

**Aug. 6**

**West Nile Virus: An Update for Clinicians**



**Slides and Handouts**

Materials for this presentation are available for downloading at the Grand Rounds website

*<http://extra.dshs.state.tx.us/grandrounds>*

*Google "dshs grand rounds"*

**Connection Info**

**Conference Call**

*1-877-820-7831 and enter code 150459#*

**Webinar**

*[www2.gotomeeting.com/register/678301986](http://www2.gotomeeting.com/register/678301986)*

**Technical Difficulties**

**Conference Call**

*512.810.1019*

**Webinar**

*GoToWebinar 1-800-263-6317(toll free) or 1-805-617-7000*

## Questions?

email [GrandRounds@dshs.state.tx.us](mailto:GrandRounds@dshs.state.tx.us)

call **512.810.1019**

*Webinar participants can also submit questions using the **chat box** on the right side of their screen*

## Recorded Webinar

This presentation is being recorded and will be posted on the Grand Rounds website on August 7<sup>th</sup> at:  
<http://extra.dshs.state.tx.us/grandrounds>

3

## Introductions



David Lakey, MD, Commissioner  
is pleased to introduce our  
DSHS Grand Rounds topic and speakers

4

## West Nile Virus: An Update for Clinicians



**Robert Kaspar, MD**, Infectious Disease Officer for the State of Texas, Texas Department of State Health Services (DSHS), and Clinical Associate Professor, University of Texas Health Science Center, San Antonio



**Paul McGaha, DO, MPH**, Regional Director for Health Service Region 4 and 5 (North), DSHS, and Acting Assistant Commissioner for the DSHS Division for Regional and Local Health Services



**Tom Sidwa, DVM, MPH**, Manager with the Zoonosis Control Branch at the Texas Department of State Health Services (DSHS)

5

## Epidemiology of West Nile Virus

- Brief Description of WNV
- WNV Movement Into and Across the USA
- WNV Surveillance
- Trends: 2002-2012
- Disease Distribution by
  - Clinical Manifestation
  - Age Group
  - Race
  - Gender



Tom Sidwa, DVM, MPH

6

## West Nile Virus

- **Genus Flavivirus**
  - Single stranded RNA virus
  - Few genetic changes since entering USA
  - Member of Japanese encephalitis virus antigenic complex
    - Cross-reactivity may complicate lab test interpretation
- **1937 - isolated in West Nile District of Uganda**
- **Mosquito-vectored**
  - Mosquito vectors vary across the country
  - Texas
    - Culex quinquefasciatus (primary)
    - Aedes albopictus; Culex tarsalis

7

### WNV Sylvatic Cycle

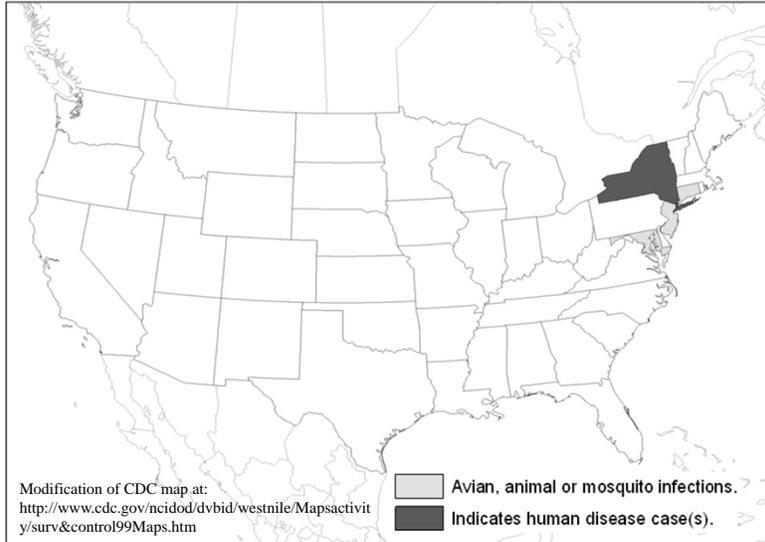
- Birds are amplifying hosts
  - Source of virus for feeding mosquitoes
  - Some species, e.g. crows, jays, experience high mortality rate (bird die off events)
- Humans are dead end hosts for the mosquito-vectored cycle
  - Low viremia, so not a source of virus for feeding mosquitoes
  - **HOWEVER**, human to human transmission occurs without mosquito involvement
    - Blood product transfusion
    - Transplacental
    - Organ transplant
    - Occupational (lab)
    - Breastmilk (1 probable case)
- Horses are dead end hosts
  - Low viremia, so not a source of virus for maintaining the mosquito-vectored cycle

#### West Nile Virus Transmission Cycle

```

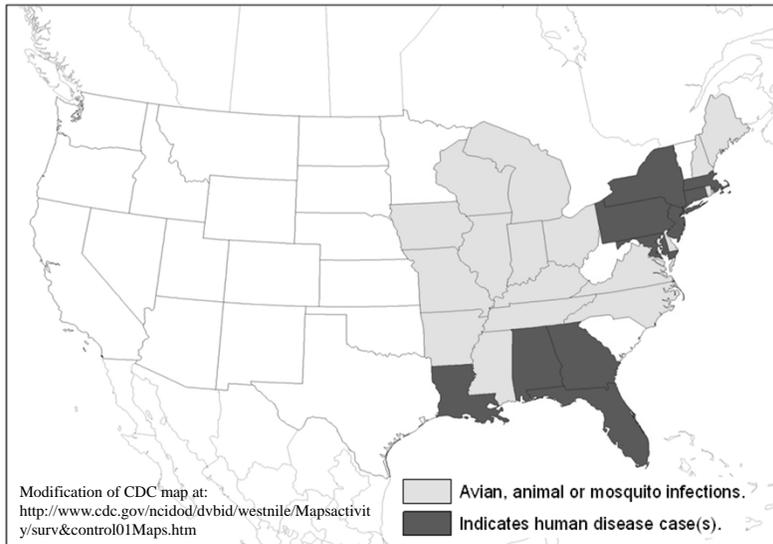
graph TD
    Mosquito[Mosquito vector] -- "West Nile virus" --> Bird[Bird reservoir hosts]
    Bird -- "West Nile virus" --> Mosquito
    Mosquito -- "West Nile virus" --> Child[Incidental infection]
    Bird -- "West Nile virus" --> Horses[Incidental infection]
  
```

### Virus Entry Into the USA - 1999



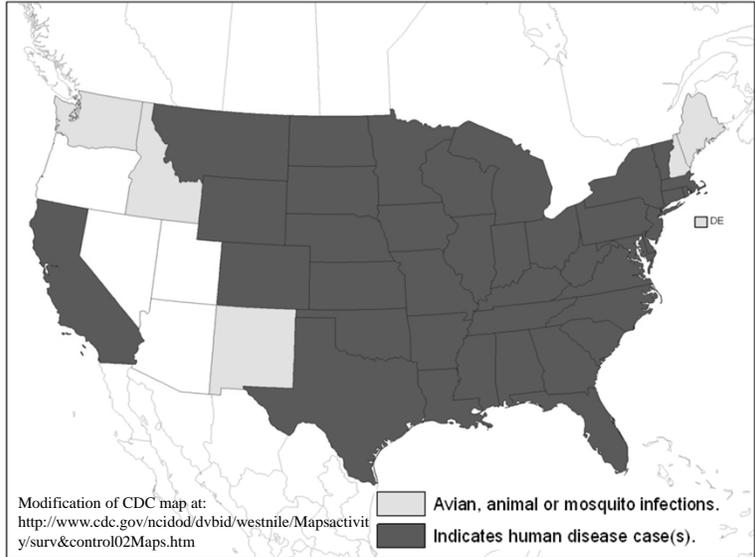
9

### Virus Movement through 2001



10

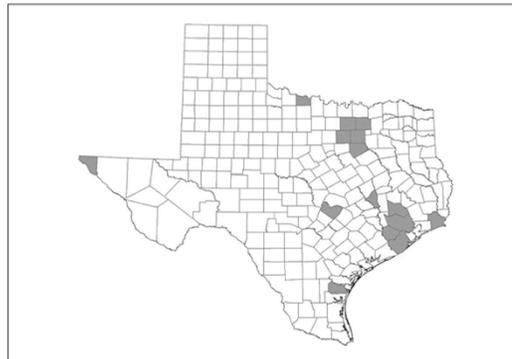
### Rapid Spread of Virus - 2002



11

### Positive Mosquito Pools – Texas (through 8/2/12)

- Mosquito surveillance serves as a sentinel for human disease and informs mosquito control intervention
- Mosquito surveillance is a local function
- Varies across the State
- Identification/testing is done locally, or at the DSHS Laboratory

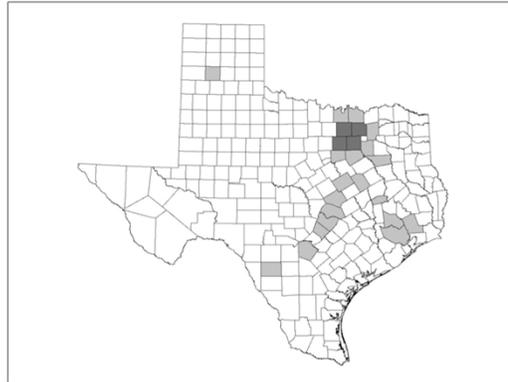


Texas Department of State Health Services Data

12

## Human WNV Illness Cases – Texas (through 8/2/12)

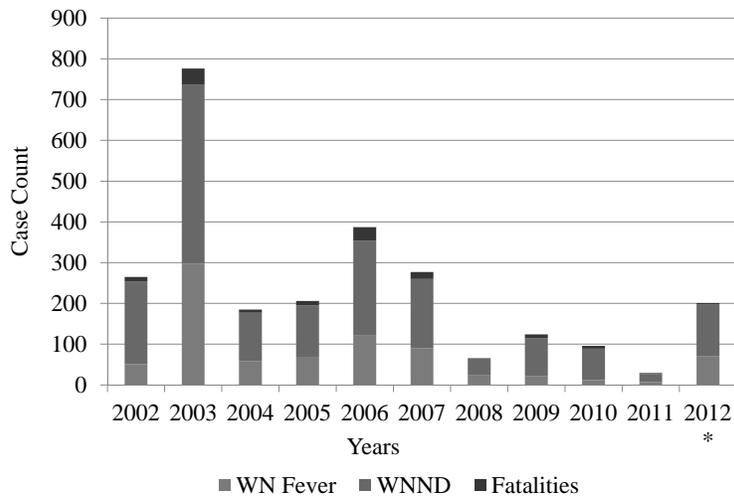
- Map depicts counties with cases
- Dark shaded counties indicate the most impacted locations to date
- Pattern similar to map of positive mosquito pools



Texas Department of State  
Health Services Data

13

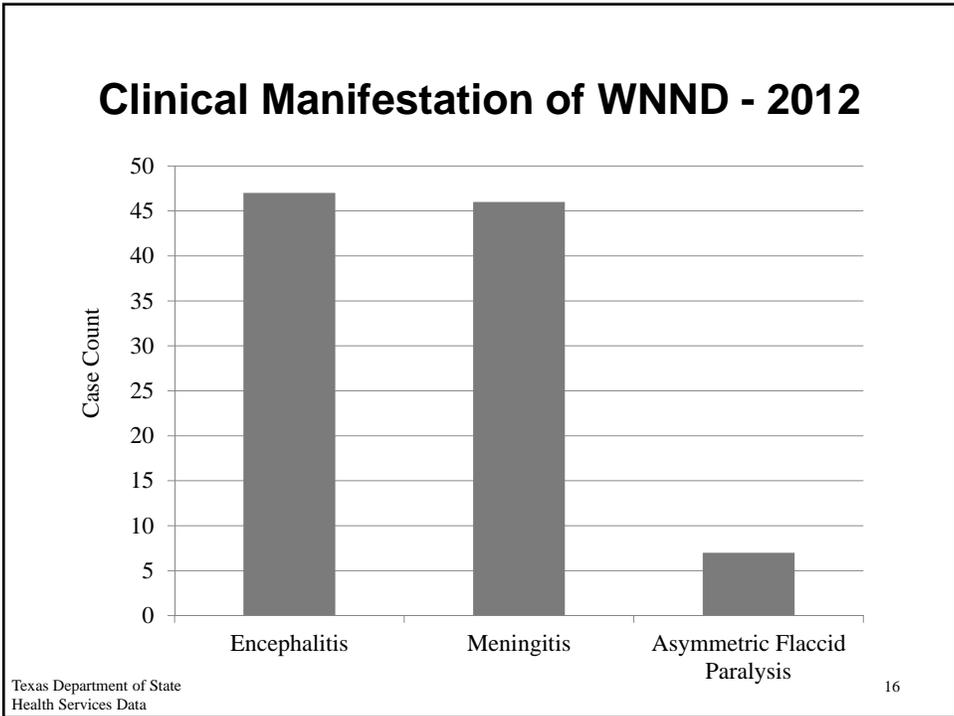
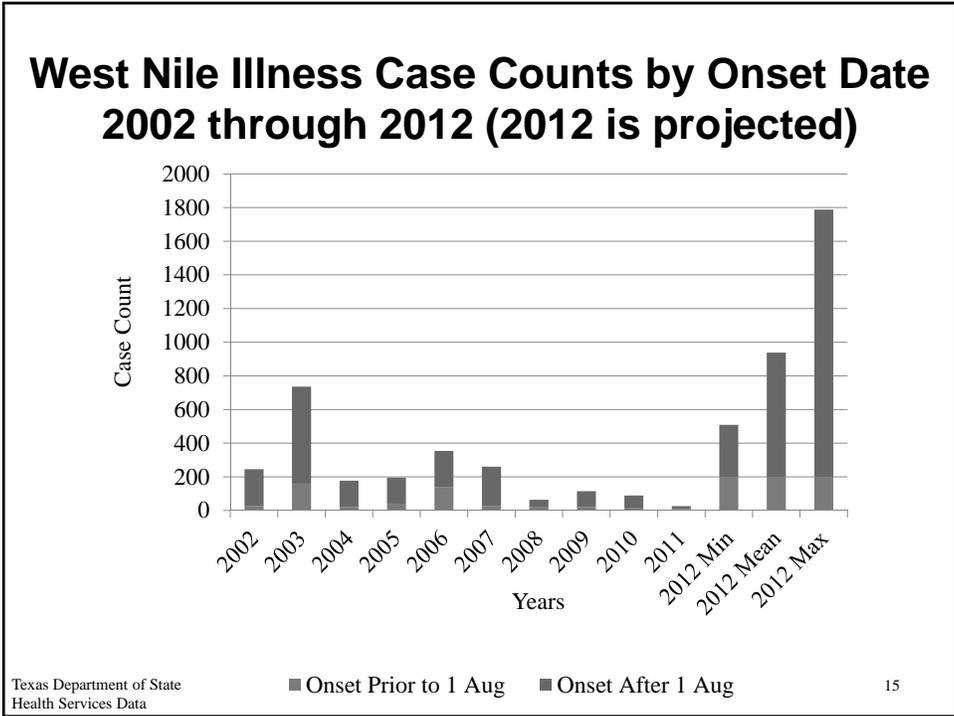
## West Nile Illness in Texas by Year

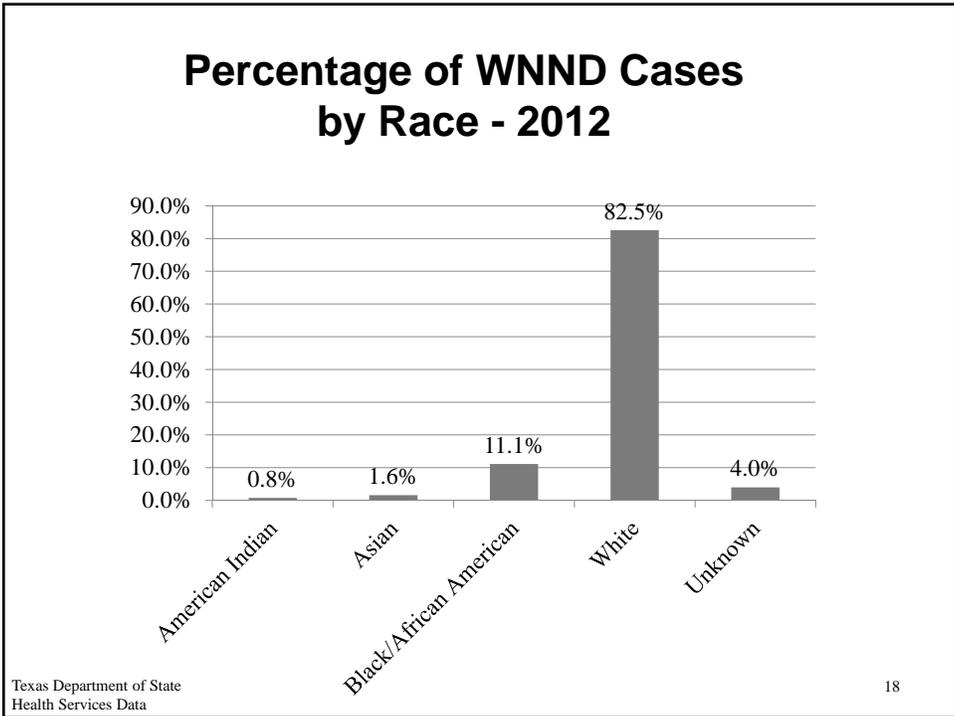
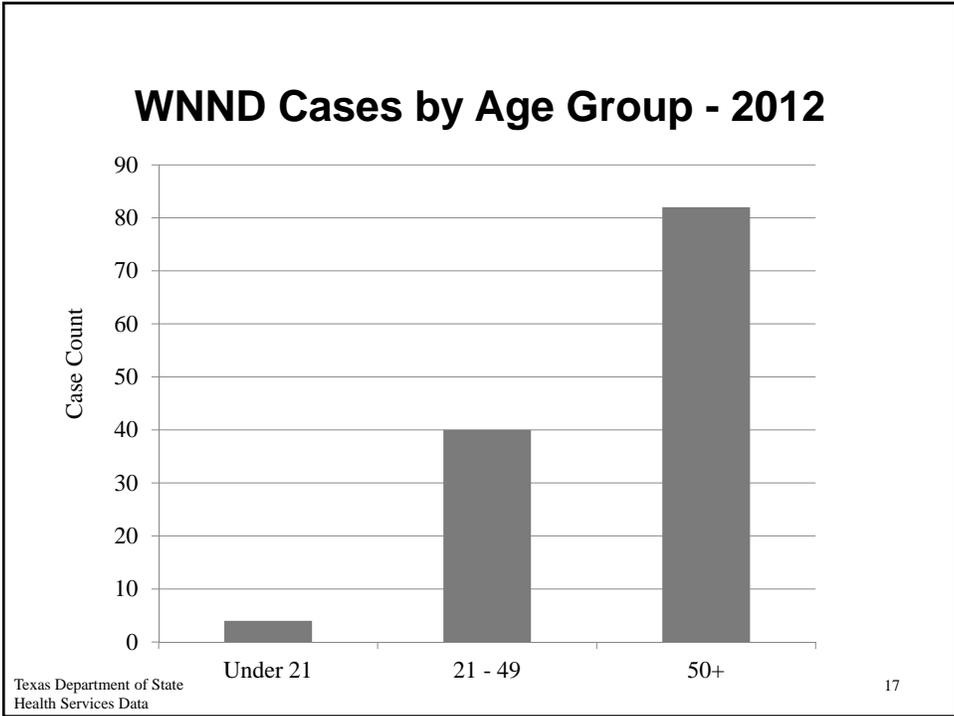


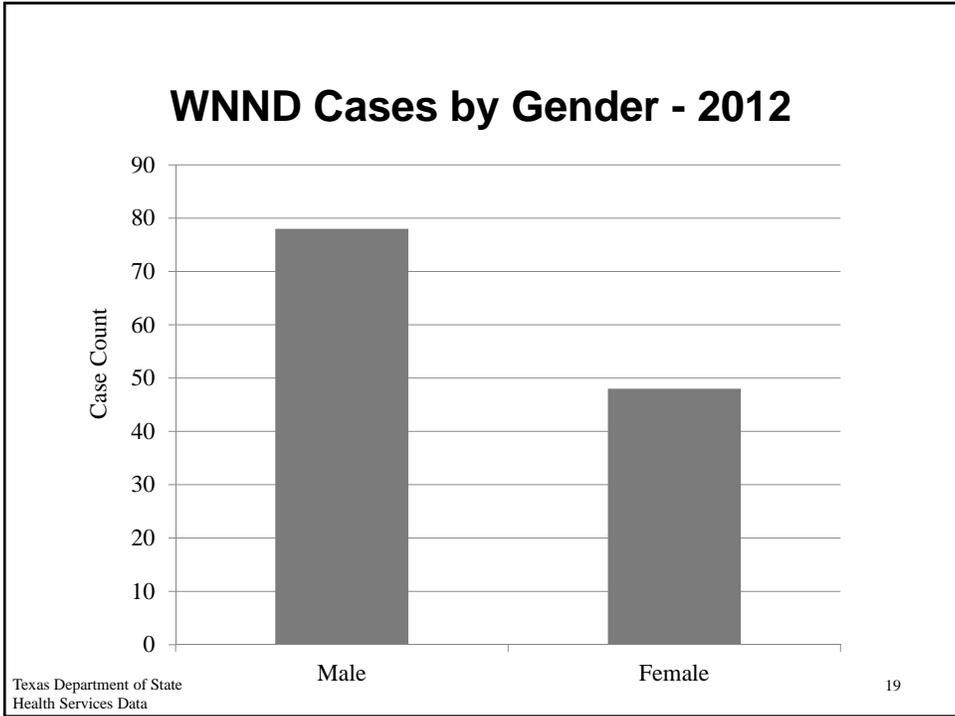
\* 2012 Data through July 31st

Texas Department of State  
Health Services Data

14







## Signs and Symptoms

Two categories of West Nile Virus Illness:

- West Nile Fever
- West Nile Neuroinvasive Disease



**Robert Kaspar, MD**

20

## Signs and Symptoms West Nile Fever

- Incubation period of 2-15 days (average 3-6 days)
- Presents like many other viral illnesses
- Strong suspicion necessary for diagnosis
- Some patients do not have fever
- 20-50% have mild maculopapular rash on chest, back and arms
- Headache, malaise, back pain, myalgias, anorexia, nausea, vomiting, diarrhea, abdominal pain

21

## WNV Rash



Rash more prevalent in:\*

- mild disease (Fever>Meningitis>Encephalitis)
- younger patients (under age 65 > over age 65)

\*Ferguson, et al., Clin Infect Dis. 2005;41:1204-07; Huhn, et al. AJTMH. 2005;72:768-76.

## Signs and Symptoms

### West Nile Neuroinvasive Disease

- May have any of the symptoms previously noted for West Nile Fever
- Much **less** likely to have rash
- Can present with meningitis, encephalitis, flaccid paralysis or a mixture of these
- Ocular manifestations common, especially chorioretinitis
- Paralysis usually asymmetrical

23

## Differential Diagnosis

### West Nile Fever

Very broad differential; many viral illnesses may present similarly; suspicion based on time of year, mosquito activity, other cases being reported

### West Nile Neuroinvasive Disease

Aseptic Meningitis due to other viruses (eg enteroviral); herpes simplex, St Louis Encephalitis, rabies, anti-NMDAR antibody, lupus and other autoimmune cerebritis, amebic, Guillain-Barre, etc.

24

## Diagnostic Approach

When to suspect West Nile Fever or West Nile Neuroinvasive Disease:

- Right time of year (summer, early fall)
- Right conditions (weather favors mosquitoes)
- Known positive mosquito pools
- Reports of West Nile Virus cases

**Due to overlap with other illnesses,  
definitive diagnosis is by laboratory testing**

25

## Diagnostic Lab Testing

### West Nile Fever

Peripheral Blood Testing for:

IgM EIA for West Nile Virus

**AND**

Nucleic Acid Amplification Test for West Nile Virus

(Testing for both is complementary; 94% sensitivity with both tests)

26

## Diagnostic Lab Testing

### West Nile Fever

#### Caveats:

False positive blood IgM antibody can occur due to recent immunization with yellow fever or Japanese encephalitis vaccine or infection with related viruses such as dengue or St Louis Encephalitis.

IgM antibody to WNV can persist for 6 months

27

## Diagnostic Lab Testing

### West Nile Neuroinvasive Disease

Testing as for West Nile Fever

#### **AND**

Lumbar puncture with CSF testing for IgM antibody and nucleic acid amplification for West Nile Virus

CSF shows increased protein, normal glucose, WBC (avg 225/ml), may have lymphocytic or neutrophilic predominance

CT usually normal, MRI usually abnormal

28

## Diagnostic Lab Testing

If West Nile Neuroinvasive Disease is suspected, but initial tests are negative, repeat testing of new specimens is recommended.

29

## Treatment

- At present, the mainstay of treatment is supportive. Uncontrolled studies and case reports suggesting effective treatment must be viewed with caution, since the clinical course and outcomes of West Nile virus infection are highly variable.
- **Possible exception** – transplant recipients of an infected organ donor (preventive IVIG before infection becomes established).

30

## West Nile Virus Vaccine

Research on a human vaccine for West Nile virus continues, but no human vaccine is currently available.

## West Nile Virus and Pregnancy

- In 2002, pregnant woman at 26 weeks of pregnancy developed West Nile encephalitis; subsequently delivered a full term infant with severe CNS damage and evidence of congenitally acquired infection.
- 2003-2004: CDC registry collected 77 women infected with West Nile virus during pregnancy; none had conclusive evidence of congenital infection.
- Current uncertainty about effect of West Nile virus during pregnancy.
- Further info can be obtained from CDC at: 907-221-6400.

## WNV: Long-Term Outcomes

- West Nile Fever:
  - Persistent symptoms commonly reported
  - Chicago 2002: 63% of 98 WNF patients with persistent symptoms at 30 days; median duration of symptoms 60 days\*
  - Colorado 2005: Quality of life measures (SF-36) significantly reduced among 16 WNF patients at 2 years post-infection#
- West Nile Encephalitis:
  - Persistent disabling neurologic sequelae
  - Tremors, movement disorders, subjective cognitive problems in >50%#
  - >3 years after acute illness
  - Higher all-cause mortality rates >1 year post-infection^



33

\*Watson, et al., Ann Intern Med, 141; 2004

# Sejvar, et al., J Neuropsychol 2: 2008

^Green, et al., EID 2005

## Risk Factors

- **Age** is by far the most important risk factor for developing neuroinvasive WNV infection.
- Immunosuppression increases the risk of symptomatic infection and progression to CNS infection.
- Residents of endemic areas and visitors are at higher risk.
- Outdoor occupations and outdoor recreational activities confer risk.
- Solid organ transplant recipients may be at up to 40 times greater risk for developing severe WNV disease.



Paul McGaha, DO, MPH

34

## Age and Risk

- 70-80% of those infected asymptomatic
- 1 in 5 infected develop West Nile fever (mild disease)
- 1 in 100 infected develop CNS disease
- Patients over 50 years have a 10-fold increased risk of neurologic symptoms
- Patients over 80 years have a 43-fold increased risk of neurologic symptoms
- Patients developing meningitis or severe encephalitis have a case fatality rate of 5-10%

35

## Repellents for Use on Skin and Clothing

- CDC/DSHS recommend the use of products registered by the EPA for use as repellents applied to skin and clothing.
- EPA registration indicates the materials have been reviewed and approved for efficacy and human safety when applied according to the instructions on the label.

36

## Repellents for Use on Skin and Clothing

Products containing these active ingredients typically provide reasonably long-lasting protection:

- **DEET** (Chemical Name: N,N-diethyl-m-toluamide or N,N-diethyl-3-methyl-benzamide)
- **Picaridin** (KBR 3023, Chemical Name: 2-(2-hydroxyethyl)-1-piperidinecarboxylic acid 1-methylpropyl ester )
- **Oil of Lemon Eucalyptus\*** or **PMD** (Chemical Name: para-Menthane-3,8-diol) the synthesized version of oil of lemon eucalyptus
- **IR3535** (Chemical Name: 3-[N-Butyl-N-acetyl]-aminopropionic acid, ethyl ester)

37

## Repellents for Use on Skin and Clothing

- In general, higher concentrations of active ingredient provide longer duration of protection.
- Concentrations above ~50% do not offer a marked increase in protection time.
- Products with <10% active ingredient may offer only limited protection, often from 1-2 hours.
- Regardless of what product you use, if you start to get mosquito bites, reapply the repellent according to the label instructions or remove yourself from the area with biting insects if possible.

38

## Repellents for Use on Clothing

- Permethrin is recommended for use on clothing, shoes, bed nets, and camping gear
- Highly effective as an insecticide and as a repellent

39

## EPA Precautions

- Apply repellents only to exposed skin and/or clothing (as directed on the product label). Do not use repellents under clothing.
- Never use repellents over cuts, wounds or irritated skin.
- Do not apply to eyes or mouth, and apply sparingly around ears.
- Do not allow children to handle the product. When using on children, apply to your own hands first and then put it on the child. You may not want to apply to children's hands.
- Use just enough repellent to cover exposed skin and/or clothing. Heavy application and saturation are generally unnecessary for effectiveness.
- After returning indoors, wash treated skin with soap and water or bathe.
- If you or your child get a rash or other bad reaction from an insect repellent, stop using the repellent, wash the repellent off with mild soap and water, and call a local poison control center for further guidance.

40

## **Repellents Use for Children (AAP)**

- Use no more than 30% DEET on infants and children.
- Do not use DEET on infants younger than 2 months of age.

41

*Always follow the  
recommendations appearing  
on the product label when  
using repellent*

42

## The Four Ds of WNV Prevention

- **Dusk to Dawn** – These are the prime mosquito feeding hours.
- **Dress** – Wear long sleeves and long pants to avoid being bit.
- **DEET** – Buy an insect repellent that contains DEET and be sure to follow the manufacturer's instructions.
- **Drainage** – Make sure flower pots, water dishes, bird baths and children's swimming pools are properly drained so they're not breeding grounds for mosquitoes.

43

## Drain Sources of Standing Water

- At least once or twice a week, empty water from flower pots, pet food and water dishes, birdbaths, swimming pool covers, buckets, barrels, and cans.
- Check for clogged rain gutters and clean them out.
- Remove discarded tires, and other items that could collect water.
- Be sure to check for containers or trash in places that may be hard to see, such as under bushes or under your home.

## For More Information West Nile Virus

Speaker email addresses:

- [Bob.Kaspar@dshs.state.tx.us](mailto:Bob.Kaspar@dshs.state.tx.us)
- [Paul.McGaha@dshs.state.tx.us](mailto:Paul.McGaha@dshs.state.tx.us)
- [Tom.Sidwa@dshs.state.tx.us](mailto:Tom.Sidwa@dshs.state.tx.us)

DSHS West Nile Information

<http://www.dshs.state.tx.us/idcu/disease/arboviral/westnile/information/general/>

Centers for Disease Control and Prevention West Nile Information

<http://www.cdc.gov/ncidod/dvbid/westnile/index.htm>

World Health Organization West Nile Fact Sheet

<http://www.who.int/mediacentre/factsheets/fs354/en/>

45

## Questions for Our Speakers



David Lakey, MD  
DSHS Commissioner

To send questions:

Type: Question into the GoToWebinar chatbox

Email: [GrandRounds@dshs.state.tx.us](mailto:GrandRounds@dshs.state.tx.us)

Phone: 512.810.1019

If time does not allow for all questions to be addressed, DSHS will post responses to unanswered questions on the DSHS Grand Rounds website.



46

## Upcoming DSHS Grand Rounds Presentations



- **Motivational Interviewing (Sept. 19<sup>th</sup>)**
- **Deep in the Heart of Texas: Integration of Public Health Research and Congenital Heart Disease (Sept. 26<sup>th</sup>)**
- **Trauma Informed Care (Oct. 3<sup>rd</sup>)**
- **Healthy Texas Babies: Prevention of Subsequent Preterm Delivery in High Risk OB Patients - 17P (Oct. 10<sup>th</sup>)**
- **What Is Causing the Increasing Rate of Mood Disorder in Youth? (Oct. 17<sup>th</sup>)**
- **Redesigning Public Health Systems in Texas (Oct. 24<sup>th</sup>)**
- **Poisonings in Texas (Oct. 31<sup>st</sup>)**
- **Lessons Learned from *The Immortal Life of Henrietta Lacks* (Nov. 7<sup>th</sup>)**

47