

## EXECUTIVE SUMMARY

WNV is a mosquito-borne infection that first made its appearance in North America in 1999. It is a human, horse and bird neuropathogen that can result in encephalitis, meningitis and sometimes lead to death.

Surveillance information from birds and mosquitoes provides an early warning of risk to human health and helps to guide control and education interventions. In the Region of Peel, WNV was first detected in birds and mosquitoes in 2001, with cases of locally acquired human illness occurring for the first time in 2002.

In 2002, Peel Health conducted surveillance activities in the Region involving dead birds, adult mosquitoes, larval mosquitoes and human cases. An analysis of 2002 surveillance data informed the development of the West Nile Virus Prevention & Control Plan 2003.

### Dead Bird Surveillance

By the end of the 2002 mosquito season, over 1,400 dead crows had been sighted and reported to Peel Health. Twenty out of the 71 crows that were submitted for testing were found to be positive for WNV.

The first WNV-positive bird in Ontario in 2002 was found in Mississauga on May 19<sup>th</sup>. However, it was a sharp rise in dead crow sightings starting in late July and a number of WNV-positive mosquito pools that led to the public being notified of a possible increased risk of human illness.

### Adult Mosquito Surveillance

Although 41 species of mosquitoes were found in the Region of Peel in 2002, only a small number were found to be important in the transmission of WNV from mosquitoes to humans. While eight separate species of mosquito were found to be positive for WNV, mosquitoes from the genus *Culex* were the most important, accounting for 30% of the mosquitoes collected and tested and 77% of the WNV-positive pools. *Culex* mosquitoes also exhibited some of the highest WNV infection rates in Peel.

In particular, *Culex pipiens* and *Culex restuans* were key “amplification” species, because they prefer to feed on birds, the main reservoir of WNV, and are effective transmitters of the virus. They are more common in urban and suburban settings and primarily use standing or slow-moving water in which to lay their eggs. They breed quickly, producing as many as four generations such that their numbers greatly increase over the course of the mosquito season.



Very few *Culex* mosquitoes were trapped in the Caledon area compared to Mississauga or Brampton. No WNV-positive pools of mosquitoes were found in Caledon in 2002.

While other species of mosquitoes are more likely to bite people, control of *Culex* mosquitoes is one of the most important strategies to reduce the risk of WNV transmission to humans.

### **Mosquito Breeding Site (Larval) Surveillance**

Larval surveillance provides crucial information for mosquito control interventions. In 2002, a total of 278 sites were surveyed for standing water in Peel: 152 were in Mississauga, 106 in Brampton and 20 in Caledon. The presence of mosquito larvae was identified in 42% of the potential breeding sites from which samples were taken. Ditches and culverts were some of the more numerous breeding sites and often contained mosquito larvae.

### **Human Case Surveillance**

Mosquito-borne acquisition in Canada of WNV disease in humans occurred for the first time in 2002. As of May 28, 2003, 112 residents of Peel had laboratory evidence of WNV infection stemming from the 2002 season: 37 confirmed cases, 20 probable cases, and 55 suspect cases. Of the 57 confirmed and probable cases, 91% were from Mississauga and 9% from Brampton.

As found in other jurisdictions, and contrary to initial expectations, cases of WNV were not limited to older adults or the infirmed, as many of those affected in Peel (32%) were less than 50 years of age. Few confirmed or probable cases of WNV occurred among the very young, while most occurred among the 50-59 and 60-69 year age groups. The rate of diagnoses of WNV disease increased with increasing age.

While most of those infected did not suffer very severe disease, there were two deaths, seven cases of encephalitis and five cases of meningitis among the 57 WNV confirmed or probable cases in Peel. Fairly high proportions of symptoms such as muscle weakness (53%) and changes in mental status (37%) were also observed.

Identification of WNV in humans underscores the importance of active, hospital-based human surveillance programs starting in July through to September, as well as the need to consider WNV as a possible diagnosis when clinicians encounter patients with encephalitis, meningitis, acute flaccid paralysis or non-specific fevers occurring throughout this time period.



## CONCLUSION

In Peel in 2002, the first indication of WNV activity was a WNV-infected dead bird found in Mississauga on May 19<sup>th</sup>. The first human illness onset of August 4<sup>th</sup> occurred during a spike in reported sightings of dead crows that started July 21<sup>st</sup> and continued until August 10<sup>th</sup>. The first WNV-positive pool for adult mosquitoes was from a sample collected on June 20<sup>th</sup>.

Analysis of the Region of Peel's complete surveillance results shows that these monitoring systems have the potential to predict human risk from WNV in the future. Detailed analysis of information on Peel mosquitoes shows that *Culex* mosquitoes play a key role in local transmission of WNV as reported for other similar areas in the North American literature. In Peel, *Culex* mosquitoes were numerous and had high rates of transmission. It is appropriate that the Peel WNV Prevention and Control Plan focus control efforts on *Culex* mosquitoes.



## INTRODUCTION

West Nile Virus (WNV) is a mosquito-borne “flavivirus” that first made its appearance in North America in 1999. It is a human, horse and bird neuropathogen<sup>1</sup> that can result in encephalitis, meningitis and even death.

“West Nile” Virus is so named because it was first isolated and identified in an infected person from the West Nile Province of Uganda in 1937.<sup>2</sup> There have since been reported outbreaks of WNV in Africa, Asia, the Middle East and Europe. There was no known transmission of WNV in the Western Hemisphere until reports of humans with the mosquito-acquired infection occurred in New York City in 1999.

There are several theories as to how the virus arrived in North America. One theory suggests that the virus arrived in an infected migratory or imported bird; another suggests that mosquitoes infected with the virus were accidentally transported to North America with other cargo.<sup>3</sup>

WNV was detected for the first time in Canada in 2001 in birds and mosquitoes from Ontario, including Peel. In 2002, Canadian health authorities documented WNV activity in five provinces: Nova Scotia, Quebec, Ontario, Manitoba and Saskatchewan.<sup>3</sup> Meanwhile, the 2002 WNV epidemic in the United States saw activity reported in 44 states and the District of Columbia. The first cases in California, in a human with no travel history, and Washington, in a horse, meant that the sweep of the epidemic across the North American continent was complete in just three years.<sup>4</sup>

WNV is similar to St. Louis Encephalitis (SLE), a very closely related mosquito-borne virus native to North America. An epidemic of SLE which occurred in the Mississippi and Ohio River basins in 1975 saw 2,100 human cases and 170 deaths with a case fatality ratio of 8%.<sup>4</sup> There were 66 cases associated with this outbreak in southwestern Ontario.<sup>5</sup> WNV & SLE are transmitted primarily by the *Culex* species of mosquitoes and are amplified in birds, although SLE does not kill birds or horses.<sup>4</sup>

WNV is also similar to Japanese Encephalitis Virus (JEV), which occurs widely in eastern and southern Asia.<sup>2</sup> People who have been vaccinated against JEV or Yellow Fever can have equivocal test results for WNV. Equivocal results can also occur from infection with other flaviviruses such as SLE and Dengue.<sup>6</sup>

### ***The WNV Transmission Cycle***

Evidence suggests that WNV can remain in an area over the winter months in infected birds and/or mosquitoes,<sup>7</sup> or in unhatched mosquito eggs.<sup>3</sup> A relatively small number of infected mosquitoes and/or birds would therefore be present within the region in early spring. This is when the virus begins to amplify. As certain types of female mosquitoes (*Culex pipiens* and *restuans*) feed on birds to get their blood meal in order to breed, the



virus is transmitted back and forth between the “vector” (the mosquito) and the reservoir “host” population (the bird), causing an increasing number of both birds and mosquitoes to become infected.

Towards mid-to-late summer, certain other mosquito species, such as *Aedes vexans* and *Coquillettidia perturbans*, that feed on both birds and mammals become important in the transmission of WNV to people. By this time, there has been significant amplification of the virus among the bird population. These “bridge vector” mosquitoes that have fed on a WNV-infected bird become infected with WNV. People are infected when they are subsequently bitten by infected mosquitoes. Hence, the period of greatest risk to humans and other mammals is in late summer or early fall when the level of WNV in birds and mosquitoes is at its highest.<sup>2</sup>

This report describes findings from the WNV surveillance activities conducted in Peel Region in 2002 involving dead birds, adult mosquitoes, larval mosquitoes and human cases.

