Arbovirus infections and surveillance in Wisconsin, 2010

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Arbovirus- Overview

- Disease Characteristics
- Laboratory testing, results, and interpretations
- Surveillance Case Definition
- Epidemiology and Statistics
- Reporting

Arbovirus Characteristics

Arthopod-borne viruses

- Family, genus:
  - *Togaviridae*, *Alphavirus*
  - *Flaviviridae, Flavivirus*
  - *Bunyaviridae, Bunyavirus*
- Maintain in nature between vertebrate hosts and blood feeding arthropods
- Vectors- arthropods (mosquitoes, ticks)
- Vertical transmission (female, eggs, offspring)
- Humans and domestic animals can become ill but are “dead-end” hosts

Arbovirus Agents

United States

- West Nile virus (WNV)
- St. Louis encephalitis (SLE)
- California encephalitis (CA) includes La Crosse encephalitis (LAC)
- Eastern equine encephalitis (EEE)
- Western equine encephalitis (WEE)
- Powassan (POW)

Travel-associated to an endemic county

- Dengue (DEN)
- Japanese encephalitis (JE)
- Chikungunya (CHIK)

Human Arbovirus Reported in Wisconsin, 2002-2009 (n=250)

Common	Total cases(%)
• WNV	139 (56)
• CA/LAC	69 (28)
• Dengue*	36 (14)
Rare	
• SLE/WEE/EEE	none
• Powassan (POW)	4 (2)
• Chikingunya*	2 (<1)

* Travel-associated

West Nile Virus (WNV)

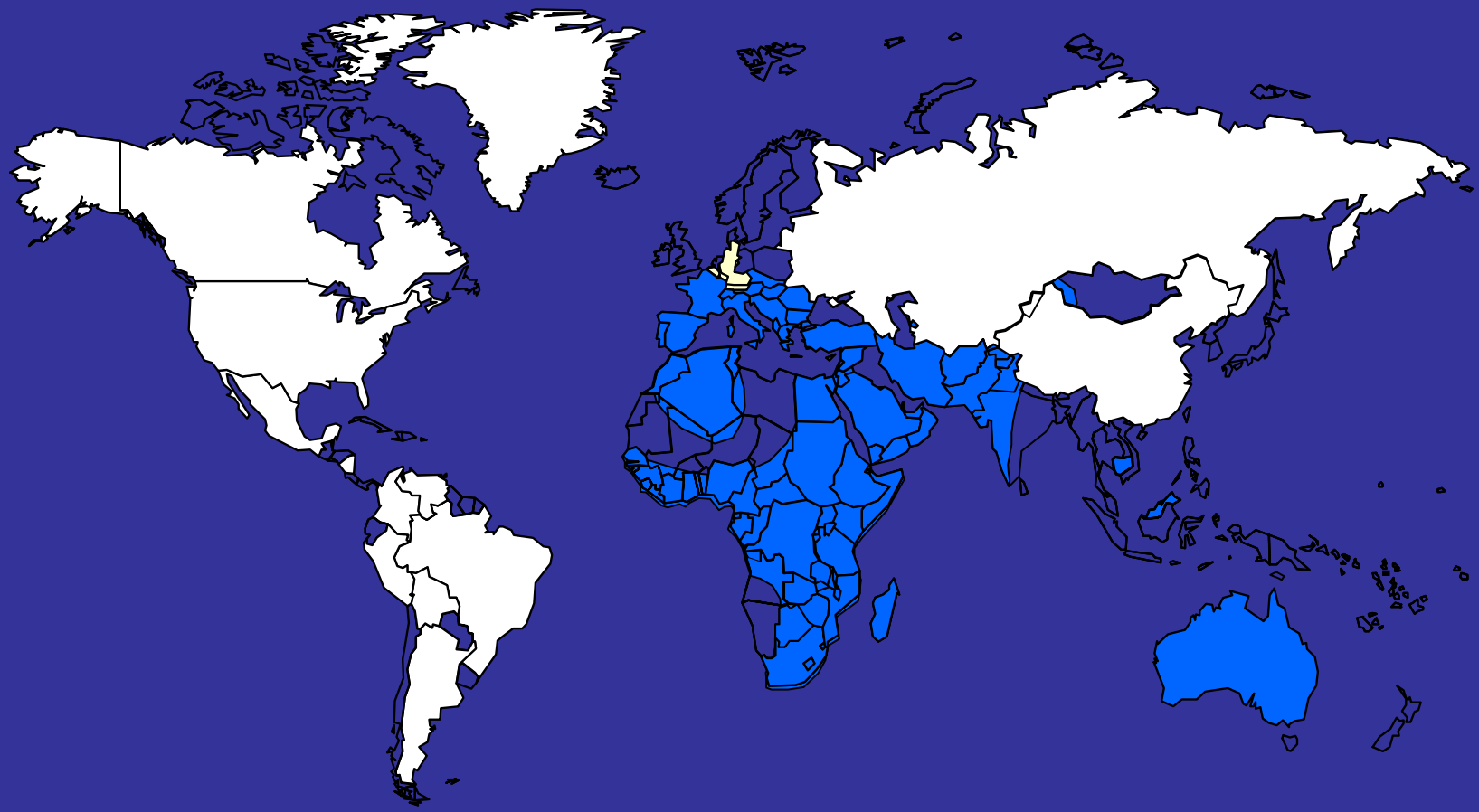
- Originally isolated from *West Nile* province of Uganda in 1937
- Introduced to US (NYC) in 1999
- 2002, first WNV outbreak in WI (52 cases)
- Now endemic to most US states

WNV-Epidemics

Historical timeline:

- **Israel – 1951-1954, 1957**
- **France – 1962**
- **South Africa – 1974**
- **Romania – 1996**
- **Italy – 1998**
- **United States - 1999**

West Nile Virus
Approximate Geographic Range in 1998



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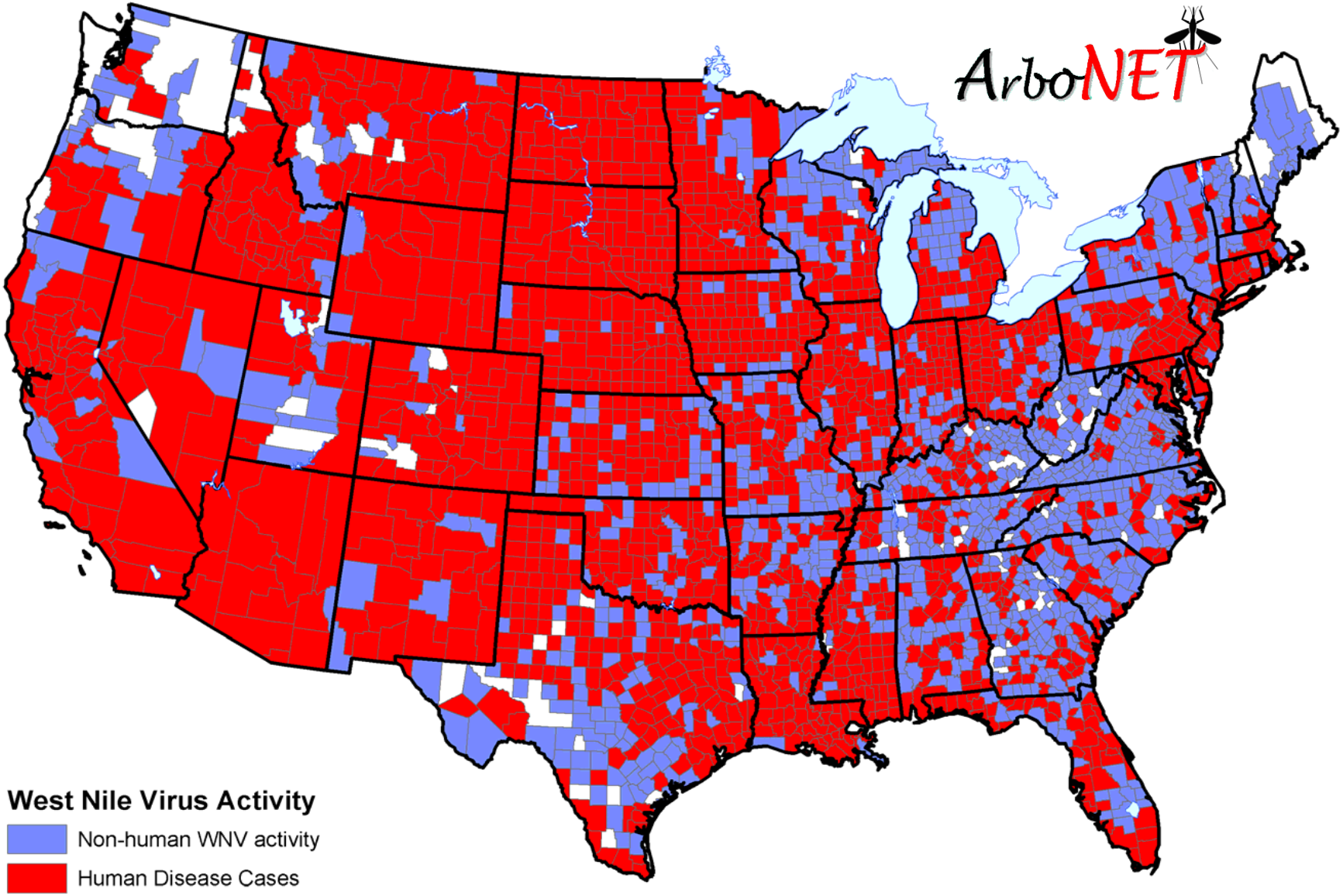

West Nile Virus Activity: 1999-2008

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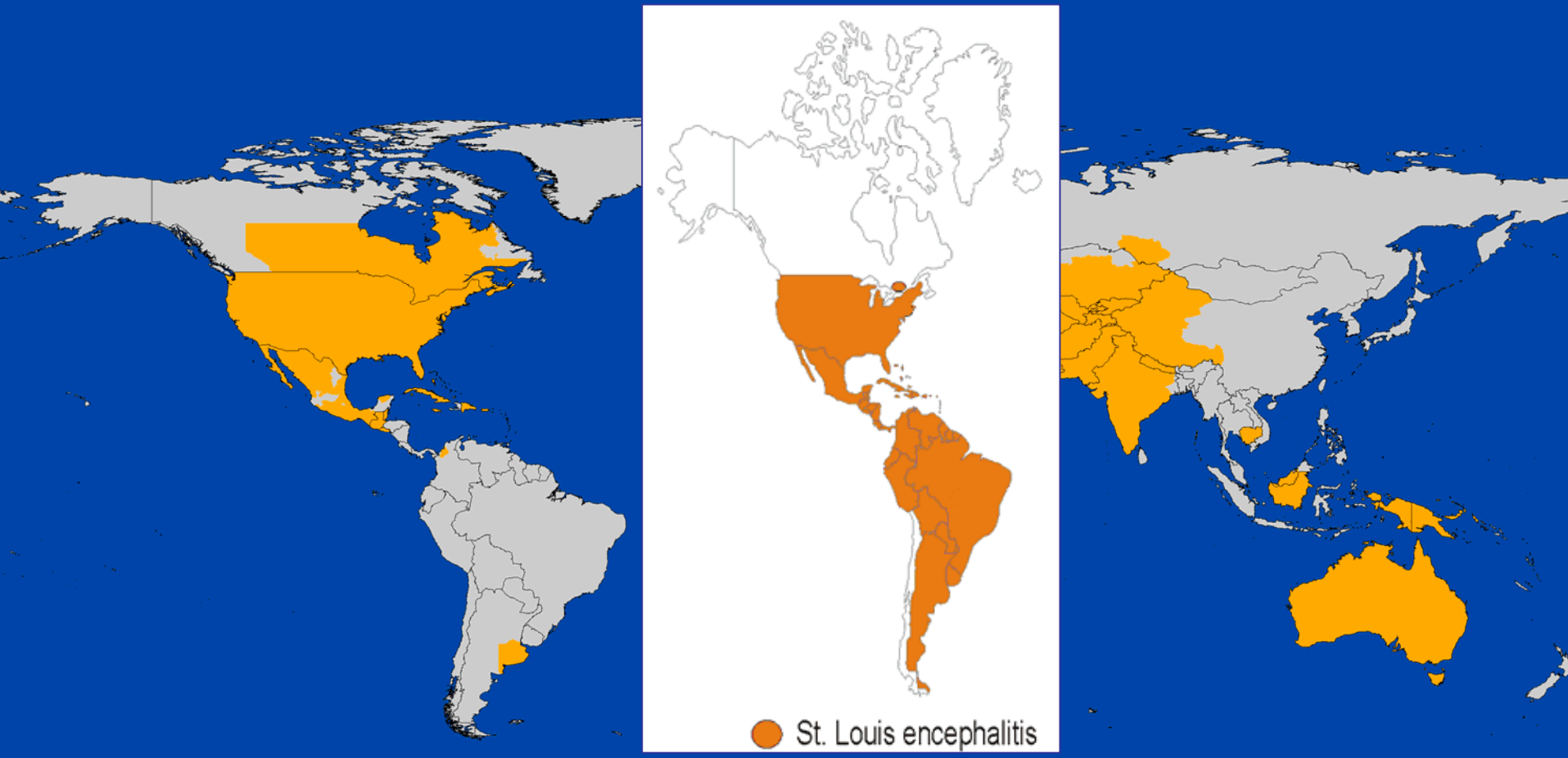
Approximate Global Distribution of West Nile Virus, by State/Province, 2007



West Nile Virus - the most widespread of the flaviviruses

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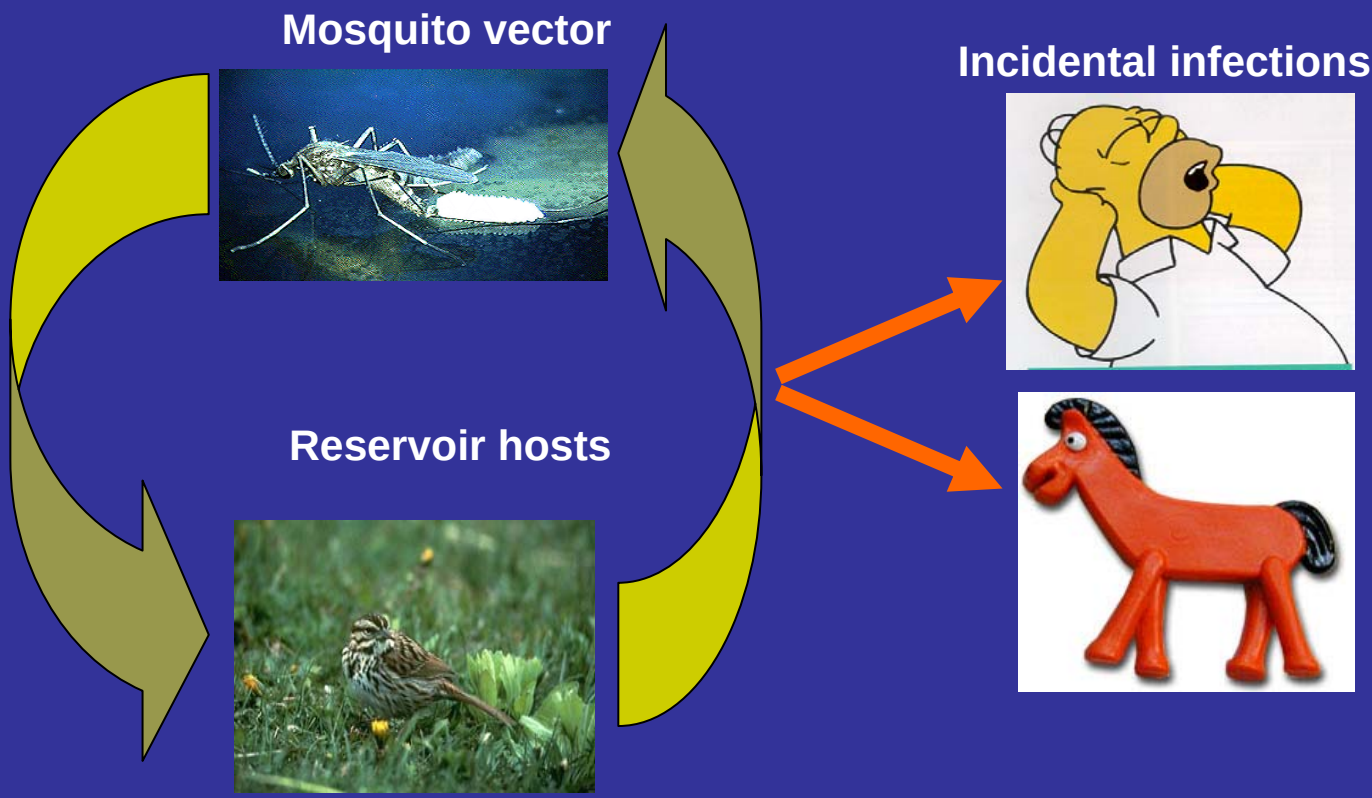
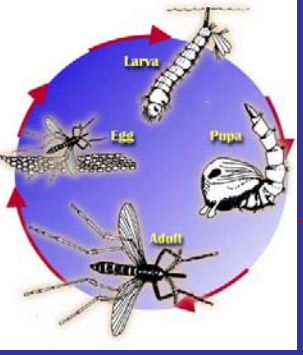
WNV Transmission Cycle



Female *Culex* species

Primary vector for West Nile virus transmission



Mosquito Cycle

1. Mosquito eggs- 100 to 300 eggs
    - Breeding grounds- containers, toys, bird baths, pools, standing water
2. Larvae- commonly called wigglers
    - Live in water from 4-14 days
    - Get oxygen through a breathing tube “siphon”
    - Feed on algae, plankton, fungi and bacteria, microorganism
3. Pupae- commonly called trumpets
    - Live in water 1-4 days, floats on the surface of water
4. Adult stage- blood feeding
    - Female requires a blood meal for egg production
    - Weak fliers, survive only a few weeks

Characteristics of WNV Infections

- Incubation period- usually 3-14 days after being bitten by an infected mosquito
- Asymptomatic- about 80% of the people infected with WNV do not become ill
- Milder symptoms- up to 20% experience
  - fever, headache, eye pain, muscle aches, joint pain, rash, swollen lymph nodes, nausea and vomiting
- Severe symptoms- up to 1% may experience
  - muscle weakness, inflammation of the brain (encephalitis and meningitis), paralysis, and coma
- Risk groups- elderly, people who have received an organ transplant, and compromised immune systems
- Infection can also occur through transfusions, transplants, and mother to child

Human Disease Surveillance

WNV characteristics	2008	2007
Total	8	14
Neuroinvasive (%)	38	43
Fever (%)	63	43
Age range (median)	17-69(48)	22-84(58)
Hospitalizations (%)	50	57
Deaths (%)	13	7
Males/Females (%)	89/13	43/57

WNV Testing

Commercial Laboratories

- Most often performs EIA or IFA on serum and CSF to detect the presence of IgM and IgG antibodies to WNV
- Commercial kits can have false-positive results and cross-reactivity among the arboviral agents
- Positive IgM from commercial is only a presumptive result, confirmation testing at WSLH or CDC is needed to confirm result
- Presence of IgM are detectable at 3-8 days after illness onset and in general can persist for 30-90 days; but has been documented to persist up to 500 days
- False-negative may be due to sample collected too close to onset date, a second sample collected 4-6 weeks from onset date may be warranted
- IgG antibody are produce after IgM but can persist in the body for years
- A positive IgG result and a negative IgM may indicative of a previous infection in absence of compatible clinical symptoms; or if patient is symptomatic evaluation for other etiologic agents is warranted

WNV Confirmation Testing

WSLH

- Conduct panels of multiple arbovirus agents
- Available fee-for-service to providers and physicians
- Fee- exempt if approved by the vectorborne coordinator
- Available diagnostic tests- serum and CSF
  - IgM capture enzyme immusoassays (IgM CEIA)
  - Microsphere immunoassay (MIA)

CDC

- All testing listed above
- Plaque reduction neutralization assay (PRNT)
- Fee-exempt testing must be sent by WSLH
- Depending on travel history and symptoms, vectorborne epidemiologist may order other agents not normally run in panel (Powassan, Dengue, Chikungunya)

WNV Treatment

- There is no specific treatment for WNV infection
- Physician will provide treatment to relieve the symptoms of the illness
- Life long immunity
- No vaccine available

Surveillance Case Definition, WI

An illness is classified a case if compatible clinical signs and symptoms and meets laboratory criteria

Clinical criteria

- Non-neuroinvasive: fever, headache, stiff neck, myalgias (general symptoms)
- Neuroinvasive: fever and one of the following
  1) Altered mental state (disorientation, stupor, coma)
  2) Meningitis, pleocytosis in CSF (increased in white blood cells)
  3) Encephalitis, peripheral or central neurologic dysfunction, paralysis, nerve palsies, abnormal reflexes, and sensory deficits)

Laboratory criteria

- Probable case: Igm positive that is performed by commercial lab
- Confirmed case: Commercial lab result confirmed by WSLH or CDC

Wisconsin Surveillance

Statewide- 2010

- WNV surveillance includes 4 major components- monitoring for human illnesses, equine, and dead birds (corvids), and mosquito testing

- Electronic reporting- WEDSS began in August 2007

- Vectorborne epidemiologist coordinates activities among numerous partners- Local Health Departments, DNR, USDA-Wild Life, Wisconsin State Laboratory of Hygiene, UW-Vet Diagnostic Lab, and CDC

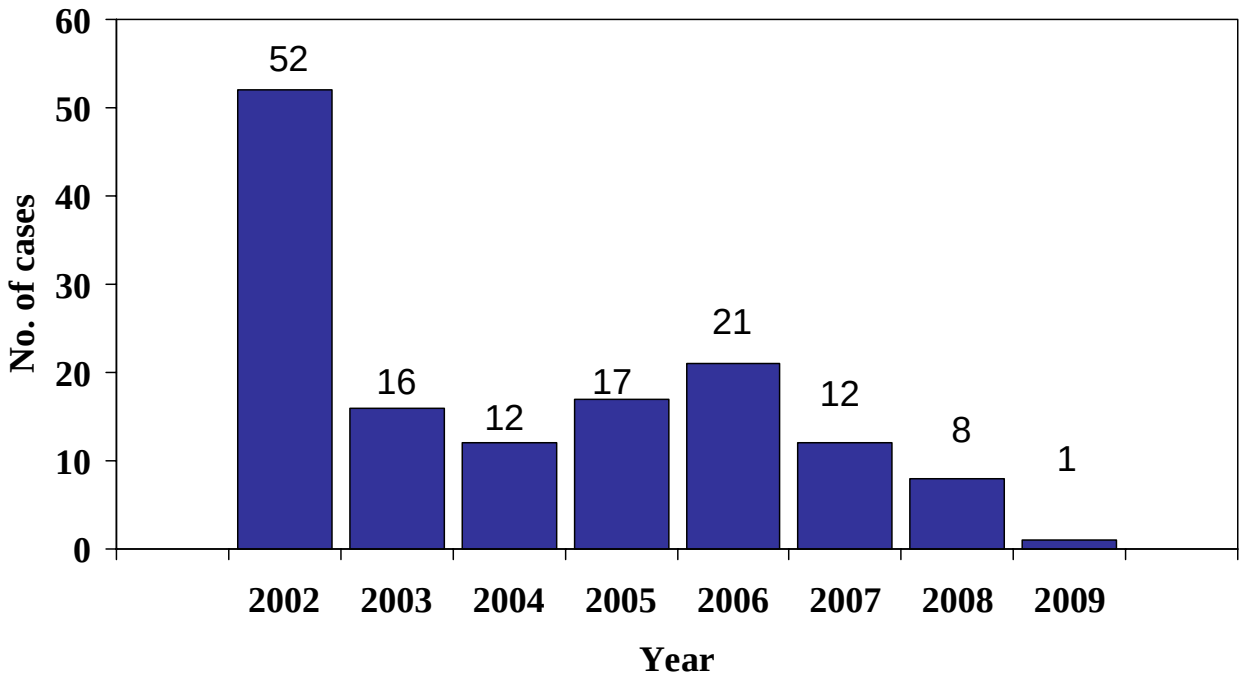
Wisconsin Surveillance, 2010

Activity as of 7/13/10

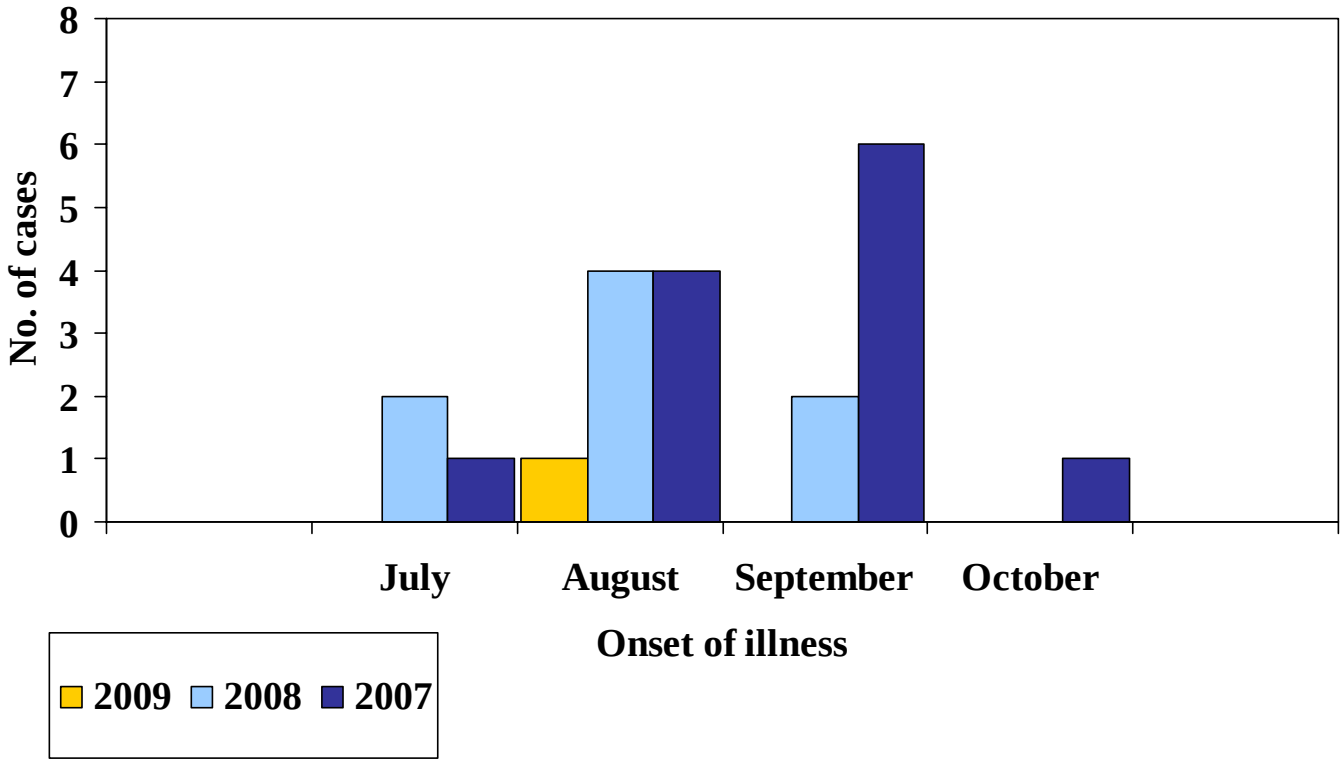
- Dead Bird Hotline
  - 305 phone calls about birds
  - All 15 corvids (crow,raven,blue jay) tested were negative for WNV
- Mosquito collection- partner between the DPH, UW-Madison Entomology, LHDs
  - Limited resources, involves four regions in WI
  - All 9 *Culex* spp. pools were negative for WNV
- No cases of WNV human or equine

WNV Confirmed Human Cases in WI, 2002-2009

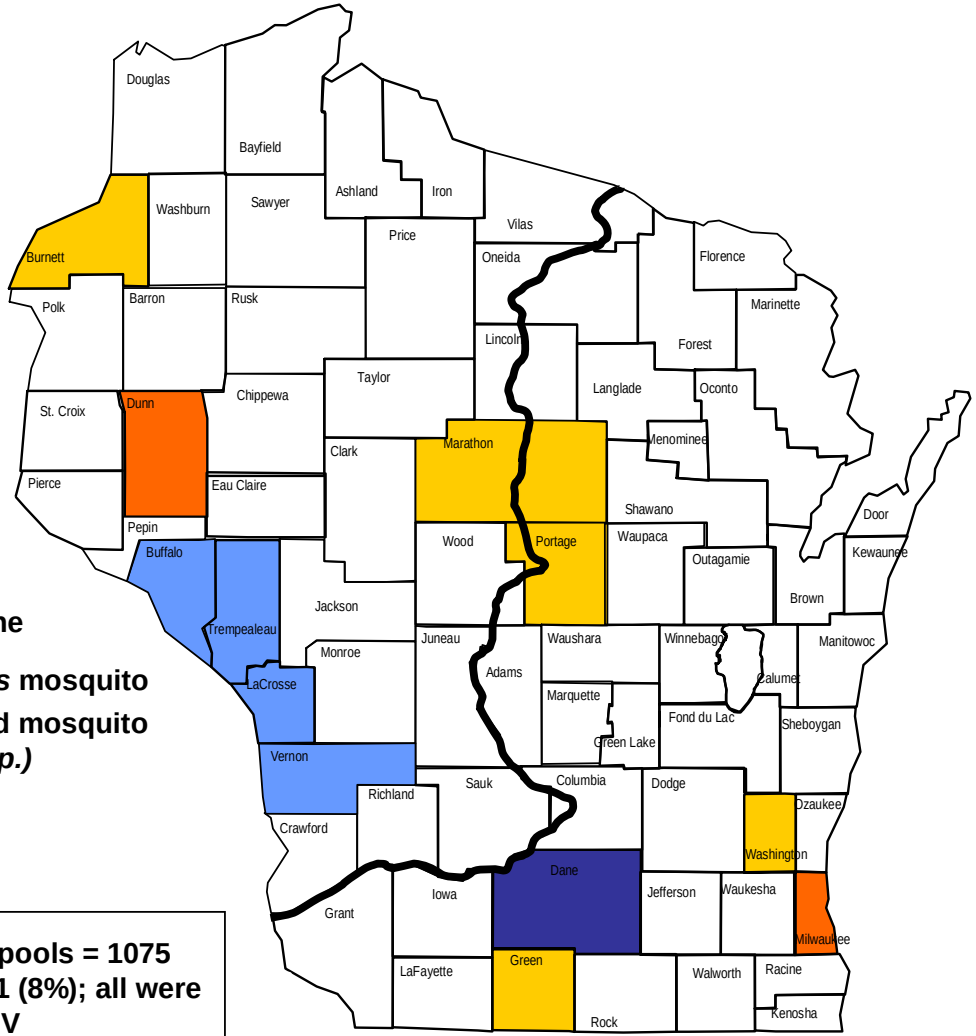
Annual comparison of WNV infections in Wisconsin residents from 2002 to 2009



WNV confirmed human cases by month of infection, 2007-2009,Wisconsin



Humans and other WNV activities Surveillance in Wisconsin, 2009

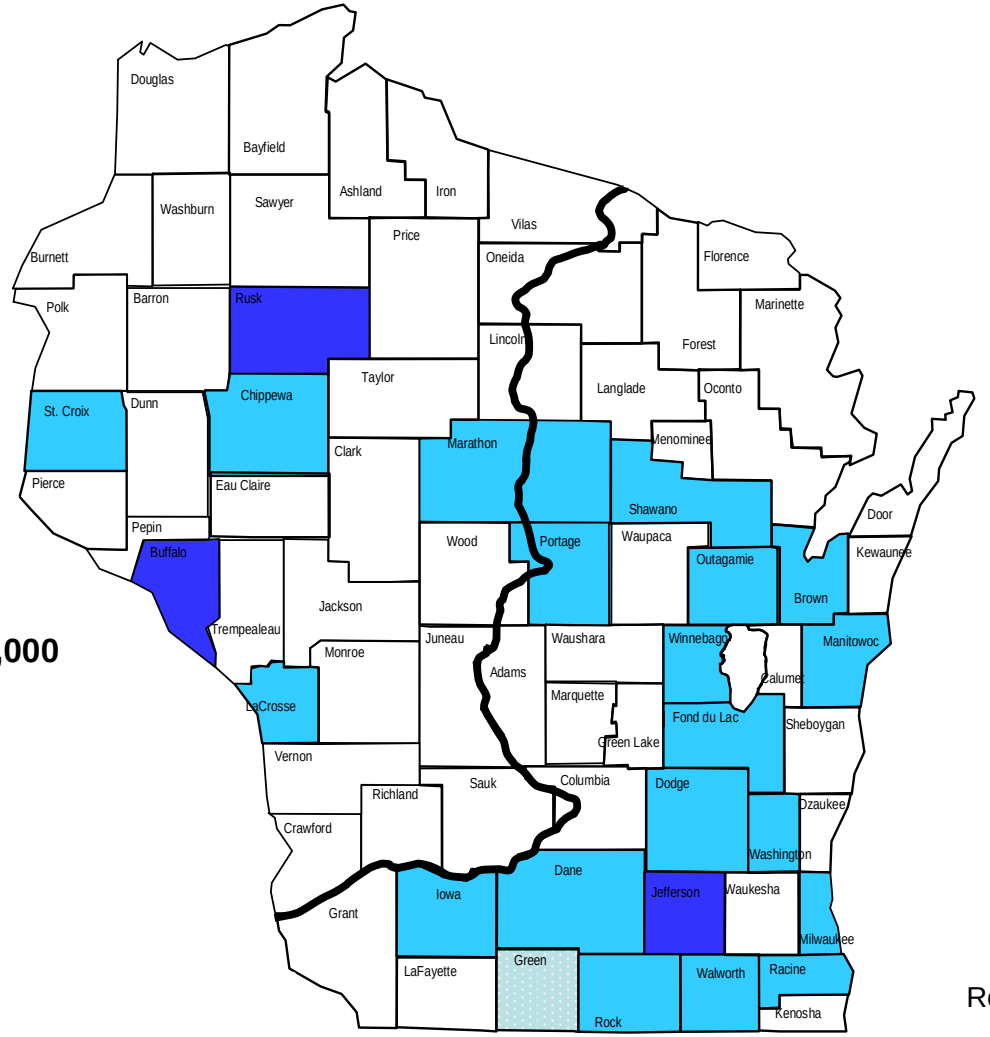


- **All activities**
- **Avian and Equine**
- ***Aedes japonicus* mosquito**
- **Human case and mosquito pools *(Culex spp.)***

Total mosquito pools = 1075
Pools tested= 81 (8%); all were negative for WNV

Revised 07/12/10

Average Incidence of WNV Human Infections by County of Residence, 2005-2009 (n=59), WI

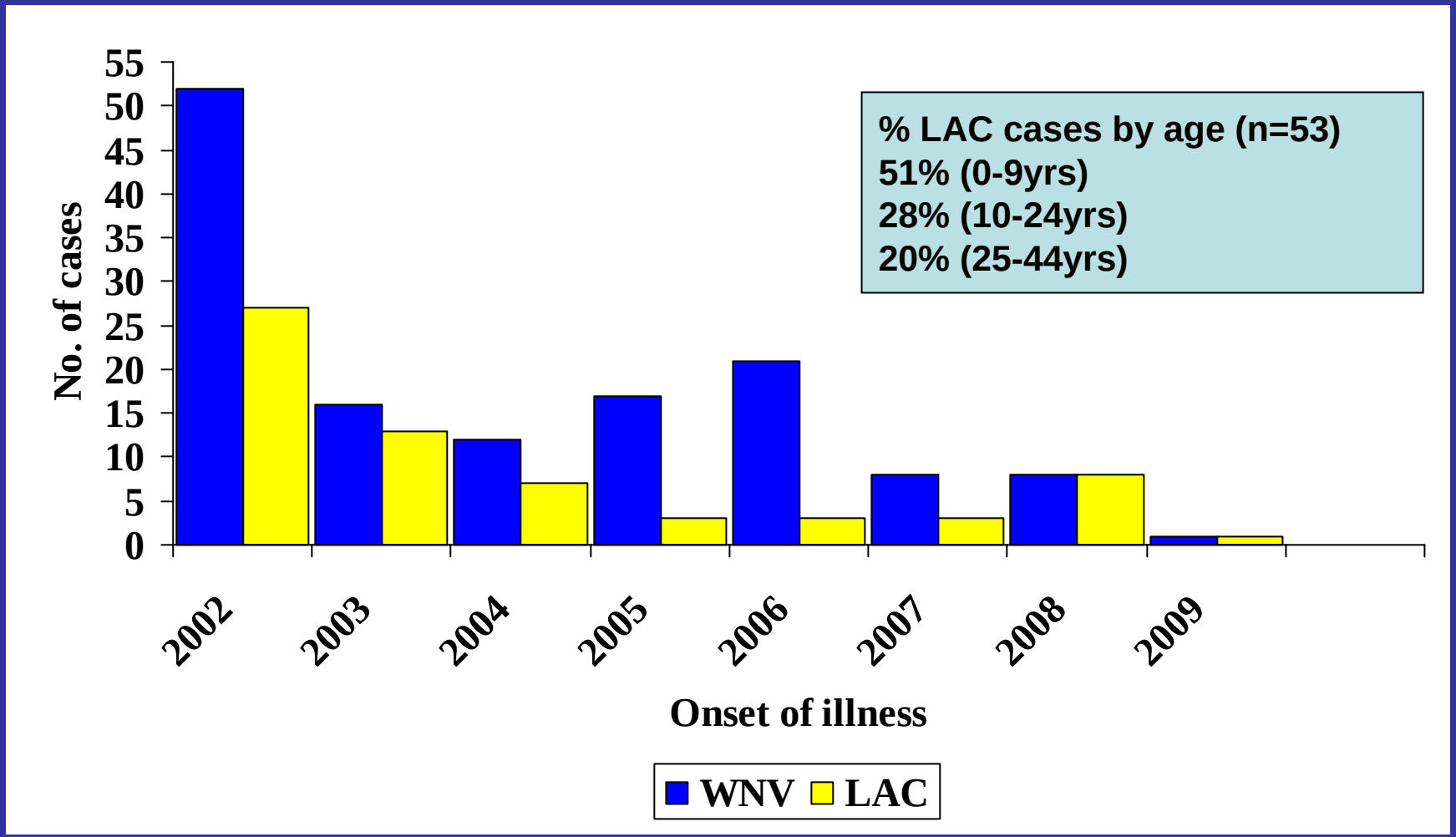


Average annual incidence per 100,000

- **1-2**
- **<1**

Revised 02/22/10

WNV and LAC Human Confirmed and Probable Cases in WI, 2002-2009



Reporting in Wisconsin

- All patient positive results should be reported to LHDs/DPH
- Vectorborne epidemiologist will request sample from commercial labs for confirmation at WSLH or CDC
- All positive IgM blood donor screening results should be reported to DPH (PVDs); If donor is symptomatic and have IgM+, patient will be reported as a PVD+ and a WNV case
- Travel history is important
- DPH will report all confirmed, probable cases, and PVDs to the CDC- Arbonet
- WEDSS and ELR will be covered in the afternoon workshop

Effective Control Methods

- Make sure window screens don’t have any holes; fill in any holes in trees
- Remove breeding sites such as containers filled with water, tires, pots, or discarded tires
- Change the water in birdbaths and pet dishes at least every three days
- Clean roof gutters and downspouts for proper drainage
- Landscape to prevent water from pooling, trim tall grasses, weeds and vines

Don’t Get Bitten

- Limit time spent outdoors at dawn and dusk
- Avoid shady areas where mosquito may be resting
- Wear protective clothing
- Apply insect repellent, follow label instructions

For CDC repellents information , visit website http://www.cdc.gov/ncidod/dvbid/westnile/qa/insect_repellent.htm

- Don’t sweat!

Mosquito Products

Repellents that work: CDC recommends EPA registered products

- DEET
- Picaridin
- Oil of Lemon Eucaluptus
- IR3535

Products that do not work:

- Carbon dioxide baited mosquito traps
- Citrosa plants
- Eating garlic or taking vitamin B
- Scented personal products
- Alcohol

Additional Questions

Feel free to contact me at DPH:

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