West Nile Virus
Human Case Surveillance

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WNV Prevention, Surveillance, and Control Workshop
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Summary of Human WNV Activity
California, 2005
Human WNV cases in the U.S., 2005
Human West Nile virus cases in California, 2005, by week of onset (n=756)*
(Reported as of November 29, 2005)

* Onset dates not available for 97 cases.
Reported incidence of human WNV illness, by county
California, 2004-2005

<table>
<thead>
<tr>
<th>Incidence per 100,000 pop.</th>
</tr>
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<tbody>
<tr>
<td>0.06 - 1.99</td>
</tr>
<tr>
<td>2.00 - 3.99</td>
</tr>
<tr>
<td>4.00 - 5.99</td>
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<tr>
<td>6.00 - 17.84</td>
</tr>
</tbody>
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Statewide incidence = 2.30 per 100,000 pop.

2004

Statewide incidence = 2.52 per 100,000 pop.

2005 (as of 11/29/05)
Human WNV activity, 2004-2005

<table>
<thead>
<tr>
<th></th>
<th>2004</th>
<th>2005*</th>
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<tbody>
<tr>
<td>Total human infections</td>
<td>830</td>
<td>910</td>
</tr>
<tr>
<td>Total symptomatic cases</td>
<td>779</td>
<td>854</td>
</tr>
<tr>
<td>Incidence per 100,000 pop.</td>
<td>2.30</td>
<td>2.52</td>
</tr>
<tr>
<td>Neuroinvasive disease</td>
<td>289</td>
<td>285</td>
</tr>
<tr>
<td>West Nile fever</td>
<td>395</td>
<td>501</td>
</tr>
<tr>
<td>Median age, all cases</td>
<td>52 yrs</td>
<td>50 yrs</td>
</tr>
<tr>
<td>Median age, neuroinvasive</td>
<td>57.5 yrs</td>
<td>56 yrs</td>
</tr>
<tr>
<td>Total WNV-related fatalities</td>
<td>28</td>
<td>18</td>
</tr>
</tbody>
</table>

* Reported as of November 29, 2005
Incidence of WNV illness, by age and clinical presentation
California, 2005 – as of November 29 (n=785)

* 2000 U.S. Census Data
Risk factors for WNND

- Age is a risk factor for WNND (p<0.001)
- In 2004, observed high frequency of hypertension and diabetes in fatalities, neuroinvasive cases
- 2005 WNV case history form asks about HTN, DM
- Preliminary data, 2005 cases
  - HTN (p=0.012) and DM (p<0.001) are risk factors for WNND for all cases
  - For cases ≥ 45 years, DM remains a significant risk factor, but HTN does not
  - Little information available on Type I vs. Type II, controlled vs. uncontrolled DM
2004 WNV-associated fatalities

- Reviewed WNV case history forms, extended clinical and laboratory information, discharge summaries, and death certificates
- 28 fatalities from 7 counties
  - Illness onset June 19 - October 15, 2004
  - Deaths occurred June 24, 2004 - March 19, 2005
  - Median age in years = 75 (range: 25-94)
  - 18 (64%) male
  - 19 (68%) White, 7 (25%) Hispanic
2004 WNV-associated fatalities

- Median interval between hospitalization and death in days = 14 (range: 1-172)
- Underlying chronic conditions
  - Hypertension (n=19, 68%)
  - Diabetes mellitus (n=12, 43%)
  - Immunocompromised status (n=2, 7%)
- WNV often not considered on admission (e.g. pneumonia, bronchitis)
- Death certificates did not always list WNV as cause or contributing factor
2005 WNV-associated fatalities

As of November 29, 2005:

- 18 fatalities reported from 11 counties
- Median age in years = 79 (range: 62-92)
- 14 (78%) male
- Of 9 decedents where data is available, median interval in days between hospitalization and death = 10 days (range: 4-31)
Acute flaccid paralysis

- In 2004, 21 (3%) cases had acute flaccid paralysis, per case history form
  - Median age in years = 61 (range: 12-91)
- As of November 29, 2005, 35 (4%) cases with acute flaccid paralysis
  - Median age in years = 55 (range: 13-84)
  - 18 with encephalitis and/or meningoencephalitis
  - 7 with meningitis
  - 2 fatalities
Pediatric cases in CA, 2004

- In 2004, 440 (22%) individuals tested for WNV at VRDL were ≤18 years
- 33 (4%) of the 779 WNV cases ≤18 years
  - 18 (55%) West Nile fever
  - 14 (42%) West Nile neuroinvasive disease
  - 1 case clinical presentation unknown
  - Median age in years = 11 (range: 2-18)
  - 27 (81%) male
  - No fatalities
Pediatric cases in CA, 2004

Pediatric WNV Cases in California, 2004
N=33 (23 cases reviewed)

- **West Nile Fever**
  - 12 cases
  - Median age = 13 yrs
  - None hospitalized

- **West Nile Neuroinvasive**
  - 11 cases

- **Meningitis**
  - 6 cases
  - Median age = 12 yrs
  - 5 cases hospitalized
  - Length of stay 3-5 days

- **Encephalitis**
  - 5 cases
  - Median age = 15 yrs
  - All cases hospitalized
  - Length of stay 5-71 days
  - 2 cases with AFP
Pediatric cases in CA, 2005

- In 2005, ~500 (23%) individuals tested for WNV at VRDL have been ≤18 years
- 35 (4%) of the 854 WNV cases ≤18 years
  - 21 (60%) West Nile fever
  - 13 (37%) West Nile neuroinvasive disease
  - 1 case with unknown clinical presentation
  - Median age in years = 16 (range: 2-18)
  - 21 (60%) male
  - **No fatalities**
WNV Outcome Studies

- WNV encephalitis case follow-up, 2004 (2005 in progress)
  - 3, 6, and 12 month follow-up surveys
  - For activities of daily living, e.g. eating and walking, most returned to baseline by 3 months
  - However, many neuropsychological outcomes worsened over time, e.g. depression, word finding and memory
  - Currently investigating cases that were lost to follow-up
  - Contact: Shilpa Gavali SGavali@dhs.ca.gov

- WNV fever case follow-up
  - Contacts: Anne Kjemtrup AKjemtru@dhs.ca.gov; or Jamie Riggs-Nagy JRiggs@dhs.ca.gov
Initial conclusions

- Diabetes appears to be a risk factor for neuroinvasive disease
- Mortality greatest amongst elderly population (consistent with national surveillance data)
- Acute flaccid paralysis can affect all age groups
- Relatively reassuring news for pediatric population
Issues and Challenges in 2005
2005 updates

- WNV became reportable by providers and laboratories
- Completed case history form no longer required for testing at State virus lab (VRDL)
- Case history form updated and disseminated to counties, posted to CD forms website
- VRDL stopped requesting that commercial labs submit all IgM-positive specimens to VRDL for repeat/confirmatory testing
- Guidelines developed for use within regional public health laboratory network
Within the regional public health laboratory network, a person was considered a WNV case if he or she had a clinically compatible illness and the following lab results:

- IgM(+) by two different assays; or
- IgM(+) and IgG(+) by EIA; or
- IgM(+) and IgG(+) by IFA; or
- Rising IgG antibodies
VRDL WNV Testing Algorithm

**LOCAL RESULT:**
- NEGATIVE/NOT TESTED
  - EIA
    - Focus IgM
    - In-house IgG

**LOCAL RESULT:**
- POSITIVE
  - EIA
    - Focus IgM w/heterophile†
    - In-house IgG

- Focus M(-) heterophile(-) In-house G(-)
- Focus M(-) heterophile(-) In-house G(+)
- Focus M(+) heterophile(+) In-house G(-)
- Focus M(+) heterophile(+) In-house G(+-)
- Focus M(-) heterophile(-) In-house G(+)

**Report (Neg)**
- Repeat EIA
  - Focus IgM w/heterophile

**Report (Pos)**
- Call LHD
- IFA and/or Neut
- Request conv sample

**REVIEW**
Making the diagnosis...

- IgG(+) only
  - In general considered to be old infection
  - Follow-up specimens requested if WNV still clinically suspected, particularly if initial specimen was collected early, or if patient was a child with no travel history

- IgM(+) only, by one assay
  - Possibility of false IgM(+) result
  - Heterophile subtract procedure can only be done on serum

- Correct diagnosis especially important for neuroinvasive disease cases
Old WNV infection?

- Suspect WNV cases detected early in the 2005 season were approached with caution
  - Possible lingering IgM from a 2004 infection
- In addition to clinical, travel, and exposure history, checked for:
  - Non-human surveillance activity
  - Rise in antibodies with follow-up serum
  - Avidity test results (experimental - not reported)
Infections vs. Cases

- California WNV website summary lists total number of human WNV infections
  - This includes asymptomatic infections, e.g. blood donors
- A “case” must also have clinical illness
  - CDC website lists the number of cases
- Media does not always make this distinction
- In 2005, tried to keep better track of infection vs. case breakdown
Reporting WNV infections

(+) WNV Result from Commercial Lab

(+) WNV Result from Local/State Lab

CMR from Provider

Local Health Dept

- Investigate
- Arrange for additional testing if necessary
- If meets case def, complete case hx

CMR entered into AVSS or local system

CDHS Surveillance and Statistics Section

- Fax or mail case hx to CDHS-VRDL

Case reported to CDC via ArboNET

Case added to line list on www.westnile.ca.gov
WNV reporting issues

- Updated state line list twice a week, on Tuesdays and Fridays
- When reporting positive lab results from VRDL, waited for local health department’s confirmation before adding to line list
What worked in 2005

- Routine communication between state and local health departments and other agencies via teleconferences, email updates, etc.
- Expanded WNV testing at local public health laboratories
- Improved accuracy and timeliness of reporting
- Continued collaboration with commercial laboratories, Kaiser, blood banks
2006 and beyond...

- Maintain network between state, local public health departments and labs, vector control agencies, Kaiser, etc.
- Continue to work with commercial labs on timely reporting of WNV results to local health departments
- Further streamline reporting process
- Use feedback/lessons learned from 2005 to improve human WNV testing and surveillance
  - Send comments to Cynthia Jean CJean@dhs.ca.gov or Carol Glaser CGlaser@dhs.ca.gov