Guidelines for Surveillance, Prevention, and Control of West Nile Virus Infection -- United States

The introduction of West Nile (WN) virus in the northeastern United States during the summer and fall of 1999 raised the issue of preparedness of public health agencies to handle sporadic and outbreak-associated vectorborne diseases (1-3). In many local and state health departments, vectorborne disease capacity has diminished. Because it is unknown whether the virus can persist over the winter, whether it has already or will spread to new geographic locations, and the public health and animal health implications of this introduction, it is important to establish proactive laboratory-based surveillance and prevention and control programs to limit the impact of the virus in the United States. On November 8 and 9, 1999, CDC and the U.S. Department of Agriculture (USDA) cosponsored a meeting of experts representing a wide range of disciplines to review the outbreak and to provide input and guidance on the programs that should be developed to monitor WN virus activity and to prevent future outbreaks of disease. This report summarizes the guidelines established during this meeting.

Surveillance

Because of bird migration patterns, enhanced surveillance is a priority in those states already affected or having a potential for being affected, including areas from Massachusetts to Texas along the Atlantic and Gulf coasts*. Active surveillance activities should be implemented through the winter in southern states where mosquito activity continues throughout the year, or implemented early in the spring in northern states where mosquito activity ceased with the onset of cold weather. Surveillance activities that should be emphasized in the catchment area include the following:

1. Active bird surveillance to detect the presence of and to monitor WN virus activity in both wild and sentinel bird populations (4). In particular, surveillance for dead crows may be a sensitive means to detect the presence of WN virus in an area.

2. Active mosquito surveillance to detect and monitor WN virus activity in mosquito populations and to help identify potential vectors (4).

3. Enhanced passive veterinary surveillance by general alerts to veterinarians for reporting neurologic illness in animals, with emphasis on horses as a backup system to monitor the extent of WN virus transmission outside the bird-mosquito cycle.

4. Enhanced passive human surveillance by general alerts to health-care providers to report viral encephalitis and, if resources permit, aseptic meningitis in humans.

Laboratory Diagnosis
Diagnosis of WN or other virus infections requires specialized laboratory diagnostic tests (4). Surveillance activities require the availability of laboratories that can provide the following minimal laboratory diagnostic support:

1. **Serology.** Using CDC and USDA protocols and reagents, the IgM and IgG enzyme-linked immunosorbent assays (ELISAs) for WN virus should be established in all state public health and veterinary laboratories to provide initial testing for human and animal specimens (5). State health, veterinary, and reference laboratories with biosafety level 3 facilities should have the capability to conduct neutralization tests to identify specific flavivirus antibodies.

2. **Virus isolation and detection.** Regional state public health laboratories and reference laboratories with biosafety level 3 facilities should have virus isolation and identification capabilities. Selected other laboratories also should have reverse transcriptase polymerase chain reaction (RT-PCR) capability to detect viral RNA (5-7). Antigen-capture ELISAs to detect WN and other arboviruses in mosquito pools should be developed and made available to state and local laboratories. Regional state public health and reference laboratories should have the capability to use immunohistochemistry to detect virus in autopsy tissues.

**Prevention and Control**

Mosquito control is the most effective way to prevent transmission of WN and other arboviruses to humans and other animals, or to control an ongoing outbreak (4). Mosquito-control methods should include the following:

1. **Mosquito abatement districts.** The most effective and economical way to control mosquitoes is by larval source reduction through locally funded abatement programs that monitor mosquito populations and initiate control before disease transmission occurs. These programs also can be used as the first line emergency response for mosquito control if disease is detected in humans or domestic animals.

2. **Public outreach.** Public education about vectorborne diseases, particularly about modes of transmission and means of preventing or reducing risk for exposure, is a critical component of a prevention and control program.

**Public Health Infrastructure**

Effective surveillance, prevention, and control of vectorborne diseases, including WN virus, require designated resources in local and state health departments. Few state and local health departments have trained personnel or the resources to address adequately vectorborne diseases. At a minimum, each state health department should have functional arbovirus surveillance and response capability, including entomology and laboratory support. Geographic location and risk for WN transmission will determine the extent of a state's capability to handle arboviral diseases.

**Interjurisdictional Data Sharing**

WN fever is a zoonosis that affects numerous animal species, including humans. Effective surveillance and response will require coordination and data exchange between federal, state, and local agencies including departments of health, agriculture, and wildlife. A system of secure e-mail list servers and/or World-Wide Web sites will be necessary to facilitate the rapid and efficient exchange of data and other information between authorized users.
Research Priorities

Targets of applied research include understanding how and why the 1999 WN virus epidemic occurred, the public health and animal health implications of this introduction to the Western Hemisphere, and developing effective prevention strategies. High-priority research topics include defining current and future geographic distribution; bird migration as a mechanism of virus dispersal; vector relations and range; vertebrate host relations and range; virus persistence mechanisms; mosquito biology and behavior; mosquito control methods; mosquito surveillance methods; developing and evaluating disease prevention strategies; improving laboratory diagnostic tests; clinical spectrum of WN virus illness and long-term prognosis in humans; determining risk factors in enzootic areas; viral pathogenesis; genetic relations and the molecular basis of virulence; WN virus vaccine development for animals and humans; antiviral therapy for flaviviruses; and economic impact of the northeastern outbreak.

Reported by: Animal, Plant, and Health Inspection Svc, US Department of Agriculture. Div of Vector-Borne Infectious Diseases, National Center for Infectious Diseases, CDC.

Editorial Note:

The 1999 WN virus epidemic in the New York City (NYC) metropolitan area resulted in 61 human cases (55 confirmed and six probable), including seven deaths (1-3). Exotic zoo birds, American crows, and horses also were affected and had high death rates. In addition to NYC, epidemic/epizootic transmission was detected in surrounding New York counties. Emergency surveillance programs detected epizootic transmission in New Jersey and Connecticut but no cases in humans.

The surveillance and laboratory efforts required from NYC, surrounding counties, and adjacent states consumed considerable resources and demonstrated a need to enhance state and local health department programs to combat vectorborne infectious diseases. In December 1999, CDC announced the availability of fiscal year 2000 supplemental funds to support WN virus surveillance, prevention, and control projects. The 19 state and local health departments eligible to apply for these funds represent those areas where WN virus transmission already has occurred or where transmission would be more likely to occur based on bird migration patterns.

The focus of these cooperative agreements enables state and local health departments to increase surveillance activities and enhance laboratory capacity for detecting WN and other arboviruses. In the initial year, surveillance activities will be focused to determine whether WN virus survived the winter and, if so, to ascertain its geographic distribution along the Atlantic and Gulf coasts.

References


Disclaimer All MMWR HTML versions of articles are electronic conversions from ASCII text into HTML. This conversion may have resulted in character translation or format errors in the HTML version. Users should not rely on this HTML document, but are referred to the electronic PDF version and/or the original MMWR paper copy for the official text, figures, and tables. An original paper copy of this issue can be obtained from the Superintendent of Documents, U.S. Government Printing Office (GPO), Washington, DC 20402-9371; telephone: (202) 512-1800. Contact GPO for current prices.

Return To: MMWR MMWR Home Page CDC Home Page

**Questions or messages regarding errors in formatting should be addressed to mmwrq@cdc.gov.**

Page converted: 1/20/2000