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CDC's Public Health Response to West Nile Virus

Statement of

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Good morning, Mr. Chairman and Members of the Subcommittee. I am Dr. Stephen Ostroff, Deputy Director, National Center for Infectious Diseases, Centers for Disease Control and Prevention. I am pleased to be here to update you on West Nile virus (WNV) activity in 2004, CDC's public health response to WNV-related illnesses in the United States, and how we work directly with state and local public health officials to address this and other emerging infectious threats. I will also discuss the status of our WNV prevention programs. We thank the Congress for your continued support and recognition of the critical need for a strong and flexible public health system to deal with West Nile virus, and other emerging threats, including bioterrorism.

As a result of major public health efforts, the overall impact of mosquito-borne illnesses in the United States was significantly reduced in the middle of the last century, although mosquitoes that can transmit malaria, dengue, and yellow fever remain. Since then, Americans have not regarded mosquito-borne diseases as a major domestic threat. But the introduction and rapid spread of WNV has changed this. CDC has played an important leadership role in responding to this new threat, principally by rebuilding the nation's capacity to monitor and diagnose mosquito-borne viral diseases through state and local public health partners around the country. The more we strengthen our nation's front-line workers, whether in the field or in the laboratory, the better prepared we are to respond to new and emerging infections, such as WNV.

Emerging Infectious Disease Threats

The past decade has seen a significant number of emerging infectious disease problems in the United States. Some, such as *E. coli* O157:H7 and *Cyclospora*, are foodborne. Others, like hantavirus pulmonary syndrome, are transmitted from animals to people. Still others, like Lyme disease and ehrlichiosis, are vector-borne, while others, like vancomycin-resistant enterococci, result from the development of antimicrobial resistance in response to the misuse of antibiotics. Some emerging infectious diseases appear to be caused by new pathogens; others, in retrospect, have been here all along but were just not recognized. Some are clearly domestic in origin and others just as clearly have been introduced from abroad, illustrating the futility of thinking of infectious diseases in purely domestic or international terms. Just last year, we were reminded once again that infectious diseases know no borders. In February, CDC began assisting with the global outbreak of Severe Acute Respiratory Syndrome (SARS); then in May, CDC responded to an outbreak of monkeypox imported into the U.S. via African rodents.

CDC launched a major effort in 1994 to rebuild the component of the U.S. public health infrastructure that protects U.S. citizens against infectious diseases. In 1998, CDC issued *Preventing Emerging Infectious Diseases: A Strategy for the 21st Century*, which describes CDC's plan for combating today's emerging diseases and preventing those of tomorrow. It focuses on four goals, each of which has direct relevance to the detection of and response to WNV: 1) disease surveillance and outbreak response; 2)

applied research to develop diagnostic tests, drugs, vaccines, and surveillance and prevention tools; 3) public health infrastructure and training; and 4) disease prevention and control. The plan emphasizes the need to be prepared for the unexpected whether it is the next naturally occurring influenza pandemic or the deliberate release of anthrax organisms by a terrorist. This CDC plan is available on CDC's website at www.cdc.gov/ncidod/emergplan/index.htm, and copies have been provided previously to the Committee. The timing of this report is noteworthy, since WNV was recognized in New York City only one year later, highlighting many of the issues it addresses.

Despite the diversity of emerging infectious diseases, public health workers, in partnership with health care providers in the United States, must detect them and respond. This is particularly true at the state and local levels of the system. CDC and other Department of Health and Human Services agencies have worked to strengthen the infectious disease public health infrastructure through cooperative agreements with states to build epidemiologic and laboratory capacity and through the development of emerging infections programs, which are now in place in 10 locations around the country. These programs have significantly improved our ability to respond to infectious disease emergencies. Resources for bioterrorism preparedness and response have also substantially bolstered capacity at the state and local level.

West Nile Virus

WNV is a mosquito-borne flavivirus first recognized in the West Nile district of Uganda

in 1937. Since then, it has been seen in Europe, the Middle East, Africa, and as far east as India. The virus lives in a natural cycle involving birds and mosquitoes, and only incidentally is transmitted to humans and other mammals, often in outbreak situations. A closely related virus, St. Louis encephalitis (SLE) virus, acts similarly in North America. Most humans who become infected with WNV through the bite of an infected mosquito will develop a mild illness or will not become sick at all. However, in a small fraction (<1%), encephalitis (inflammation of the brain) or meningitis (infection of the membranes surrounding the brain and spinal cord) will develop; approximately 10% of these patients will die. Individuals aged 50 or older are recognized to be at higher risk than the rest of the population for the development of severe illness following WNV infection. It is likely that persons with compromised immune systems are also at higher risk.

The human and animal epidemic of WNV encephalitis which began in the northeastern United States in the summer and fall of 1999 underscored the ease with which emerging infectious pathogens can be introduced into new areas. The dramatic introduction and spread across the United States of a disease not previously seen in the Western Hemisphere reinforces the importance of rebuilding the public health system to prevent and respond to potential future introductions of other emerging infections.

WNV was first recognized in the United States in late August 1999 in New York City.

Eventually, 62 cases of human WNV- illness were identified that year. A randomly conducted household survey where residents were asked to provide blood specimens was conducted in the fall of 1999 in the New York City borough of Queens. The human infection rate was 2.6% - indicating that as many as 8,000 New York City residents had been infected with WNV. Subsequently, WNV-infected mosquitoes were trapped in New York City during the winter of 2000. This result suggested that WNV had established itself in the United States and was likely to expand its geographic range.

Laboratory studies of the virus demonstrated it was essentially identical to a WNV strain, which had been isolated from geese in Israel in 1998, and all viruses identified in New York were indistinguishable by molecular typing techniques, indicating the outbreak resulted from a single introduction. When and how that introduction occurred is uncertain, but based on the wide circulation of the virus in the New York City area by August 1999, the virus likely was introduced several months earlier with subsequent amplification in nature. Testing of a limited number of banked specimens from birds and humans have found no evidence of WNV in New York prior to 1999. Among the possibilities for how it was introduced are through an infected bird, through infected mosquitoes, or through an infected human. Continued genomic analysis of WN viral isolates since 1999 indicates that even though the virus has expanded throughout the United States, it has remained genetically stable. This information is important when designing vaccines, assays for diagnosis and possible therapeutic interventions.

In 2000, WNV was detected in 12 northeast and mid-Atlantic states. A total of 21 persons were found to be infected, 19 with severe illness and 2 with milder symptoms. In 2001, WNV transmission expanded into the south with an epicenter of activity in Florida and Georgia. In total, 359 counties in 27 states and Washington, DC, reported WNV activity, including 66 human illnesses, to ArboNET -- a web-based, real-time surveillance data network maintained by 57 state and local public health agencies and CDC.

The geographic range of WNV expanded greatly in 2002 and 2003, ending up at the front range of the Rocky Mountains. In 2002, 4,156 human WNV-infections were reported, and in 2003, 9,858 human WNV-infections were reported. The rapid spread and increased human activity of WNV in 2002 and 2003 were likely the result of permissive conditions for virus transmission and the fact that WNV reached the areas of the country that are historically at high risk for large outbreaks caused by other epidemic flaviviruses, such as St. Louis encephalitis.

In concert with the increased case counts, new routes of WNV-transmission were identified in 2002. These included WNV transmission through transfusion of contaminated blood products, breast feeding, and possible intrauterine infection of babies during pregnancy. The discovery of transfusion-associated transmission of WNV resulted in the initiation of nationwide screening of the blood supply since July

2003. Development and implementation of the blood screening processes resulted from a very successful collaboration between federal public health agencies, state public health officials, blood collection agencies, and private industry that implemented rapid assays for detection of WNV-contamination in blood specimens. More than 12 million blood donations are now screened for WNV each year. Since screening began, 1000 presumptively viremic donors have been reported to CDC. CDC continues to work with partner agencies and organizations to identify the best approaches to use in the future to ensure the safety of the blood supply. It is believed that at least 800 transfusion-associated human WNV-infections were averted in 2003 because of the blood screening protocols currently in place.

Current West Nile Virus Spread

This year, WNV infection has continued to expand geographically; it now covers all of the continental United States, with the greatest activity in highly populated areas of Arizona and southern California. As of October 1 2004, surveillance in humans, birds, mosquitoes, and horses has detected WNV activity in 47 states and Puerto Rico. Among the 1821 human patients for whom data are available, the median age was 51 years (range 1 month to 99 years); 58% were male. A total of 59 human deaths have been reported. Building on lessons learned from previous years, CDC activated our emergency operations center to assist the states in improving their outreach and communication campaigns. In addition, we have provided education to health care workers, utilized the Health Alert Network (HAN) and the *Epidemic Information*

Exchange (*Epi-X*) systems to disseminate information to clinicians and public health officials, and held press telebriefings, all critical activities both for this disease outbreak and for strengthening our future response capabilities.

Public Health Response

As WNV continues to spread geographically, the federal and state public health response continues to evolve. CDC has been the lead federal agency to respond to the WNV outbreak in humans. Much progress has been made in monitoring and managing the epidemic over the last few years. Since fiscal year 2000, DHHS and CDC have provided more than $100 million to state or local health departments to develop or enhance epidemiologic and laboratory capacity for WNV and other mosquito-borne diseases. In fiscal year 2004, approximately $23.6 million was awarded to those public health agencies to address the continued spread of the virus.

CDC has provided extramural funding to other federal agencies for related WNV surveillance and diagnostic activities in support of the states. In addition, CDC funds university-based research grants to support studies on WNV distribution, pathogenesis, clinical outcome, and variability. CDC continues to fund cooperative agreements with four universities to provide trained entomologists, biologists, and other vector-borne specialists for the WNV public health response. Finally, CDC has undertaken an aggressive intramural research program in several scientific areas to address the long-term needs related to epidemic WNV.

In collaboration with our partners, CDC has developed public and professional health education strategies to confront the WNV problem. The “Fight the Bite!” campaign recommends prevention measures for individuals to reduce their risk of exposure to WNV by: 1) eliminating any areas of standing water around the house, i.e., draining standing pools, cleaning gutters, and emptying bird baths; 2) minimizing outdoor activities at dawn, dusk, and in the early evening; 3) wearing long-sleeved shirts and pants when outdoors; and 4) applying insect repellent according to package directions to exposed skin and clothing.

This year CDC provided specific support for California and Arizona, the two states hardest hit with WNV epidemics. Over one million dollars in supplemental funds were distributed to Arizona and California. These funds support mosquito control activities in Arizona. In California these funds will help enhance WNV surveillance activities, supplement human and dead bird testing, and will support a WNV public health education campaign.

In preparation for the expansion of WNV activity to the western United States, 2 years ago CDC initiated activities that continue to support WNV prevention and control activities in California. CDC funds the California State Health Laboratory as a regional WNV testing center for the Western United States. This funding ensures that California develops and sustains state of the art testing technology and increases their

capacity for large scale WNV testing. CDC WNV funding also supports the Border Infectious Disease Surveillance Project, which strengthens laboratory infrastructure and capacity to perform WNV diagnostic testing in Mexico border laboratories. To complement this surveillance project, CDC funds a collaborative project between Imperial County and Baja California health authorities to develop mosquito-borne disease prevention strategies and educational tools appropriate for residents in the US-Mexico border regions.

In addition to the specific WNV prevention and control activities outlined above, the following are some additional national measures that CDC has implemented since the first WNV outbreak five years ago:

- developing and commercializing diagnostic tests for use at state laboratories to identify WNV in humans, and training every state laboratory in how to run them and how to diagnose infection;
- implementing Arbo-NET, an electronic surveillance system to track and monitor WNV and other mosquito-borne illnesses;
- convening a national meeting each year to provide public health workers, laboratorians, and local officials an opportunity to exchange the latest information about this disease;
- producing and revising consensus guidelines for the surveillance, prevention, and control of WNV;

- working with the Association of State and Territorial Health Officials to collaborate with state and local health departments in the development and distribution of consensus recommendations for sustainable mosquito control programs;
- performing registry studies of birth outcomes among women with WNV infections during pregnancy;
- evaluation of pesticide resistance in mosquito populations;
- developing educational materials for health care providers on the clinical aspects and diagnosis of WNV infection as well as public education materials;
- providing routine technical assistance during WNV season through bi-weekly conference calls for all state and local health departments to discuss the current status of WNV in each respective jurisdiction;
- collaborating with 4 states to evaluate health impacts and monitor pesticide levels in residents to determine whether mosquito-control spraying during the West Nile epidemic increases the amount of pesticides to which people are exposed;
- conducting a feasibility study to determine the impact of mosquito control in two cities in 2003; and
- collaborated with FDA to develop guidance on “Recommendations for the assessment of donor suitability and blood and blood product safety in cases of known or suspected West Nile virus infection”.

Conclusion

In conclusion, addressing the threat of emerging infectious diseases such as WNV depends on a flexible and responsive public health system and sustained and coordinated efforts of many individuals and organizations. As CDC carries out its plans to strengthen the nation's public health infrastructure, we will collaborate with state and local health departments, academic centers and other federal agencies, health care providers and health care networks, international organizations, and other partners. We have made substantial progress to date in enhancing the nation's capability to detect and respond to an infectious disease outbreak; however, the emergence of WNV in the United States has reminded us yet again that we must not become complacent. We must continue to strengthen the public health systems and improve linkages with health care providers and colleagues in veterinary medicine and public health. Priorities include strengthened public health laboratory capacity; increased surveillance and outbreak investigation capacity; education and training for clinical and public health professionals at the federal, state, and local levels; and communication of health information and prevention strategies to the public.

Thank you very much for your attention. I will be happy to answer any questions you may have.