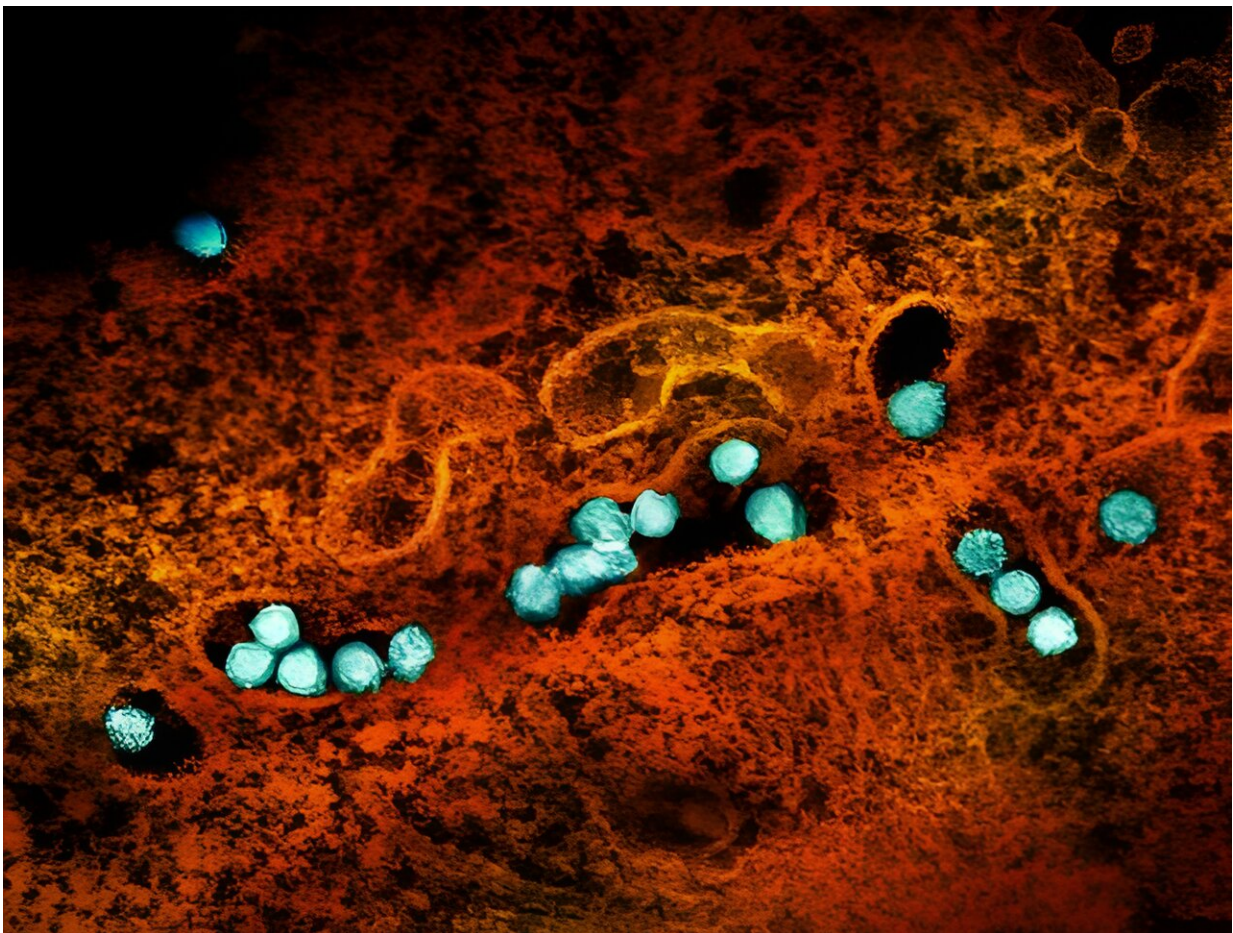


What Canadians need to know about West Nile virus, a mosquito-borne infection that can be life-threatening

September 18 2023, by Muhammad Morshed



Microscopic view of West Nile virus particles in a cell. Credit: NIAID, [CC BY](#)

During the late summer of 1999, New York City recorded an [unusual number of cases of encephalitis](#) (inflammation of the brain). At the same time, the [Bronx Zoo](#) reported a massive death of birds and mammals.

The human encephalitis cases might have been attributed to a flare-up of an endemic arbovirus ([a virus transmitted by a tick or mosquito bite](#)) such as [St. Louis encephalitis](#), but the concurrent bird and mammal deaths suggested the human illnesses warranted further investigation.

Scientists eventually identified these as the first confirmed cases of West Nile [virus](#) (WNV) in North America.

West Nile virus in North America

WNV was first reported in a woman with a fever in Uganda in 1937. An [outbreak in Israel in 1957](#) established WNV as a cause of [severe meningoencephalitis](#) (inflammation of the spinal cord and brain) in [elderly patients](#).

Several clusters or medium-range outbreaks were reported from Asia, Europe and Africa in the 20th century. Finally, the virus managed to cross the Atlantic and landed in North America in 1999.

In 1999, the [case number](#) was limited to 62 in New York City, and there was concern about a huge surge in 2000. Fortunately, the case number in 2000 was 21, which is exceedingly low, but it had spread to New Jersey and Connecticut. The case number remained in a similar low range (only 66 cases) in 2001.

However, the virus hit hard the following year. In 2002, the case number rose to over 4,000 in the United States. The same year, [Canada experienced its first cases](#) in Ontario.

The U.S. has reported a [cumulative total](#) of 56,569 cases and 2,773 deaths, while [Canada has reported 6,683 cases](#) and about 150 deaths (I'm told by the Centre for Food-borne, Environmental & Zoonotic Infectious Diseases, Public Health Agency of Canada), with the highest number of cases observed in the U.S. in 2003 and in Canada in 2007.

This virus spread across the entire continent very quickly, and covered most of North America by 2005. However, it took almost 10 years for the virus to [show up in British Columbia](#). In Canada, most of the cases were found in the Prairie region (Alberta, Saskatchewan and Manitoba). [In the U.S.](#), Midwestern states have been most affected.

West Nile virus is an RNA virus, a close cousin of [Dengue](#), [Yellow fever](#), St. Louis encephalitis and [Zika virus](#), to name a few. It belongs to the family Flaviviridae.

Symptoms and transmission

[Approximately 80 percent of people](#) exposed to WNV are asymptomatic. [The incubation period](#) in humans is about a week; however, this ranges from two to 15 days after the virus enters the body.

Among symptomatic individuals, all of them experience fever, and many also experience headaches, body aches, a mild rash and swollen lymph glands to varying degrees.

Although most cases go unnoticed, the virus still has deadly potential. [A small number of people](#) (around one percent) experience severe symptoms, including encephalitis. However, over the years, the [number of neurological cases has been increasing](#).

This virus is mostly [transmitted via mosquito bites](#); however, very rarely it could transmit via [blood transfusion](#), organ or tissue transplants, from

mother to unborn babies and through exposure to infected animals.

A number of birds, predominantly corvids such as crows, jays and magpies, act as reservoirs as well as [amplifying hosts](#). When an uninfected mosquito feeds on an infected bird and then bites a healthy human, the human becomes infected.

Humans are considered dead-end hosts, meaning that even if a mosquito feeds on an infected individual, that mosquito cannot transmit the virus to another individual [as can happen with the dengue virus](#).

Once people are severely infected with West Nile virus, they [acquire longer immunity](#). Older people are usually at high risk for severe infection due to underlying health conditions. People with diabetes and uncontrolled hypertension [have a greater risk](#) of developing severe neurological disease from the West Nile virus.

Diagnosis

Patients who become ill with a fever and severe headache within a few days of a [mosquito bite](#) should visit their family physician or any health-care facility.

Because WNV is closely related to other pathogens, diagnosis is often challenging. Patient signs and symptoms, history of mosquito bites and [laboratory tests](#) are all important when assessing patients for possible infection with West Nile virus.

The most common [laboratory test](#) is to detect antibodies against WNV in the blood. However, WNV antibodies cross-react with dengue, Zika or other flaviviruses, so if this test is positive, an additional test is required to confirm the diagnosis.

This additional test is called the Plaque Reduction Neutralization Test or PRNT for short. It requires a live virus, so it must be done in a containment level 3 (CL3) laboratory.

The laboratory can also diagnose viral RNA using molecular tests, but interestingly, the virus often disappears from the blood when people exhibit symptoms. For encephalitic patients, cerebrospinal fluid can be used to detect the virus using molecular methods such as a polymerase chain reaction (PCR) test.

Preventive measures

There is no human vaccine for the West Nile virus. The most important preventive measure to avoid West Nile virus infection is to avoid mosquito bites. This seems simple but is often very challenging.

People should use common sense during outdoor and indoor activities. Mosquito bites can be prevented by using bug spray, wearing protective clothing and avoiding areas that may have mosquitoes during the times when the species is most active, typically dusk and dawn.

A few species of mosquitoes can transmit WNV to humans. Among these, two of the most common species—the *Culex pipiens* and *Culex tarsalis*—are found across Canada, and their habitat is [predicted to expand with climate change](#). Mosquitoes not only transmit WNV, but also transmit [California serogroup viruses](#), which cause encephalitis, as well as [eastern equine encephalitis](#) viruses.

There is also no specific treatment for West Nile virus; medical management is supportive. Patients with [severe symptoms](#) often require pain control for headaches and medication and rehydration to treat nausea and vomiting.

So far in 2023, only a few human cases have been identified in Ontario. However, a few mosquito pools in Manitoba and Ontario also tested positive, and also a few WNV-positive birds were found in Saskatchewan, Manitoba, Ontario and Québec.

No matter how many cases we are seeing, everyone is advised to take precautions against mosquito bites to avoid these life-threatening diseases.

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