

BACK TO BITE US: WEST NILE VIRUS

Her entire lifetime may average only a few weeks, but the female *Culex pipiens* mosquito makes the most of it. Feeding on the blood of humans and animals gives this common carrier of West Nile virus (WNV) the protein she needs to produce several hundred eggs every few days—eggs that evolve into biting adult mosquitoes seeking blood meals of their own. And with each bite, an infected mosquito may transmit WNV.

Compared to other states in the US, Oregon and Washington have largely been spared the bite of WNV. However, once the virus becomes established in an area, cases can skyrocket. Idaho, which had only 13 human cases during 2005, was swarmed by 996 cases during 2006. Last summer, WNV became established in most of Oregon, and we can expect a surge in cases this year. This issue of the *CD Summary* reviews the epidemiology, clinical

features, and prevention of WNV infection.

RESERVOIRS AND VECTORS

WNV is a mosquito-borne flavivirus.* Its principal host, or reservoir, is wild birds, primarily of the Corvid family, which include crows, jays, ravens and magpies. Infected birds develop a high, long-term viremia, sufficient to allow biting female mosquitoes to pick up the virus and spread it to other birds, to humans, and to other animals. Testing of dead birds has proved the best way of following the progress of the epizootic. In Oregon, dead bird samples are collected by local health departments and vector control districts and tested at the Oregon State Public Health Laboratory and the Oregon State Veterinary Diagnostics Laboratory. Instructions and forms to submit samples can be found on our website at <http://oregon.gov/DHS/ph/acdl/diseases/wnil/birdform.pdf>.

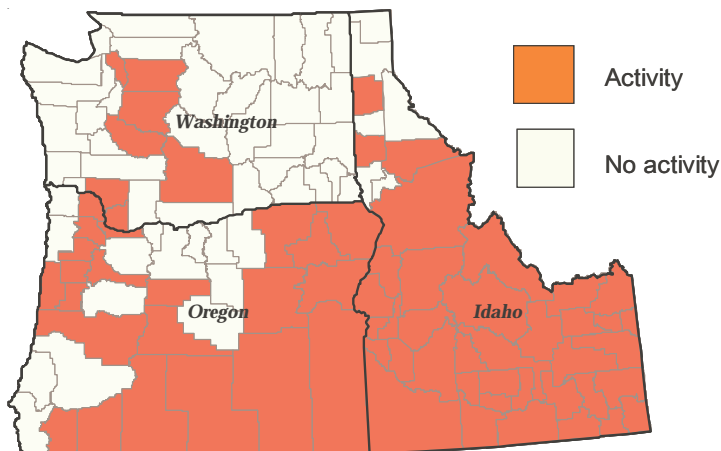
WNV has been detected in 62 of the approximately 175 mosquito species found in the United States. In 2006, *Culex* mosquitoes remain the primary vector target for prevention of WNV disease in the United States. In Oregon, the competent mosquito vectors of concern are *Cx. pipiens* and *Cx. tarsalis*. Other mosquito species, such as the aptly named *Aedes vexans*, may play a significant role in local transmission or amplification. Understanding the local mosquito ecology through ongoing trapping, counting and speciating is the *sine qua non* of predicting the risk of human infection and of controlling these vectors. In 13 counties, female mosquitoes are collected randomly in groups of 50 (a pool), identified and tested by the vector control districts either in-house or at Oregon State University.

MANIFEST DESTINY

WNV was first detected in the Western Hemisphere in 1999 during an outbreak of encephalitis in New York City. Over the next 6 years the virus spread across the continental United States, as well as into Canada, Latin America, and the Caribbean islands. Through 2006, 19,706 human cases of WNV have been reported in the U.S. Of these, 8,390 (43%) were neuroinvasive (encephalitis or meningitis), and 785 (4%) were fatal.

WNV was first sighted in Oregon—specifically, in a crow in Malheur County—in August 2004. Since then, 113 horses, 64 birds, 33 mosquito pools and 17 sentinel chickens have also tested positive for WNV infection. WNV

West Nile Virus Activity, by County, Pacific Northwest, 2006



*the family that includes, *inter alia*, St. Louis encephalitis, Japanese B encephalitis, yellow fever, and dengue viruses.



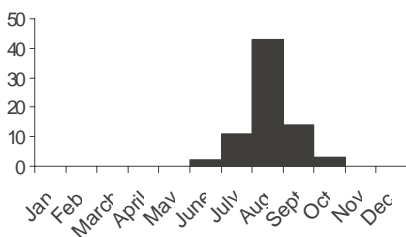
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has been confirmed in 24 of Oregon's 36 counties.

To date, 86 human WNV infections have been diagnosed in Oregon. Fifty-two cases (61%) were female, and 31 (36%) were ≥ 50 years of age. Ten (12%) had encephalitis, and two died. Sixty (72%) of the cases were reported from Malheur County. Seventy-three cases were diagnosed during 2006. August has been the peak month in Oregon; transmission seems to intensify through

Human WNV Cases, by Month, Oregon, 2006



the summer as more birds become infected and as mosquitoes become more active.

CLINICAL SPECTRUM

Approximately 80% of persons infected by WNV develop no symptoms at all. Of the 20% of cases that symptomatic, most experience a self-limited, non-specific dengue-like febrile illness with myalgias. Only about 1 in 150 infections leads to neuroinvasive disease, which is manifest as encephalitis, meningitis, or the

polio-like syndrome of acute flaccid paralysis. About 9% of neuroinvasive cases are fatal, and a substantial proportion suffers long-term disability. Risk factors for neuroinvasive disease include advancing age, diabetes, and alcohol abuse.¹

WNV infection is best diagnosed serologically, and testing is available commercially and at the Oregon State Public Health Laboratory. Find instructions and forms for collecting and submitting patient samples at <http://oregon.gov/DHS/ph/acd/diseases/wnile/clinform.pdf>.

No specific therapy is available for WNV infection; treatment is supportive. For patients with severe disease, this may involve hospitalization, intravenous fluids, seizure control, respiratory support, and prevention of secondary infections. Ribavirin in high doses and interferon alpha-2b have some activity against WNV *in vitro*, but no controlled studies have been completed on the use of these or other medications, including steroids, anti-seizure drugs, osmotic agents, or immune globulin with high titers of antibody in the management of WNV encephalitis.

PREVENTION

At this time, there is no WNV vaccine for humans.¹ The best prevention strategies are avoiding exposure to infected mosquitoes, reducing the abundance of mos-

quito vectors, and screening infected blood donations before transfusion.

Mosquito bites can be avoided by staying indoors when mosquitoes are biting; wearing long sleeves, socks, and long pants when outdoors; and using repellants with DEET,[†] picaridin or oil of lemon eucalyptus. For more information regarding prevention tips and brochures please visit our web site at www.oregon.gov/DHS/ph/acd/diseases/wnile/wnvprevent.shtml.

Reducing the population of mosquitoes is best done through "Integrated Pest Management" (IPM). IPM includes removing and preventing unnecessary standing water and repairing window and door screens. Larviciding, generally done with bacteria that are harmless to humans, eliminates mosquitoes before they can fly around. Adulticiding—eliminating adult mosquitoes with pesticides—may be called for if high infection rates are found in humans or in mosquitoes in proximity to human populations.

REFERENCES

- 1 Bode, A. V, Sejvar JJ, Pape WJ, Campbell GL, Marfin AA. West Nile Virus Disease: A Descriptive Study of 228 Patients Hospitalized in a 4-County Region of Colorado in 2003. *Clin Infect Dis* 2006; 42:1234–40.

[†]An equine vaccine is available, and it is strongly recommended, given the high case-fatality rate of WNV infection among horses.

[‡]*N,N*-diethyl-*m*-toluamide, now called *N,N*-diethyl-3-methylbenzamide.