WEST NILE VIRUS

Objectives

• Know and describe the epidemiology of West Nile
• Know and describe the public health perspective
• Know and describe the medical perspective
• Identify preventive measures at population level
• Identify signs and symptoms of West Nile
• Identify indicators of West Nile in a community

History of West Nile Virus

• WNV was first isolated from a febrile patient from the West Nile district of Northern Uganda in 1937.

• The patient presented in the setting of a large epidemiologic study of yellow fever virus.
History of West Nile Virus

• However, inoculations of mice with the patient’s serum resulted in the isolation of a virus with physical and pathologic properties similar to those of two flaviviruses, St. Louis encephalitis virus and Japanese B encephalitis virus, and sharing immunological relationships with these viruses.

History of West Nile Virus

• The first recognized epidemic of WNV occurred in Israel in 1951 in a small town outside of Haifa
  – A total of 123 cases with no fatalities occurred among 303 inhabitants;
  – Young children represented the majority of cases.

History of West Nile Virus

• During this outbreak the various clinical features associated with infection were first described in detail
  • Main symptoms: fever, headache, myalgias, anorexia, abdominal pain, exanthems, and vomiting;
  • Lymphadenopathy, angina, and diarrhea were somewhat less common.
History of West Nile Virus

• Several large outbreaks in Egypt between 1951 and 1954 led to a further understanding of the ecology, epidemiology, and clinical characteristics.

History of West Nile Virus

• On the basis of the detection of WNV in the blood of several children and a high seroprevalence rate among residents of a village north of Cairo in 1950, an extended study of WNV was begun in 1951 in the upper Nile Delta region.

History of West Nile Virus

• Serosurveys demonstrated that WNV was endemic along the Nile, with seroprevalence rates approaching 60%.

• Older children and adults appeared to have higher seroprevalence, while younger children seemed to have more symptomatic illness, suggesting that WNV was mainly an infection of early childhood.
History of West Nile Virus

- Infections were characteristically self-limited, febrile illnesses with rare occurrences of meningitis or encephalitis.

- Beginning around 1996, the epidemiology and clinical spectrum of WNV appeared to change. A large outbreak of WNV occurred in the area around Bucharest, Romania.

- It was the first WNV outbreak to be centered in a predominantly urban area, and it was the first outbreak of the virus in which the preponderance of symptomatic cases involved CNS infection.

- Serum samples obtained from Bucharest residents that predated the epidemic suggested that, for the most part, the population in and around the city was serologically naive to WNV and thus highly susceptible.
History of West Nile Virus

• Epidemiologic studies suggested that certain factors prevalent in the rather deteriorated urban infrastructure of Bucharest contributed to the epidemic.

• There was a profusion of areas conducive to mosquito breeding, an abundance of amplifying hosts in the form of domestic fowl, and the absence of protective barriers, such as screens on windows and doors.

• Several subsequent epidemics associated with relatively high rates of CNS infection were observed throughout the Middle East and Europe
  – Morocco in 1996
  – Tunisia in 1997
  – Large outbreaks in Italy and Israel in 1998.

• The outbreaks were associated with higher rates of severe CNS disease and higher fatality rates, predominantly among older individuals.

• The Tunisian outbreak of 1997 involved 173 patients hospitalized with meningitis or meningoencephalitis, and 8 deaths;
  – more than half of all these patients were over 50 years of age.
NEW YORK CITY, 1999

It all started in NYC, 1999

It started with a phone call

- August 23, 1999 (Monday)

- Deborah Asnis - Physician at Flushing Hospital Medical Center (Queens)

- Calls Marci Layton - Chief Epidemiologist, NYC DOH
Reason: Two Puzzles

- 60 year-old male & 75 year-old male
- Dr. Asnis’ patients
- Both
  - Lost use of arms and legs
  - High fevers
  - CSF leukocytosis
  - Confused

A plan

- Blood and CSF specimens to be sent to state lab in Albany

Another phone call

- Friday, August 27, 1999
- Dr. Asnis reports on two more patients
  - 80 year-old male
  - 87 year-old female
- Another neurologist overhears conversation
  - Has another similar encephalitic patient in another hospital
NYC Department of Health Makes a Visit

• Saturday, Layton & Annie Fine visit Flushing Hospital to review cases

• Three now on mechanical ventilators

• Commonality: All lived within same two-square-mile area of northern Queens

Simultaneous Admission at Flushing Hospital

• 57 year-old male
  – Fever, combative, hallucinatory
  – Came from same neighborhood as others

At End of Weekend

• Eight additional patients with similar manifestations identified in hospitals in Queens.
CDC

- Sunday:
  - Layton calls CDC for assistance

- Tuesday:
  - EIS (Epidemic Intelligence Service, CDC) Officer Kristy Murray arrives
  - More cases appear

- Wednesday:
  - Murray visits hospitals
    - Reviews patient charts
    - Interviews patients
  - Denis Nash (EIS at NYC AIDS unit)
    - Visits patients’ homes with exterminator, animal-disease expert, entomologist

Clue

- At one patient’s home, Nash’s team discovers
  - Mosquito Paradise: Standing water (birdbath), thick grass
- Patient and other patients were avid gardeners
- Patient taken off life support

Another Death

- Thursday
- 87 year-old woman dies
Lab Results

- Friday
- NY & CDC tests
  - Positive for St. Louis Encephalitis (SLE) viral antibodies in blood and CSF specimens

Mayor Giuliani

- Press conference
- Choppers spray pesticides over Queens

Disease Spreads

- Next few weeks
- Cases crop up in The Bronx and Brooklyn
- CDC dispatches more officers
Encephalitis Hotline

- 130,000 calls
- Overwhelmed

Banner Headlines

- “Killer Bug”
- “Let Us Spray!”
- Pesticide campaign involves entire city
  - Case shows up in Manhattan

Callers Into Hotline

- Dead crows all over
- Connection?
Bronx Zoo

- Crows, flamingo, cormorant, pheasant, bald eagle: All dead
- Zoo’s veterinary pathologist, Tracey McNamara
  - Sends specimens to National Veterinary Services Laboratories (Iowa)
    - Lab isolates virus
    - Virus analyzed by CDC at Ft. Collins, CO

Door-To-Door

- October
- EIS collect blood samples from families in Queens
  - 3% had antibodies to WNV
- Estimate
  - At least 8,200 residents had the disease
    - Most asymptomatic

November, 1999

- NYC epidemic concluded
- 62 confirmed cases
  - Survivors
    - 1.5 years later: Needed assistance with chores of daily living
- 7 deaths
West Nile Virus Surveillance

- Displays number of cases by county or parish in each state, D.C. and the U.S. territories of the Virgin Islands and Puerto Rico.
- Maps include: human, bird, mosquito, sentinel, and veterinary
West Nile Virus Transmission

- **Infected Mosquitoes.** Most often, WNV is spread by the bite of an infected mosquito. Mosquitoes become infected when they feed on infected birds. Infected mosquitoes can then spread WNV to humans and other animals when they bite.

- **Transfusions, Transplants, and Mother-to-Child.** In a very small number of cases, WNV also has been spread through blood transfusions, organ transplants, breastfeeding and even during pregnancy from mother to baby.

Mosquito Species found to Carry WNV

Risk Factors

- Time spent outside
- Geographic region
- Time of year
- Age
- Immunocompromised
West Nile Virus – At Risk Groups

- People over 50 at higher risk to get severe illness.
- Being outside means you are at risk.
- Risk through medical procedures is very low.
  - All donated blood is checked for WNV before being used. The risk of getting WNV through blood transfusions and organ transplants is very small, and should not prevent people who need surgery from having it. If you have concerns, talk to your doctor.

Incubation Period

- For those with symptoms, they usually occur 3 to 14 days after a person is bitten

Symptoms

- In most cases, West Nile virus causes no illness or a mild self limiting febrile illness.
- In some cases, the virus can cause a mild illness called West Nile fever. The symptoms resemble flu and may include:
  - Fever
  - Headache
  - Body aches
  - Skin rash
  - Swollen glands
Symptoms of Serious Illness

• Headaches
• High fever
• Stiff neck
• Decreased mental abilities
• Reduced alertness
• Involuntary muscle movement (tremors or convulsions)
• Muscle weakness
• Paralysis
• Coma

Treatment

• There is no specific treatment for WNV infection.
• In cases with milder symptoms, people experience symptoms such as fever and aches that pass on their own, although even healthy people have become sick for several weeks.
• In more severe cases, people usually need to go to the hospital where they can receive supportive treatment including intravenous fluids, help with breathing and nursing care.
• No vaccine exists

Treatment

• Severe WNV illness usually requires hospitalization.
• Pregnant women and nursing mothers are encouraged to talk to their doctor if they develop symptoms that could be WNV.
Prevention

• Apply insect repellent with the ingredient DEET to your exposed skin before going outdoors.

• Spray your clothing with insect repellent.

• Wear shoes and long-sleeve shirts and pants while outdoors, whenever possible

• If possible, stay indoors between dusk and dawn.

• Avoid activities in areas where mosquitoes are active and plentiful, such as near standing water.

Prevention

• Fix or install window and door screens to keep mosquitoes out of buildings and homes.

• Drain standing water that may collect in items such as flowerpots, pet bowls, bird baths, swimming pool covers, clogged rain gutters, buckets or barrels.

• Report dead or dying birds to your state health department.

Home and Community Prevention

• Dispose of tin cans, plastic containers, ceramic pots or similar water holding containers that have accumulated on your property.

• Do not overlook containers that have become overgrown by aquatic vegetation.

• Pay special attention to discarded tires that may have accumulated on your property.
Home and Community Prevention

• Drill holes in the bottom of recycling containers that are left out of doors. Drainage holes that are located on the container sides collect enough water for mosquitoes to breed in.

• Turn over plastic wading pools when not in use. A wading pool becomes a mosquito producer if it is not used on a regular basis.

Home and Community Prevention

• Clean clogged roof gutters on an annual basis, particularly if the leaves from surrounding trees have a tendency to plug up the drains. Roof gutters are easily overlooked but can produce millions of mosquitoes each season.

Home and Community Prevention

• Turn over wheelbarrows and do not allow water to stagnate in birdbaths. Both provide breeding habitat for domestic mosquitoes.

• Aerate ornamental pools or stock them with fish. Water gardens are fashionable but become major mosquito producers if they are allowed to stagnate.
Home and Community Prevention

- Clean and chlorinate swimming pools that are not being used.

- A swimming pool that is left untended by a family that goes on vacation for a month can produce enough mosquitoes to result in neighborhood-wide complaints.

- Be aware that mosquitoes may even breed in the water that collects on swimming pool covers.