

# WEST NILE STORY

ONE YEAR LATER

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**W**EST NILE VIRUS CONTINUED ITS SWEEP across North America in 2003, and the number of human cases increased faster than anyone would have predicted. Despite this, one groundbreaking study conducted on the virus in Oakville, Ont., suggests that many people still are not taking proper precautions to protect themselves.

The number of Canadians ill with West Nile in 2003 (1,317) was more than triple that recorded in 2002 (416), although the number of deaths was lower (10 deaths in 2003, compared to 20 deaths in 2002). The Prairie provinces were hit particularly hard last year, with 141 cases in Manitoba, 774 in Saskatchewan, and 272 in Alberta. A similar pattern was also seen in the United States, with the western plains states hit hardest. The five states with the highest number of human cases were: Colorado (2,477), Nebraska (1,831), South Dakota (1,013), Texas (598), and North Dakota (507). The total number of human cases in the United States in 2003 was 8,912, more than double the 4,156 cases reported in 2002.

West Nile virus has moved across North America in a wave from east to west, with regions at the leading edge of the wave being hit hardest each year. Once the wave has passed, the impact of the virus appears to decline. States that had high numbers of human cases in 2002 showed much lower numbers in 2003. For example, Illinois had the highest number of human cases in 2002 with 884, but last year reported 52 cases. Michigan had 614 cases in 2002, but only 16 cases in 2003. Ontario, which had 308 cases in 2002, reported 89 cases in 2003. In New York, where the virus has been present for five years now, the number of human cases has stayed relatively stable, ranging from 14 to 82 cases each year.

Whether this pattern will continue is not known. If it does, then states like California will be hit hardest in 2004, and those states with high human cases last year will show a marked decline in virus activity this year. British Columbia has yet to find infected birds or mosquitoes, so it may still be a year away from feeling the brunt of West Nile.

Why the virus hits so hard when it first arrives is not known. A number of theories have been put forward but no one knows for sure if this pattern will continue. The high number of cases in the west has been attributed in part to a more efficient vector of the virus. *Culex tarsalis* has been found in the lab to be a very effective vector of West Nile, and it has a greater propensity to bite humans than other mosquitoes that carry the virus. Hot weather in the west may also have helped increase mosquito numbers last summer.

Another theory suggests that as local bird populations become exposed to the virus, they develop immunity and thereby slow the growth of the virus in the bird population, reducing the risk of spillover into the human and horse population. This may explain



Above: A map showing the movement of West Nile Virus reveals a continued western advance in North America. The spread of West Nile Virus reached new territory in 2003, including Alberta, Nevada, Utah and Arizona. Since its inception in North America, WNV has spread outward each year, with the brunt of its force being felt on the virus' advancing western fringe.

why the first year of exposure to the virus is the worst year, but then numbers of cases decline in subsequent years. It is more likely that a combination of factors are responsible for this pattern, and it may be some time before we fully understand the dynamics of West Nile in North America.

In 2002, several new and unusual modes of transmission were documented for West Nile virus. The most serious was the revelation that the virus could be acquired through blood transfusions and organ transplants. In the United States, an estimated 23 people became infected after receiving blood products contaminated with the virus. Blood collection agencies in both Canada and the United States scrambled to find a test that could detect the virus in donated blood. Their efforts were successful, and several testing methods were ready when mosquito season returned in the next year.

From late June to mid-September of last year, 2.5 million blood donations in the United States were tested. Of these donations, 691 donations eventually were confirmed to be contaminated with the virus. Of the 226,000 blood donations made in Canada, 14 tested positive for West Nile virus. Although all blood is now tested, the procedures used are still considered experimental and it is not yet known how often the tests may fail to detect the virus. In the United States, for example, there were two cases of transfusion-related WNV infections reported in 2003. Because of the high rate of infections in Saskatchewan last summer, and knowing the sensitivity of the new testing procedures remained unknown, Canadian Blood Services took the precautionary measure of recalling all blood donated in the province during August and destroying it.

Although the numbers of people suffering severe infections of West Nile virus are low compared to other more common medical conditions, a recent survey in the United States has found that the disease still represents a significant impact on the health care system. The Centers for Disease Control and Prevention (CDC) found that it cost at least \$200 million (US) to treat the 4,156 people suffering from West Nile encephalitis or meningitis in 2002. On average, it cost \$51,826 (US) to treat each patient. Costs varied according to the severity of infection, ranging from \$2,000 per patient (medical examination and testing without hospitalization) to as much as \$250,000 (US). The most severely affected patients spent weeks in coma, had difficulty breathing, and relied heavily on long-term supportive care.

There are some bright spots on the horizon. Researchers at the National Institute of Allergy and Infectious Diseases (NIAID) in the United States have created a West Nile virus vaccine that protects monkeys from infection. Human clinical trials of the vaccine are expected to begin soon. The new vaccine was made by combining parts of the West Nile virus and a distantly related virus, creating a hybrid virus vaccine. NIAID has also begun trials of an experimental treatment for patients infected with the virus. Currently,





## THE OAKVILLE STUDY

TORONTO  
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In the spring of 2003, a survey was done in southern Ontario's Oakville area to determine the number of people living in the region who were infected with West Nile virus. This area was selected because it had the highest incidence of serious human cases in 2002. There were six cases of encephalitis (all hospitalized), five cases of meningitis (one hospitalized) and eight cases of West Nile fever (one hospitalized), in a population of 30,467 people (18 years and over).

The purpose of the survey was to select a sample of the human population and determine what proportion had been exposed to the virus last year. To do this, researchers selected random households in two postal code areas (L6L and L6K) and contacted each by telephone. One individual was selected from the household and a blood sample was collected. The sample was then tested for West Nile virus antibodies to determine if the individual had been exposed to the virus. Of the 1,505 people who participated in the survey, 46 (3.1%) tested positive for West Nile antibodies. These people had been bitten by an infected mosquito, but were unaware that they had been exposed to the virus. If this number is extrapolated to the entire population for the area, it is estimated that 670 to 1,219 residents of the area were likely exposed to the virus in 2002. The proportion of the population in Oakville exposed to the virus is comparable to that found in a similar survey undertaken in New York City in 1999, when the first outbreak of West Nile virus took place, but lower than another survey in Cuyahoga County in Ohio, where an estimated 4.0% to 6.4% of the population was found to have West Nile virus antibodies.

Although the proportion of the population exposed to the virus was similar between Oakville and New York City, the risk of severe illness was higher in Oakville. Based on work done in New York during the initial outbreak of West Nile, it has generally been reported that the risk of a severe infection was one of 150 infections. That is, for every 150 people infected with the virus, there will be one severe infection requiring medical treatment and hospitalization. In the Oakville study, the risk of severe infection was one in 84, almost double the earlier estimate. Unfortunately, the Oakville survey also found that although most people were aware of the risks of contracting West Nile virus, half the respondents did nothing to prevent mosquito bites.

It may be some time before we fully understand the dynamics of West Nile in North America.

patients can only be offered supportive care, as there is no treatment for the infection. In this study, patients will be given antibodies to the virus to determine if they will be better able to fight off the virus and prevent the severe health problems that can result.

Impacts of West Nile virus on wildlife are still being assessed. We know that corvids (crows, magpies, blue jays) have been impacted severely by the virus, but impacts on other bird species are not yet known. Concerns have been raised about shrikes, raptors and grouse, but more information is needed before we will know if these species are also at risk from West Nile virus. There is also some indication that people who work with birds may have an increased risk of infection. A report from Wisconsin found that workers in a turkey-rearing facility had a much higher incidence of the virus than the general population living in the same area. Turkeys in the production facility had a very high rate of West Nile infection.

In a related situation in Prairie Canada, several waterfowl banders also became infected with the virus last fall. Exactly how these workers became infected is not clear, but laboratory studies have found that birds that appear healthy can shed the virus in their saliva and feces. Further work is needed to determine if handling infected birds poses an increased risk of exposure to the virus.

Finally, concerns regarding widespread mosquito control and drainage of wetlands to combat West Nile have eased somewhat in the last year. Control efforts remain focused on *Culex* mosquitoes, which prefer small aquatic and container-type habitats and are not produced in large numbers by natural wetlands. In addition, Ducks Unlimited Canada's efforts have also helped to reduce degradation of wetlands by educating the general public to the many positive values provided by healthy wetland habitats. ✎