

West Nile fever in the Americas



Sophie Molia



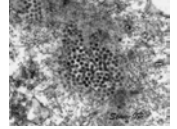
Petit Bourg, October 26, 2005

West Nile virus (WNV)

- Family Flaviviridae, genus Flavivirus, member of the Japanese encephalitis virus serocomplex (JE, SLE, KUN, MVE...)
- RNA virus
- Mosquito-borne virus
 - Particularly Culex species



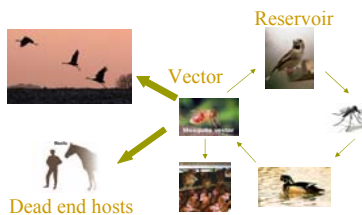
Culex quinquefasciatus



West Nile virus (WNV)

- Natural transmission cycle involving mosquito vectors and bird reservoir hosts

- Humans, horses, and other mammals usually incidental hosts



West Nile virus (WNV)

- Infection in humans
 - Subclinical or symptoms ranging in severity: passing fever to serious encephalitis
- Infection in horses
 - meningoencephalitis
- Infection in birds
 - Little known
 - Depends on species



Distribution prior to 1999



Origin of American outbreak

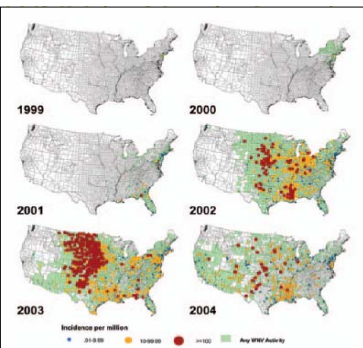
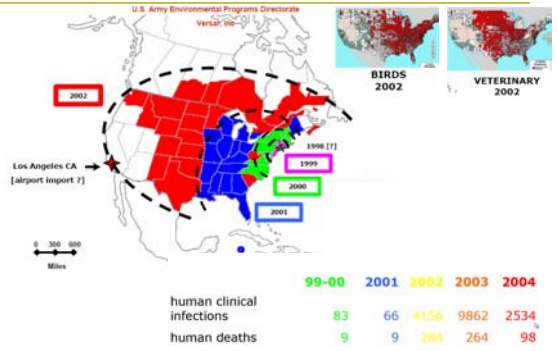
- Late August- early September 1999
 - New York city and surroundings
 - Outbreak of human encephalitis consistent with arboviral etiology
 - Serological evidence implicated a flavivirus
- Concurrent die-off of birds
 - Viral encephalitis in crows
 - Exotic avian species Bronx zoo

Origin of American outbreak

Analysis by CDC

- Not Kunjin virus, not EEEV, not SLEV, not MVEV but **West Nile virus**
- High degree of similarity between all US WNVs and the WNV isolated in Israel in 1998 (99.8%)
 - WNV-Israel 1998 associated with increased pathogenicity for birds, also observed in the US outbreak and previously observed only experimentally
 - Absence of reported human cases during Israeli epizootic may be due to background human immunity to WNV in Israel
- Introduction in NYC
 - Travel by infected humans,
 - Importation of illegal birds or other domestic pets
 - Introduction of virus-infected ticks or mosquitoes

WNV in North America



Reported incidence of neuroinvasive WNV disease by county, United States, 1999–2004

WNV in North America

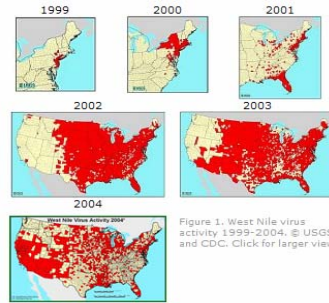
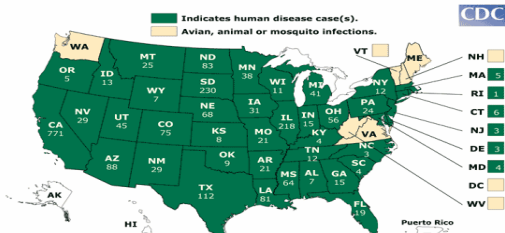


Figure 1. West Nile virus activity 1999-2004. © USGS and CDC. Click for larger view.

WNV in the USA

2005 West Nile Virus Activity in the United States (Reported to CDC as of October 18, 2005*)



2005: 2148 clinical cases and 59 deaths

WNV in the Caribbean

Spread to Central America & Caribbean likely because of:

- Bird migration
- Environmental conditions adapted throughout the year
 - High temperature
 - Large numbers of Culex mosquitoes
 - Dense avian populations



WNV in the Caribbean

- First detection: Cayman islands 2001
(Promed 15.10.01)
 - 32 year-old man with encephalitis
 - Serum positive for WNV antibodies
 - No travel in last 6 months
- Human WN case in Mexico in August 2002
(Promed 30.08.02)
 - 72 year-old man with encephalitis
 - Confirmed WN
 - Most probably imported from US (Texas)
(Promed 09.09.02)

WNV in the Caribbean

2002-2003

- WNV antibodies in horses and birds from Mexico
- Lorono-Pino 2003 □ 252 horses in the State of Yucatan, July to October 2002. Antibodies to WNV by epitope-blocking ELISA, confirmed by plaque reduction neutralization test in 3 (1.2%)
- Blitvich 2003 □ 24 horses in the State of Coahuila, December 2002. Antibodies to WNV epitope-blocking ELISA, confirmed by PRNT in 15 (62.5%)
- Farfan-Ale 2004 □ 8611 birds representing 182 species and 14 orders in the State of Yucatan. Antibodies to WNV confirmed by PRNT in 5 (3 migrants, 2 presumably resident; captured in December 2002-January 2003)
- Fernandez-Salas 2003 □ 796 birds representing 70 species and 10 orders in the State of Tamaulipas. Antibodies to WNV confirmed by PRNT in 4 (1 migratory species, 3 presumably resident; captured in March 2003)

WNV in the Caribbean

2002-2003

- WNV antibodies from birds in Jamaica
- Dupuis 2003 □ 1,600 specimens from resident and nonresident neotropical migratory birds before their northerly migrations, in Spring 2002. Neutralizing antibodies to WNV in 11 resident species
- WNV antibodies from birds in the Dominican Republic
- Komar 2003 □ 33 resident birds sampled at Los Haitises and Sierra de Baoruco NPs in November 2002. Antibodies to WNV by epitope-blocking ELISA and PRNT in 5 (15%)
- Komar 2005 □ Antibodies to WN in 12/58 (21%) resident birds sampled in March 2003, representing 6 species

WNV in the Caribbean

2002-2003

- WNV antibodies in birds and horses from Guadeloupe
- Quirin 2004 □ 360 horses sampled in July 2002. Antibodies to WNV by ELISA, confirmed by PRNT in 10 (2.7%)
- 20 chicken in 2 farms in December 2002. 11 had Ab
- WNV antibodies in horses from El Salvador
- Promed 29.04.03 □ 3 of 10 horses sampled in April 2003 in Usulután locality
- WNV antibodies in horses from Belize
- Promed 24.06.04 □ Active surveillance detected 4 cases of suspected WN in horses
- Antibodies found in one 4 year-old horse with symptoms of ataxia, hind-limb paresis, pain, and recumbency in October 2003

WNV in the Caribbean

2004-2005

- WNV antibodies in birds and horses from Puerto Rico
- Promed 14.06.04 □ Antibodies in 2 of 183 birds captured in February 2004 in Ceiba
- Promed 20.06.04 □ Antibodies found in 3 healthy horses in June 2004 in Fajardo area
- WNV antibodies in birds from Puerto Rico and Cuba
- Dupuis 2005 □ 1,950 blood specimens collected from resident and Nearctic-Neotropical migratory birds in Spring 2004
- Eleven birds and seven birds, collected in Puerto Rico and Cuba, respectively, positive in a flavivirus ELISA. Confirmatory PRNT indicated neutralizing WNV Ab in non-migratory resident birds from Puerto Rico and Cuba

WNV in the Caribbean

2004-2005

- WNV antibodies in birds, horses, and humans from Cuba
- Promed 02.02.05 □ 3 human cases (encephalitis, headache and muscle weakness) with positive IgM & IgG WNV antibodies (neutralization assay), in Villa Clara and Sancti Spiritus provinces
- 4 equine serum samples positive by competition ELISA and haemagglutination inhibition tests
- Promed 21.02.05 □ Antibodies in 5 of 210 horses tested in surveillance activities by immunohistochemical tests and virus neutralisation tests

WNV in the Caribbean

2004-2005

- WNV antibodies in horses from Colombia
 - 130 healthy equines (horses and donkeys) sampled in September-October 2004, in the northern departments of Córdoba and Sucre in the Caribbean region
 - Twelve equines (9%) from 10 different premises found positive for WNV by PRNT, corroborated by epitope-blocking ELISA. IgM in 2 of 12 equines
- WNV antibodies in horses and birds from Trinidad
 - Seropositivity in 2/60 horses and 2/40 birds

Mattar
2005

Promed
06.01.05

WNV in the Caribbean



WNV in the Caribbean

Characteristics

No wild bird mortality although reporting difficult in rural areas because of rapid decomposition

- Heat
 - Humidity
 - Detritivore foragers (dogs, ants...)
- Very few clinical cases
 - Immunity?
 - Virus mutation?
 - Specific risk factors in Neotropics?