

# **West Nile Virus: Information and Guidance for Clinicians**

**Clinician Outreach and  
Communication Activity (COCA)  
Conference Call  
August 30, 2012**

# TODAY'S PRESENTER



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The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

National Center for Emerging and Zoonotic Infectious Diseases

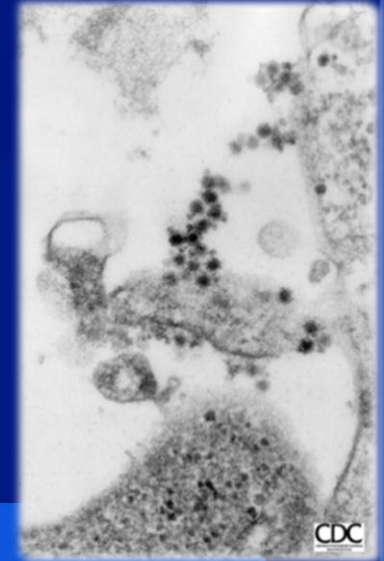
Division of Vector-Borne Diseases



# Overview

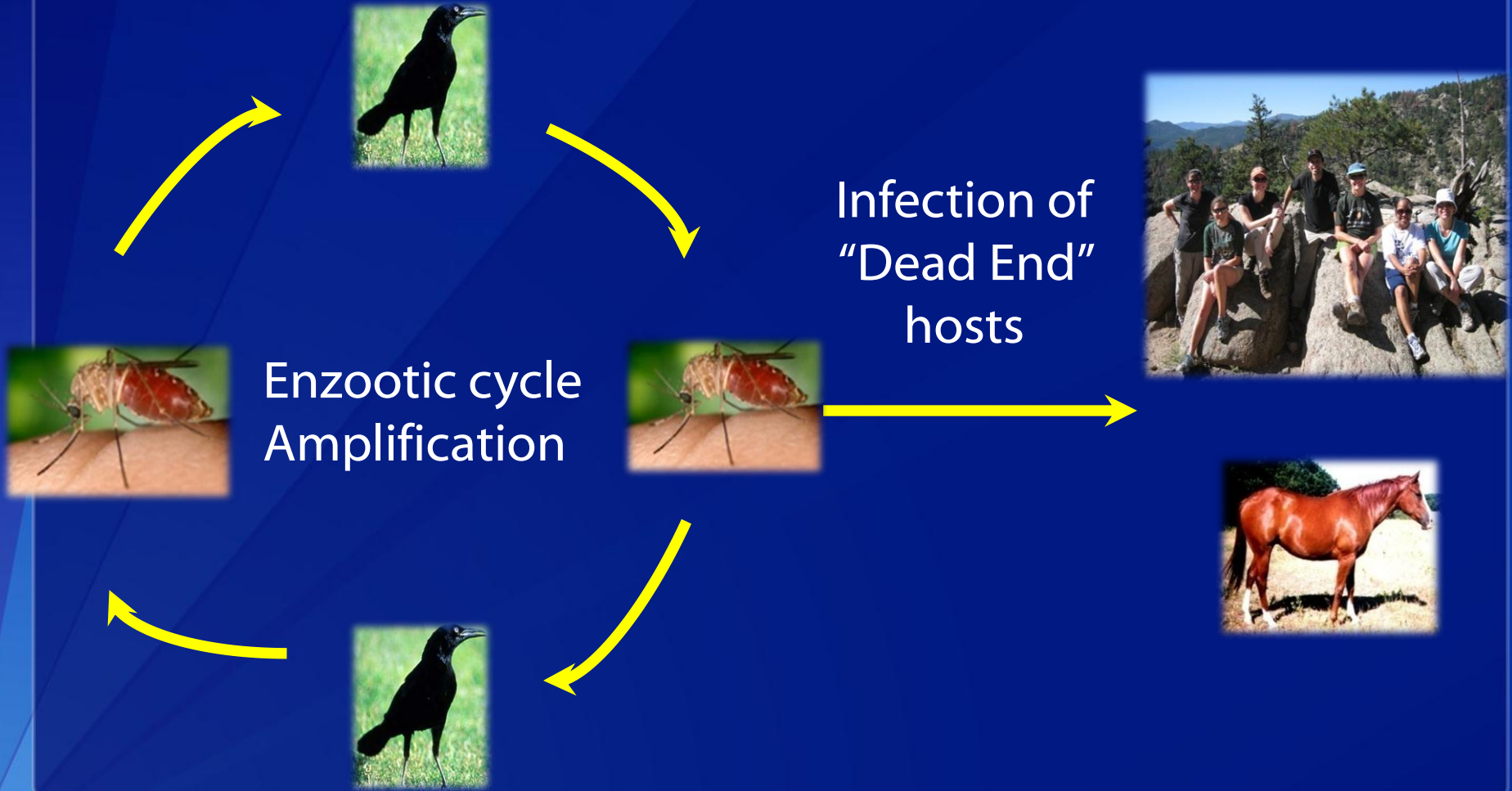
- ❑ **Virology and transmission**
- ❑ **Clinical presentation**
- ❑ **Laboratory diagnosis**
- ❑ **Management and prevention**
- ❑ **Public health surveillance**

# West Nile virus (WNV)



Virus genus:	Flavivirus
Transmission:	Mosquito-borne
Amplifying host:	Birds
Global distribution:	Worldwide
U.S. geographic foci:	New York in 1999 → spread nationwide

# WNV transmission cycle



# Person-to-person transmission of WNV



- Blood transfusion
- Organ transplantation

- Intrauterine
- Breastfeeding



# Pathogenesis of human WNV infection



Replication in dendritic cells at inoculation site



Spread to regional lymph nodes



Viremia



Invasion of central nervous system



# Clinical spectrum of human WNV infections



Neuroinvasive disease\* (<1%)

Febrile illness (20-30%)

Asymptomatic infection (70-80%)

\*Infections of central nervous system such as meningitis, encephalitis, or myelitis

## **WNV non-neuroinvasive disease**

- ❑ **Incubation period 2-14 days**
- ❑ **Non-specific febrile illness**
- ❑ **Usually resolves within a week**
- ❑ **Some symptoms may persist for weeks or months**
- ❑ **Overall case fatality <1%**

## **WNV neuroinvasive disease**

- ❑ **Meningitis, encephalitis, and acute flaccid paralysis (AFP)**
- ❑ **Most cases require hospitalization**
- ❑ **Many patients with encephalitis or AFP have sequelae**
- ❑ **50-75% need assisted living or rehabilitation**
- ❑ **Morbidity and mortality higher in elderly**
- ❑ **Overall case fatality 10%**

# Risk factors for severe disease

- ❑ **Age > 60 years**
- ❑ **Diabetes**
- ❑ **Hypertension**
- ❑ **Cancer history**
- ❑ **Chronic renal disease**
- ❑ **Chronic alcohol abuse**

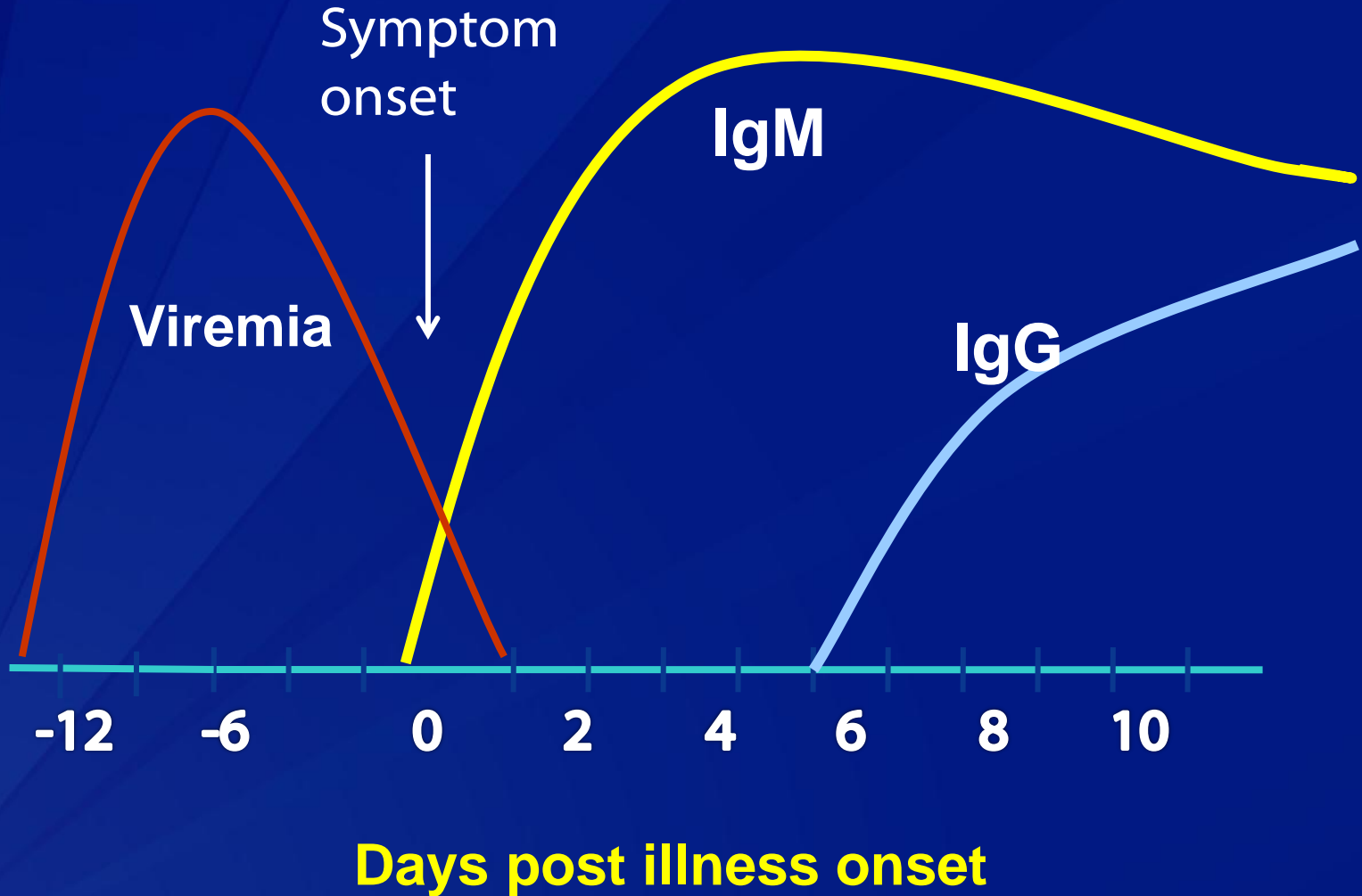
# WNV RNA in urine

- ❑ **In 2010, one study found WNV RNA in urine of 5 (20%) of 25 patients who had acute WNV disease 1-7 years earlier**
- ❑ **Two subsequent studies of 103 persons infected with WNV several weeks to 7 years prior; only one (<1%) with RNA in urine**
- ❑ **Possible reasons for discrepancy:**
  - Differences in test performance
  - Different study cohorts with different incidence WNV in urine
  - Shedding of WNV RNA may be intermittent

# WNV infection and renal disease

- ❑ **Recent publication found relationship between WNV neuroinvasive disease and risk of developing of kidney disease**
- ❑ **People with chronic kidney disease, diabetes, and hypertension are at increased risk of developing WNV neuroinvasive disease**
- ❑ **Unclear cause and effect relationship between severe WNV and chronic kidney disease**
- ❑ **Further study is need to determine what role WNV infections may have in subsequent kidney disease**

# WNV infection and antibody dynamics



# WNV antibody testing

- ❑ **IgM antibodies in serum or CSF**
  - Performed by commercial and public health laboratories
  - Provides presumptive diagnosis of recent WNV infection
- ❑ **IgG antibodies in serum or CSF**
  - Performed by commercial and public health laboratories
  - Suggest past flavivirus infection
- ❑ **Plaque reduction neutralization test (PRNT)**
  - Performed predominantly in public health laboratories
  - Confirms specificity of IgM and IgG antibodies



## **Limitations of WNV antibody testing**

- ❑ Serum collected <7 days of onset may lack detectable IgM**
- ❑ IgM can persist >1 year, positive result may = past infection**
- ❑ IgG only indicates past infection**
- ❑ Both IgM or IgG tests may be false-positive due to cross-reactive antibodies to closely related flavivirus**
- ❑ Blood products can contain WNV Ab; complicate interpretation**

## **WNV molecular testing**

- ❑ WNV RNA in serum or CSF**
- ❑ Performed by commercial and public health laboratories**
- ❑ Indicates recent WNV infection**
- ❑ Low sensitivity as viral RNA is usually absent by time of symptom onset**
- ❑ May be useful in immunocompromised patients**

## **WNV disease treatment**

- ❑ Supportive care and management of complications**
- ❑ No proven antiviral or adjunctive therapy**
- ❑ Case reports or trials with several therapies**
- ❑ No ongoing trials or products for compassionate use**

## WNV disease treatment evaluations

Product	West Nile virus studies			Trials with other flaviviruses
	In vitro data	Case reports	Clinical trials	
Ribavirin	X	X		X
Corticosteroids		X		X
Immunoglobulins				
Polyclonal		X	X	
Hyperimmune		X	X	
Monoclonal			X	
Interferon	X	X	X	

# Prevention of human WNV infections

- ❑ **No WNV vaccine licensed for use in humans**
  
- ❑ **Community mosquito control programs**
  - Use of larvicides, adulticides, and larvae-eating fish
  
- ❑ **Household and personal protective measures**
  - Use air conditioning and install window/door screens
  - Reduce mosquito breeding sites
  - Wear long-sleeved shirts and long pants
  - Apply insect repellents
  - Limit outdoor exposure during peak biting times
  
- ❑ **Screen and remove infected blood products**

# Transfusion-associated WNV infections

- ❑ **First documented in 2002**
- ❑ **Routine screen of blood supply for WNV started in 2003**
  - >2,500 infected products removed from blood supply
- ❑ **Rare transfusion-associated events still occur**
  - Testing of pooled sample can fail to detect low viremic units
  - Some products are not screened (e.g. granulocytes)

# **Transplant-associated WNV infections**

- ❑ **Since 2002, roughly one transplant-associated WNV cluster recognized each year**
- ❑ **Recipients at increased risk of severe disease**
- ❑ **Organ donor screening practices for WNV vary**
  - Screening is not mandatory
  - Concern for false-positive tests leading to organ wasting
  - Current screening techniques may fail to detect positive donors

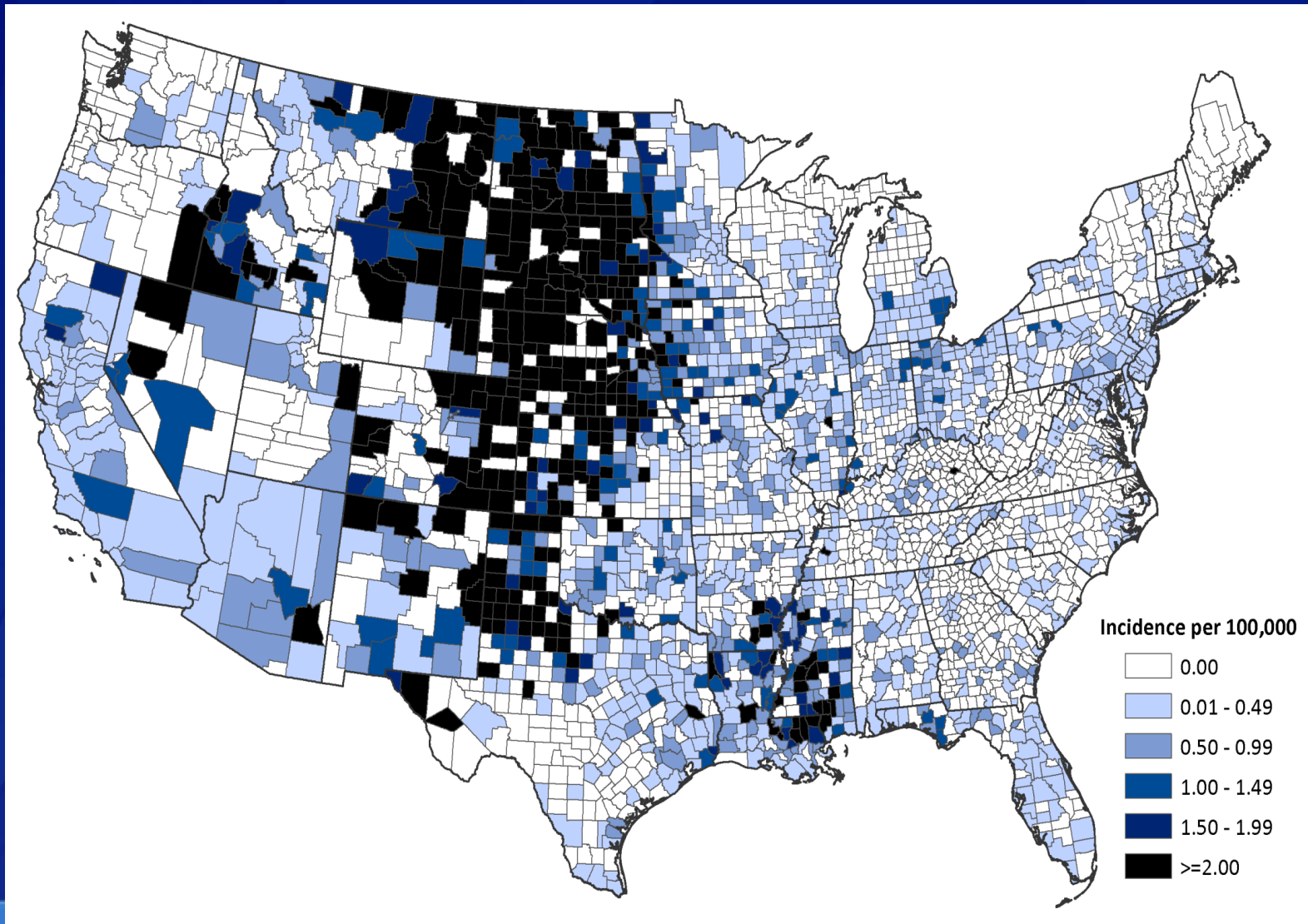


## Arboviral surveillance

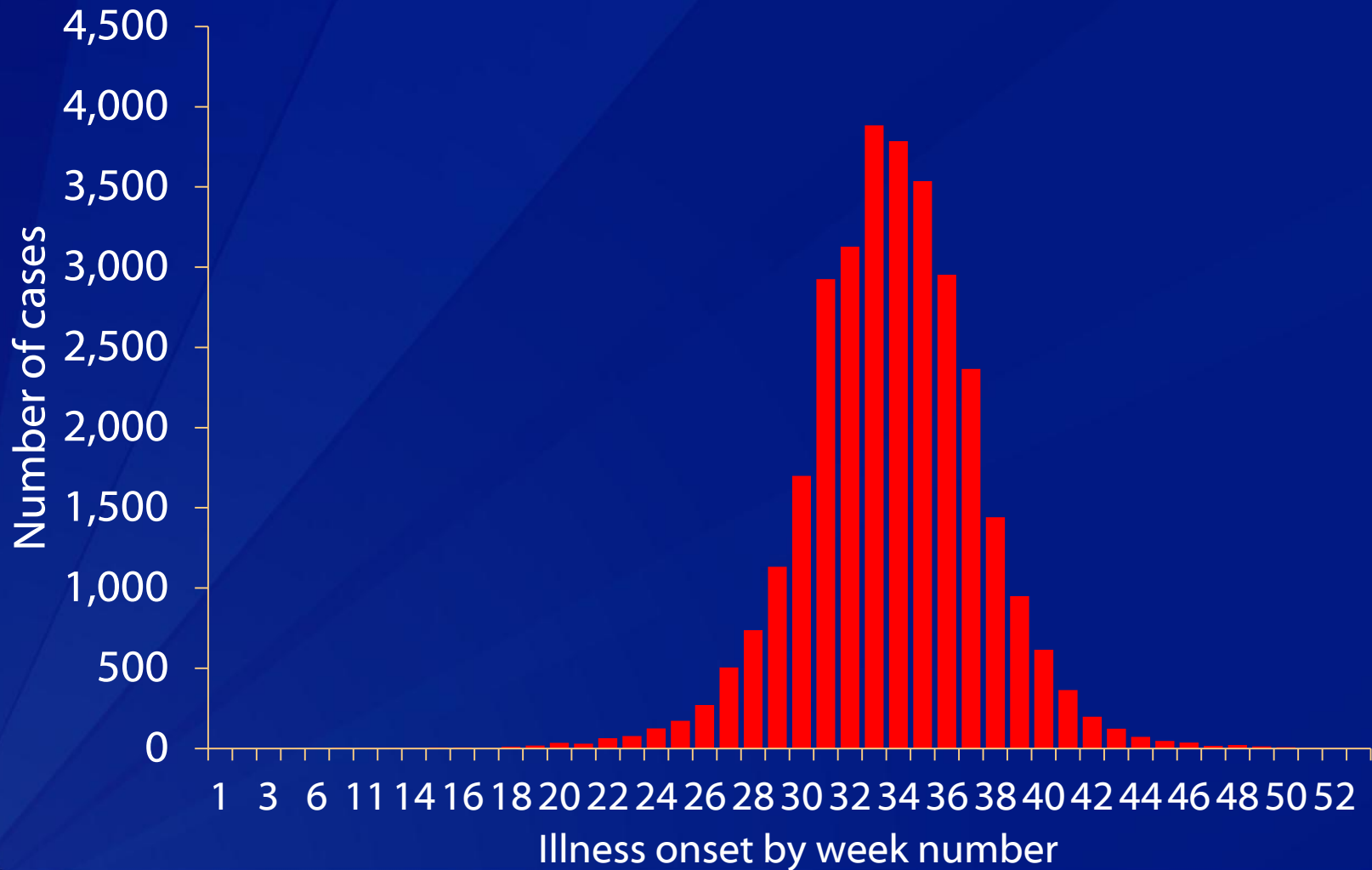
- ❑ **ArboNET is unique surveillance system**
  - Human disease cases, viremic blood donors, veterinary cases, dead birds, mosquitoes, and sentinel animals
  
- ❑ **Data are updated weekly on CDC website**
  - [www.cdc.gov/ncidod/dvbid/westnile/index.htm](http://www.cdc.gov/ncidod/dvbid/westnile/index.htm)
  
- ❑ **WNV is nationally notifiable disease**
  - Clinicians and laboratories required to report WNV disease cases to local health department



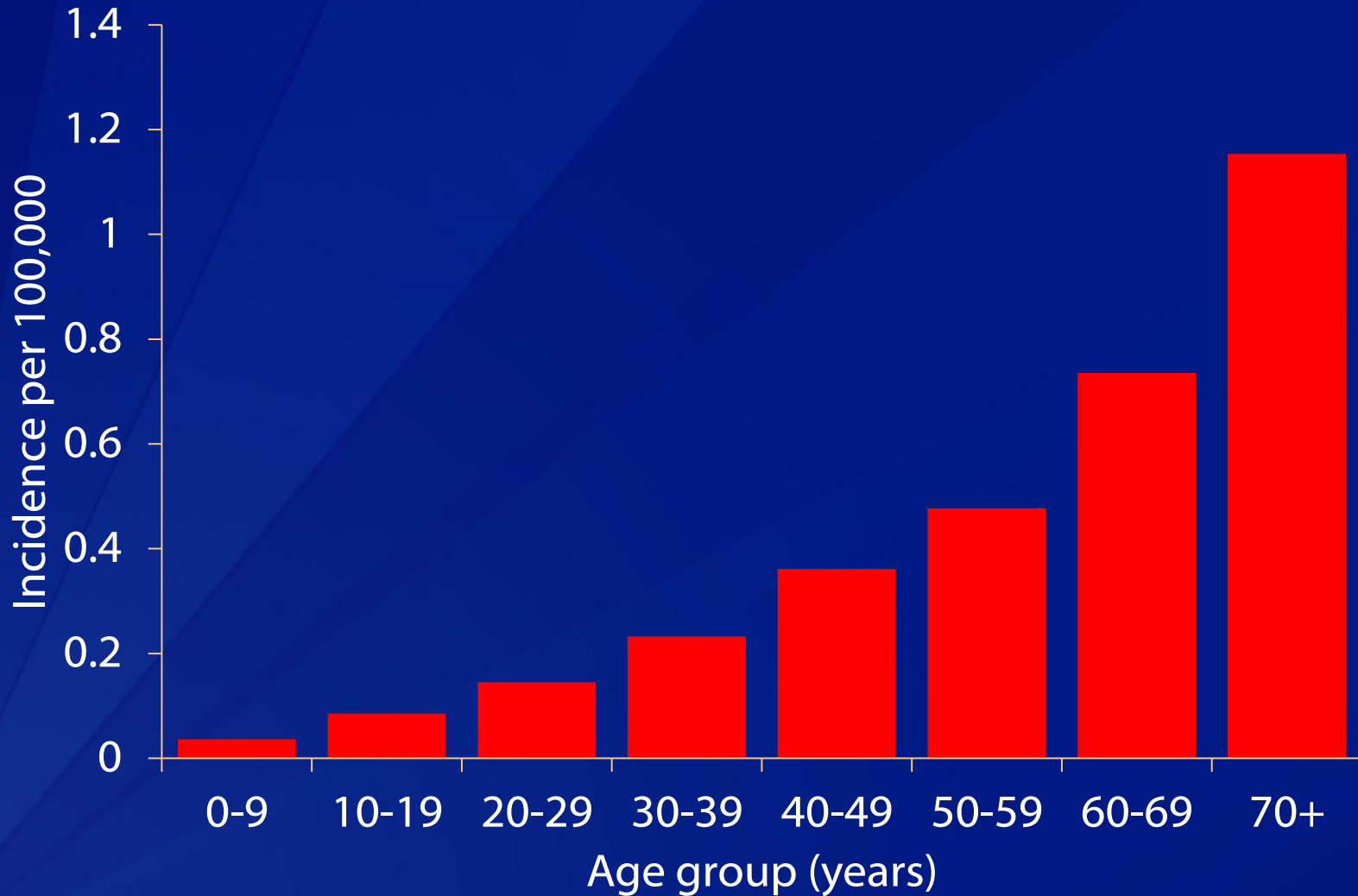
# Average annual incidence of WNV neuroinvasive disease by county – United States, 1999-2011



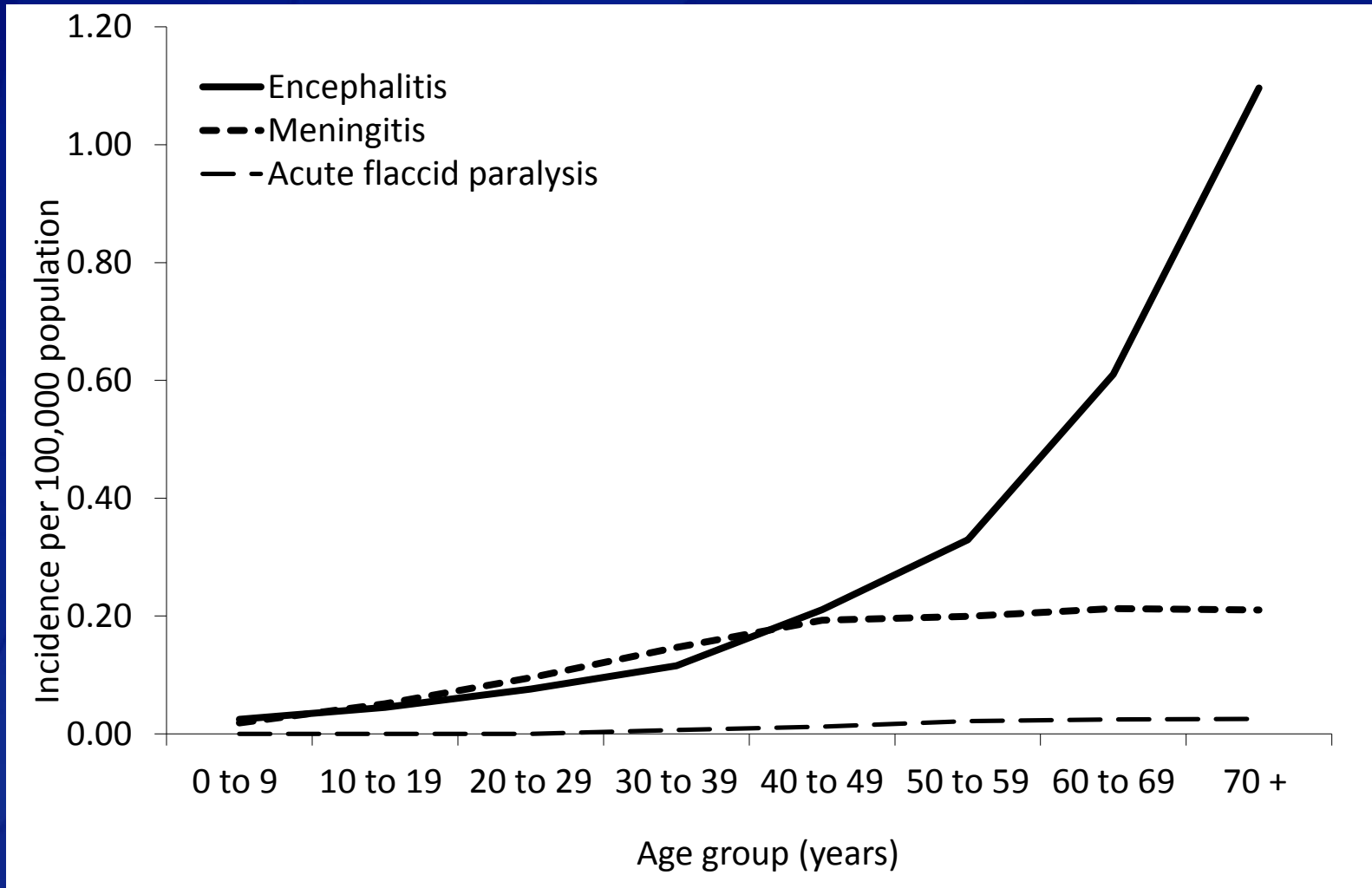
# Number of WNV neuroinvasive disease cases by week of illness onset – United States, 1999-2011



# Average annual incidence of WNV neuroinvasive disease by age group – United States, 1999-2011



# WNV neuroinvasive disease incidence by age group and clinical syndrome – United States, 1999-2008



## Demographic and outcome data for WNV disease cases by clinical syndrome – United States, 1999-2011

	<b>Fever</b> (N=17,344)	<b>Meningitis</b> (N=4,469)	<b>Encephalitis</b> (N=8,345)	<b>AFP</b> (N=429)
Male	53%	55%	60%	64%
Median Age	48 yrs	48 yrs	64 yrs	57 yrs
Hospitalized*	21%	84%	90%	86%
Died	<1%	2%	12%	11%

\* Includes data from 2004-2011

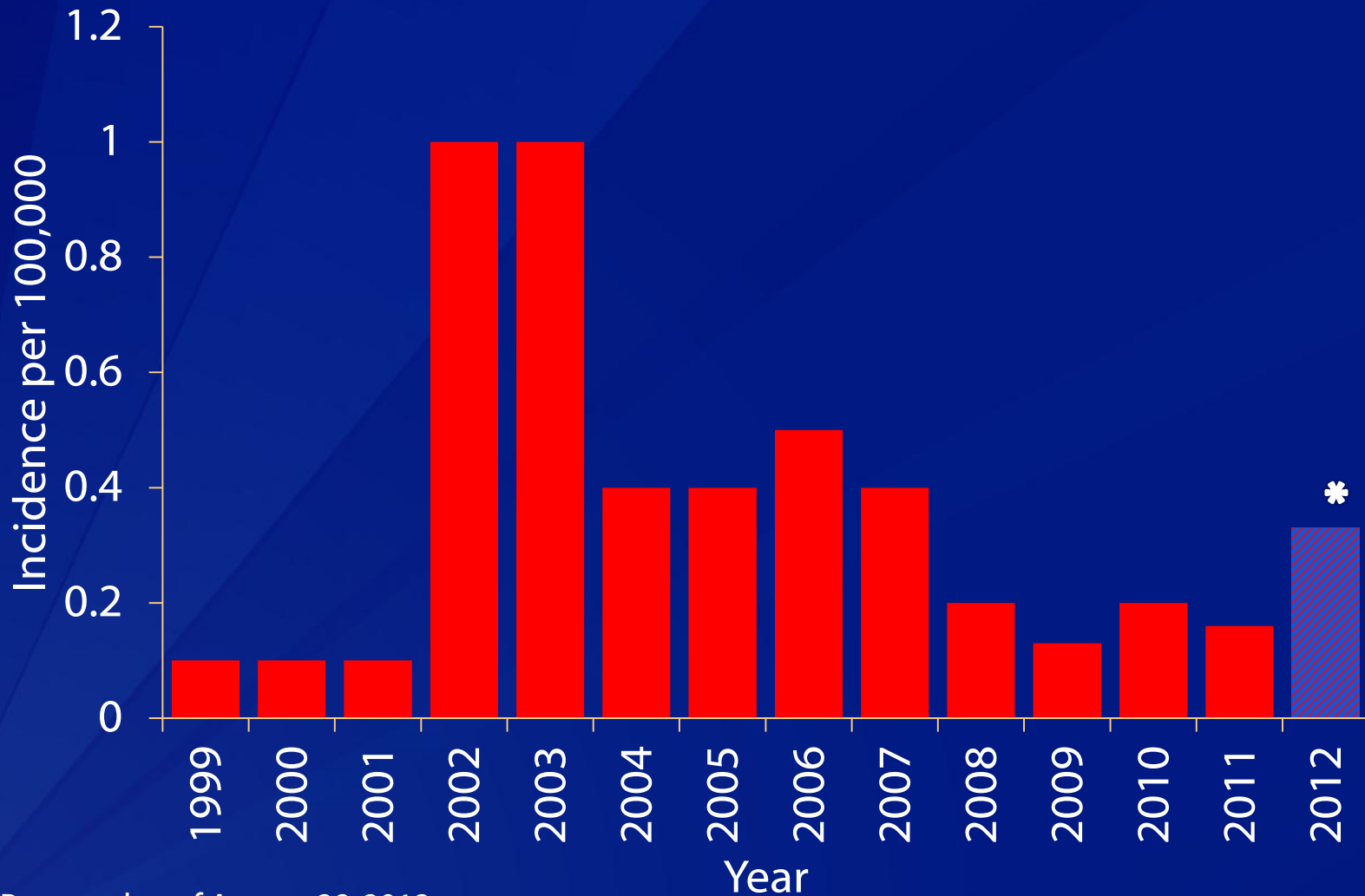
## Annual number of neuroinvasive domestic arboviral diseases cases – United States, 1999-2011

Virus	Cases per year	
	Median	(Range)
West Nile	689	(19 - 2,946)
La Crosse	73	(46 - 167)
St. Louis encephalitis	8	(2 - 79)
Eastern equine encephalitis	6	(3 - 21)
Powassan	1	(0 - 12)

## **Estimated numbers of human WNV infections and disease cases – United States, 1999-2011**

- ❑ **31,414 WNV disease cases reported to CDC**
- ❑ **Most cases are not diagnosed and reported**
- ❑ **Extrapolating from serosurvey and surveillance data**
  - 400,000 - 950,000 cases of WNV disease may have occurred in the United States from 1999 through 2011

# Average annual incidence of WNV neuroinvasive disease – United States, 1999-2012



\* Reported as of August 28, 2012



## **Preliminary WNV surveillance data for 2012 (as of 08/28/2012)**

- ❑ **48 states have reported WNV activity (people, birds, mosquitoes)**
- ❑ **1,590 cases of WNV disease in people, including 66 deaths**
  - 889 (56%) neuroinvasive disease
  - 701 (44%) non-neuroinvasive disease
- ❑ **70% of cases reported from six states (TX, SD, MS, OK, LA, MI)**
  - 45% of all cases reported from Texas
- ❑ **Currently highest number of WNV disease cases reported through last week in August since 1999**

# Summary

- ❑ **WNV remains an important cause of neurologic infections in the United States**
- ❑ **Seasonal outbreaks occur annually but are often quite focal and unpredictable in size and location**
- ❑ **No proven effective treatments or vaccines**
- ❑ **Diagnosis still important to:**
  - Stop unnecessary therapies (e.g., antibiotics)
  - Limit further diagnostic evaluation
  - Help predict patient outcomes
  - Direct public health prevention measures

# **Recommendations for healthcare providers**

- ❑ Consider WNV and other arboviral infections in the differential diagnosis of patients with aseptic meningitis or encephalitis**
- ❑ Obtain appropriate specimens for laboratory testing**
- ❑ Promptly report cases to state or local health departments to allow for appropriate control measures**

**Thank you**



## **Centers for Disease Control and Prevention Atlanta, Georgia**

# Thank you for joining!

## Please email us questions at [coca@cdc.gov](mailto:coca@cdc.gov)

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#### West Nile Virus: Information and Guidance for Clinicians

= No Continuing Education Credits

**Date:** Thursday, August 30, 2012

**Time:** 2:00 - 3:00 pm (Eastern Time)

**Join By Phone:**

**Dial-in Number:** 1-888-603-7038

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**Join By Webinar:**

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<https://www.mymeetings.com/nc/join.php?i=PW2279966&p=COCA&t=c>

**Presenter(s):**

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Medical Epidemiologist  
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National Center for Emerging and Zoonotic Infectious Diseases  
Centers for Disease and Control and Prevention

**Overview:**

Since 1999, more than 30,000 people in the United States have been reported with West Nile virus disease. Outbreaks occur each summer however, this year, some areas of the country are experiencing earlier and greater activity. People over 50 years of age and those with certain medical conditions, such as cancer, diabetes, hypertension, kidney disease, and solid-organ transplants, are at greater risk for serious illness if they are infected. Understanding the epidemiology and clinical features of West Nile virus disease is valuable for clinicians. Join us for this COCA call where a subject matter expert will review epidemiology, modes of transmission, clinical features, appropriate use of diagnostics, and treatment and prevention options for West Nile virus infections.

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The image shows a screenshot of the CDC Health Partners Outreach Facebook page. At the top, the Facebook logo is visible, along with login fields for email and password, and a "Log In" button. Below the login fields, there is a "Sign Up" button and the text "Facebook helps you connect and share with the people in your life." The main content area features the CDC Health Partners Outreach profile picture and name, followed by a "Like" button. The page is categorized as a "Government Organization" in "Atlanta, Georgia". A "Wall" section displays several posts. The first post is a text-based announcement from CDC Health Partners Outreach regarding a webinar on Crisis and Emergency Risk Communication - Radiation, scheduled for July 21 (3:00pm ET). The post includes a CDC logo and a link to the event. The second post is a text-based announcement from CDC Health Partners Outreach regarding a booth at the AVMA Convention, scheduled for July 16th. The post includes a CDC logo and a link to the event. The left sidebar shows the "Wall" tab selected, along with "Info", "Photos", "About", "2 check-ins", and "1,187 like this". The "About" section mentions the Health Partners Outreach Team and the CDC Emergency Risk Communication... The "Likes" section shows a list of users who have liked the page, including CDC Emergency Preparedness and Response and CDC.

<http://www.facebook.com/CDCHealthPartnersOutreach>