidelines are currently being reevaluated.

## **Laboratory testing using an arbovirus panel**

All specimens with positive or equivocal IgM results from commercial laboratories were sent to the Wisconsin State Laboratory of Hygiene (WSLH) for confirmation using antibody-capture enzyme immunoassays (IgM CEIA) and plaque-reduction neutralization testing (PRNT). Results from all confirmatory tests for confirmation were provided to health care providers at no cost. Specimens with positive cross-reactive results to multiple agents in the arbovirus panel were sent to CDC for confirmation.

## **WNV CDC case definition**

**Confirmed:** An encephalitis or meningitis case that is laboratory confirmed supported by the following laboratory criteria

- 1) Fourfold or greater change in virus-specific serum antibody titer, or
- 2) Isolation of virus from or demonstration of specific viral antigen or genomic sequences in tissue, blood, cerebrospinal fluid (CSF), or other body fluid, or
- 3) Virus-specific IgM antibodies demonstrated in CSF by antibody-capture EIA, or
- 4) Virus-specific IgM antibodies demonstrated in serum by antibody-capture EIA and confirmed by demonstration of virus-specific serum IgG antibodies in the same or a later specimen by another serologic assay (e.g. neutralization or hemagglutination inhibition)

**Probable:** An encephalitis or meningitis case occurring during a period when arboviral transmission is likely and with the following supportive serology

- 1) A single or stable (less than or equal to twofold change) but elevated titer of virus-specific serum antibodies, or
- 2) Serum IgM antibodies detected by antibody-capture EIA but with no available results of a confirmatory test for virus-specific serum IgG antibodies in the same or a later specimen

## **WNV surveillance summary- 2007**

In 2007, 80 positive WNV laboratory results were reported to the Wisconsin Division of Public Health by physicians and commercial laboratories. WDPH requested all specimens with presumptive or equivocal IgM results for arbovirus panel testing at the WSLH. All patients with positive confirmed results were interviewed using the CDES follow-up form #103; all cases that met CDC case definition were reported weekly to the CDC ArboNet electronic reporting system. A weekly tally of the WNV infections in humans and animals (birds and equines) was also posted on the WDPH WNV information website to assist local health departments, physicians, and citizens in tracking WNV activities in Wisconsin.

Eleven (14%) of the 80 met the CDC confirmed case definition, indicative of active WNV infections; one will remain a probable case (sample was not available for confirmation); one presumptive WNV case was negative for all arbovirus agents upon confirmation at the WSLH; and two presumptive WNV cases are pending CDC confirmation. Twelve (15%) of the 80 presumptive positive specimens were non-WI residents and 52 (65%) patients lab reports were determined to be previous WNV infections (IgG positive and IgM negative).

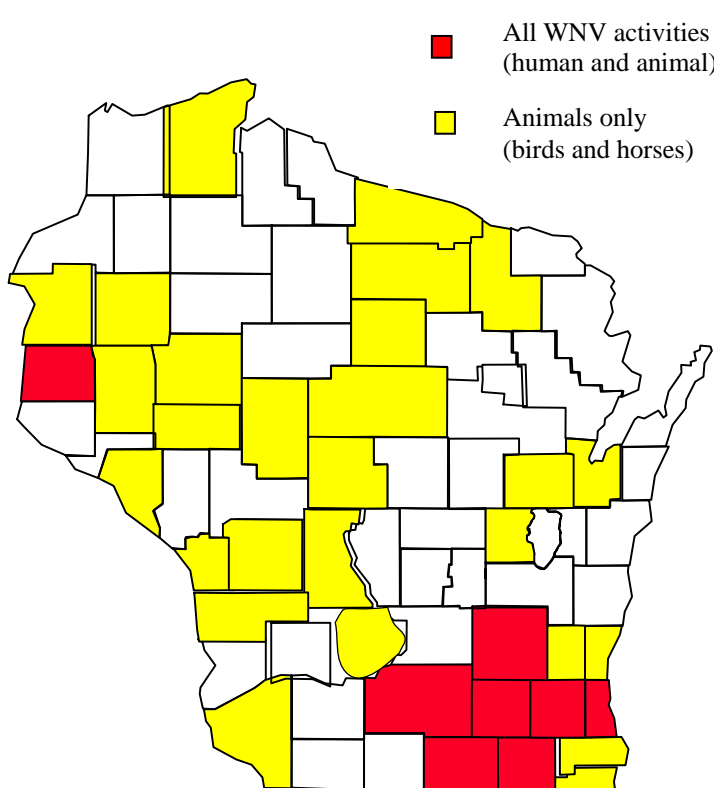
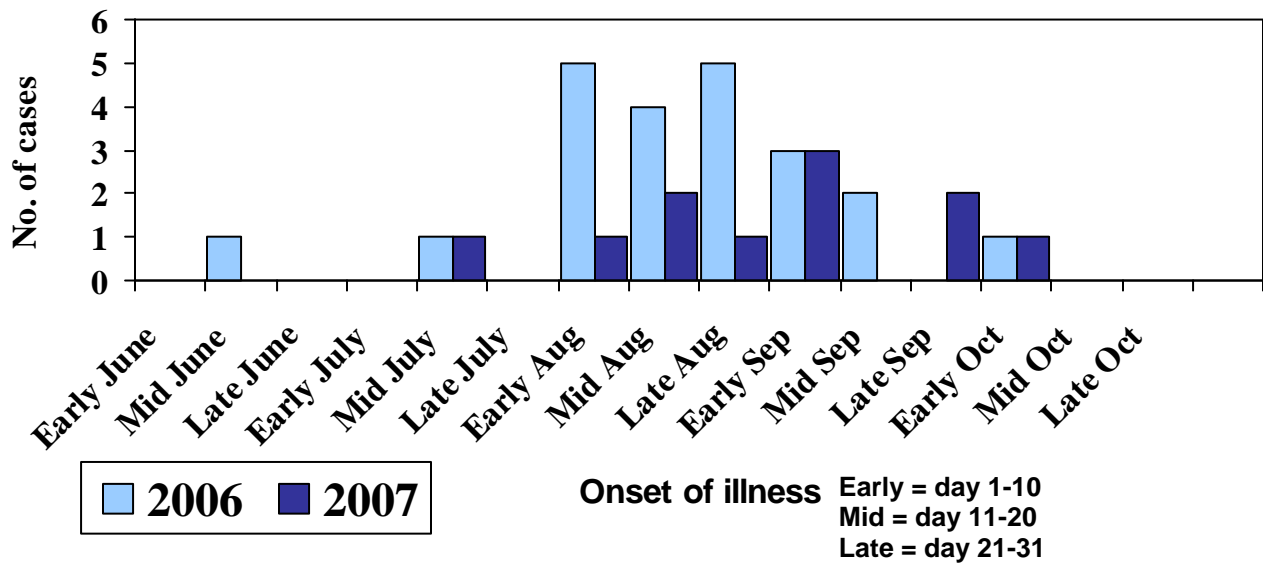
Of the 11 case patients meeting WNV case definition, ages ranged from 22 to 84 years (median = 58 years, mean = 59 years), five (45%) were females, 7 (64%) case patients were hospitalized, and there were no deaths. Three case patients reported traveling to other states during the two weeks before illness, one traveled to Canada and one traveled to Mexico. Five (45%) out of 11 WNV cases involved neuroinvasive disease (NID) with ages ranging from 22 to 81 years (median= 73 years, mean = 63 years).

In addition, two PVDs blood donors were reported from blood collection agencies. One case patient was asymptomatic and the other reported feeling ill a day prior to donating blood with symptoms of fever, headache, muscle aches, fatigue, and chills. A convalescent sample of the symptomatic patient was submitted to WSLH for testing showed positive IgM result for WNV, confirming recent WNV infection. The blood collection agencies promptly destroyed and removed the positive blood and blood products from the blood supply. To date, WNV blood transfusion-associated transmissions or transplant related WNV infections have not been identified in Wisconsin.

Most of the infections occurred during the warm weather months when mosquitoes are active. In 2007, illness onsets for WNV case patients occurred from mid July to early October with the most occurring in early September. In 2006, the first human illness was seen earlier in the season in mid June, highest number of case patients reported onset dates between early and late August, with the last onset date occurring in early October (Figure 1).

**WNV Human Cases by Onset Dates in Wisconsin**

Figure 1: Comparison of onset dates in Wisconsin residents between 2006 and 2007



**Wisconsin Map of Current WNV Activities, 2007**

The 11 cases occurred in residents of 8 different counties: Dane (2), Dodge (1), Jefferson (2), Milwaukee (1), Rock (2), Saint Croix (1), Walworth (1), and Waukesha (1). Additionally, statewide testing for WNV infection in sick or dead corvid species (crows, ravens, and blue jays) and equines were performed at the Wisconsin Veterinary Diagnostic Laboratory (WVDL). WNV infections in animals can serve as early indicators of when the virus might be circulating in a certain area and residents can be warned to take extra precautions against mosquito exposures. In 2007, WNV infections were detected in 11 human, 47 birds, and 14 horses in 36 different WI counties. (Figure 2 and 3).

Figure 3: Graph of WNV human onset dates, avian collection dates, and equine onset dates, 2007

The first 2007 WNV activity seen in a corvid collected in late May  
 (Reported as positive on June 27).  
 The first positive human had an onset date in mid July  
 The onset date for the first positive horse was in late July.

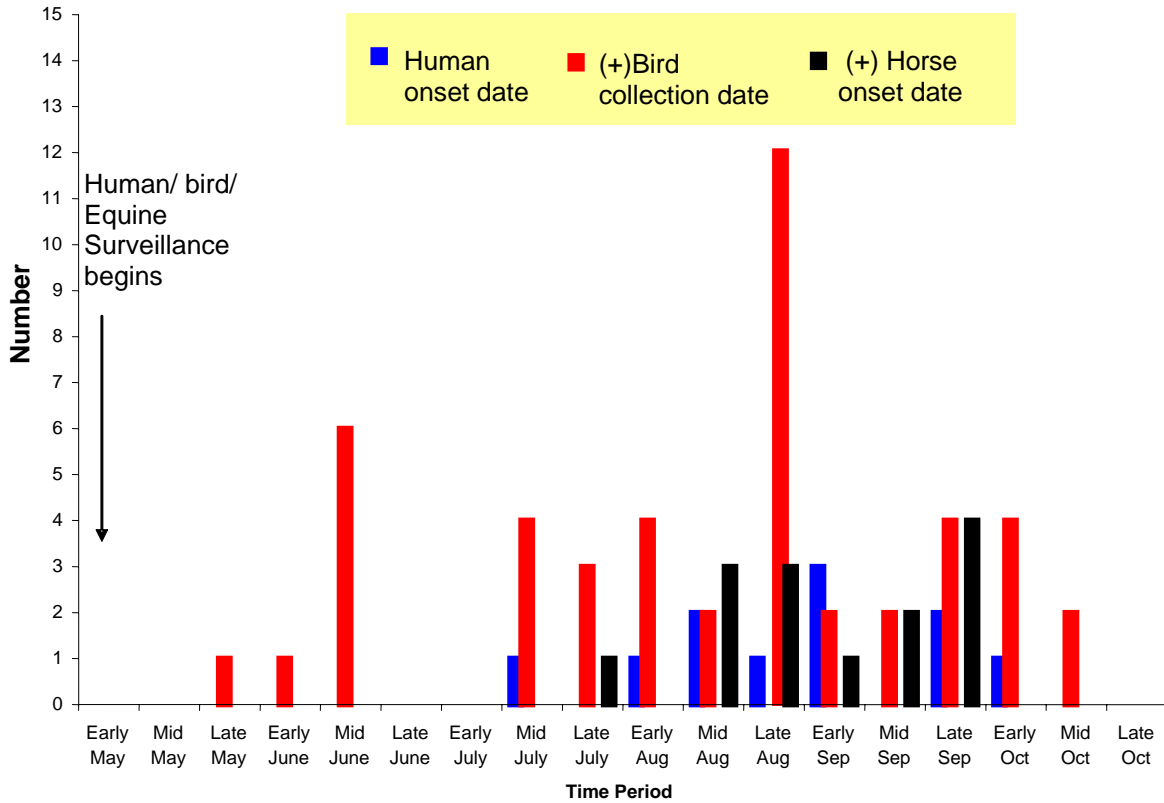
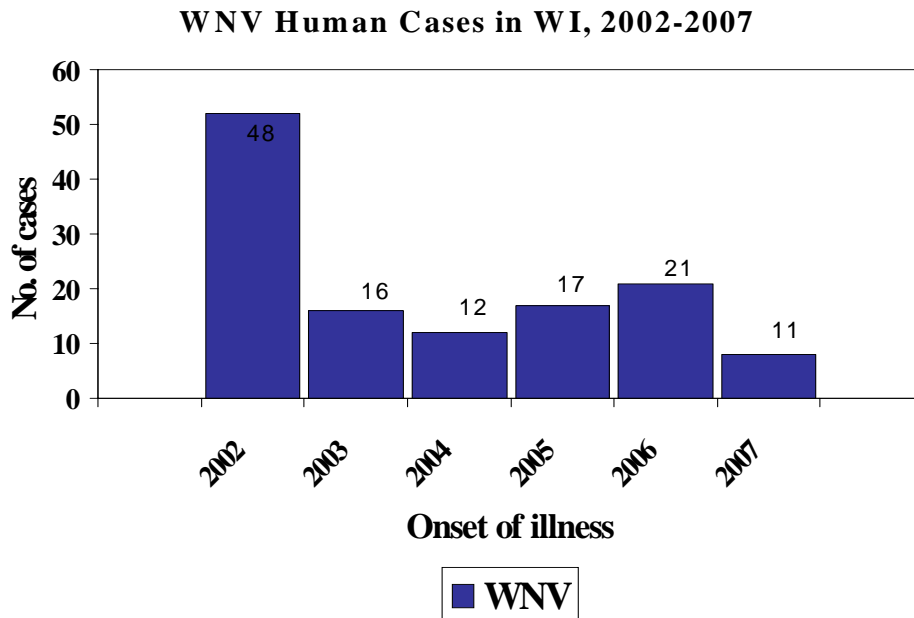


Figure 4: Annual Comparison - WNV infections in Wisconsin residents from 2002 to 2007



## Dead Bird Reporting Hotline:

WDPH collaborated with DNR, USDA Wildlife Services to provide a “dead bird reporting hotline” service (1-800-433-1610) at the beginning of the WNV season. This allowed citizens to report dead bird sightings, ask questions related to WNV diseases in birds, and find out how to arrange for testing.

From May 1 through October 31, 2007, a total of 1,644 calls were made, most of the calls were in June and July. Forty-nine (34%) out of 146 corvids tested were positive in 31 counties (51 counties submitted dead birds).



In 2007, 85% of positive birds collected were crows.



Thirteen percent of positive dead birds tested at the WVDL were blue jays.



Crow  
The Crow is the major carrier of the virus

One raven submitted for testing was positive for WNV.

## WNV National Surveillance: November 27, 2007

CDC reported 3,359 human cases of WNV infections in 43 states. Sixty-five percent of the cases were characterized as WNF and 33% involved NID illnesses. Ages ranged from 1 month to 97 years (median= 51 years); 55% of the cases were males. There were 98 deaths involved in 27 different states. Onset dates ranged from January to November, the highest number of illness was seen from July through September. Thirty-five states reported 2,082 dead birds that were positive for WNV and 430 positive WNV equines were reported in 33 states.

Sixty-three (21%) of the 302 presumptive viremic blood donors (PVDs) subsequently developed WNV illnesses; 60 (20%) reported ill with WNF and 3 people reported NID illness. Symptomatic PVDs in 29 states were also counted in the national total laboratory positive human cases.

For more information, go to CDC WNV website: [www.cdc.gov/ncidod/dvbid/westnile/index.htm](http://www.cdc.gov/ncidod/dvbid/westnile/index.htm)

## Summary of other arbovirus infections in humans

In 2007, three of the 7 presumptive LAC cases reported to DPH were confirmed cases, one was classified as probable case due to the unavailability of specimen for confirmation, two were determined to be negative and one sample is pending at CDC. Onset dates for the positive LAC cases were late July and late August. Confirmed case-patients ages ranged from 4 to 63 years (median= 35years), symptoms reported were fever, headache, nausea, fatigue, chills, muscle aches, diarrhea, and joint pain. There were no hospitalizations and no deaths. In 2006 and 2005, three cases of LAC virus infections were identified each year. The two charts below described the number of positive arbovirus infections by months and years in Wisconsin (Figure 5 and 6).

Nine Wisconsin residents from 6 counties ill with dengue fever infection reported traveling to dengue-endemic areas outside of the United States, including Central America, the Caribbean Islands, and Southeast Asia. Onset dates ranged from 1/02/07 to 10/04/07, all reported having fever as one of the

symptoms but no hemorrhagic fever was reported, ages ranged from 24 to 53 years (median= 38 years), 56% were females, 56% hospitalized, and there were no deaths.

One case of Chikungunya illness was reported in a traveler returning from India. One case of Powassan encephalitis was reported in a Wisconsin resident (Kenosha County) who did not have a history of traveling out of state but had traveled to Vernon County for turkey hunting 2 -3 weeks before illness. This patient was originally reported to DPH as presumptive positive for LAC infection. Specimen forwarded to WSLH for confirmation showed equivocal result for LAC, specimen was positive for POW virus but negative for all other arbovirus agents upon testing at CDC. This example underscores the importance of 1) prompt reporting of presumptive arboviral results from laboratorians and physicians to public health agencies, 2) confirming positive samples at a state laboratory or CDC to properly identify the cause of illness, and 3) interviewing the patient using the Arbovirus Infection follow-up form CDES #103 and reporting it to the WDPH in a timely manner.

3Figure 5: The number of arbovirus illness by infectious agents per months in Wisconsin, 2007

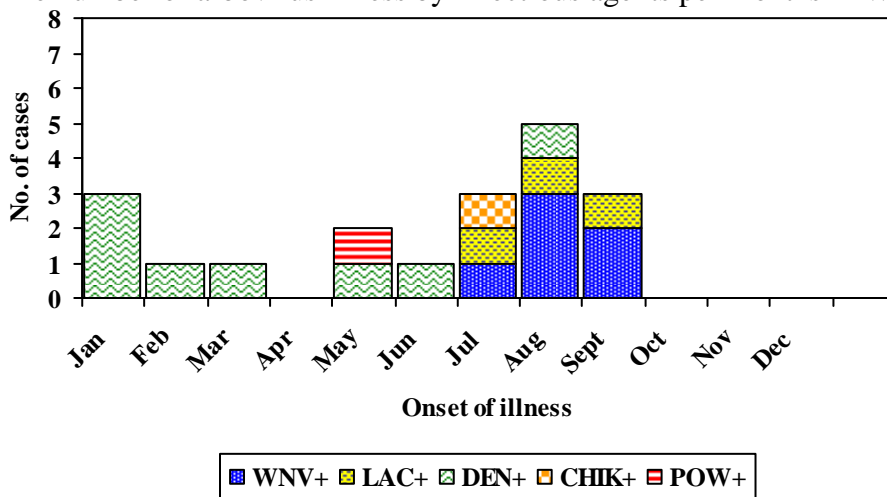
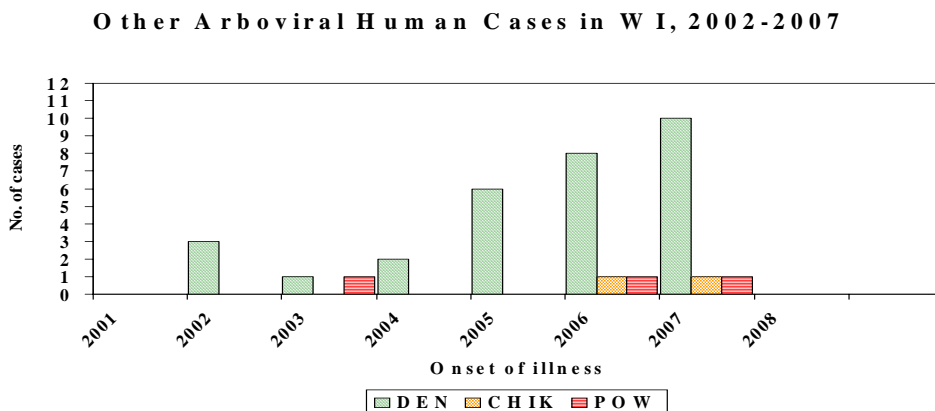


Figure 6: The number of travel related arbovirus illness in Wisconsin, 2002 to 2007



**National numbers of other arbovirus infections: November 27, 2007**

CDC reported 168 human cases of other arbovirus infections in 20 different states. Seventy-one (43%) cases involved dengue fever infections, 22 (13%) LAC, two (1%) EEE, three (2%) SLE, 1(1%) POW, and 8 (5%) other unspecified arbovirus infections.