**What is West Nile Virus?**

West Nile Virus (WNV) is a mosquito-bourne virus that can cause disease and mortality in many species of birds and mammals, including humans. The virus propagates in nature through a primarily bird-mosquito-bird cycle of transmission. While birds comprise the primary "reservoir" host for the virus, mammals (including humans) are the incidental or "dead-end" hosts.

**Where did West Nile Virus Come From?**

West Nile Virus was first isolated in the West Nile province of Uganda in 1937. Although WNV is a well-documented cause of human disease in Africa, West Asia and Eastern Europe, it was not identified in the Western Hemisphere until the summer of 1999. The first known North American emergence of the virus was in New York City, NY, USA in the late summer and fall of 1999 when there were 61 confirmed human cases, 7 of which were fatal.[1] The method of importation of the West Nile Virus to the Western Hemisphere is unknown but popular belief is that it arrived through an infected bird (including migratory) or mosquitoes.

**How is West Nile Virus Transferred?**

West Nile Virus is transmitted from mosquitoes to people after the mosquito feeds on the blood of birds that carry the virus.

**Who is at Risk of Contracting West Nile Virus?**

In most infected persons, West Nile Virus causes asymptomatic illness or a "flu-like" illness with fever, headaches and sometimes a rash. In a minority of patients – usually the very young, elderly or immunocompromised – WNV infection causes severe illness manifesting as acute encephalitis (inflammation of the brain) or rarely, meningitis (inflammation of the lining of the brain and spinal cord).

**How is West Nile Virus Affecting Muskoka?**

In the late summer of 2001, West Nile Virus was verified in a number of birds and mosquito pools in Southern Ontario. For 2002, The Ontario Ministry of Health and Long-Term Care reported the following findings for the Muskoka-Parry Sound Region:

- 4 confirmed (positive) cases of WNV identified in Birds. The first positive bird was found July 17th, 2002 and the last positive bird was found September 6th, 2002.
- 1 confirmed case of WNV in a horse; found October 16th, 2002.
- 1 confirmed case of WNV in a human; found August 2002.

[1] West Nile Virus: Surveillance and Prevention in Ontario, 2001. Ontario MOHLTC

## Prevention

A variety of measures can be taken to prevent an outbreak of WNV:

- Public Education
- Surveillance
- Source Reduction
- Municipal Initiatives
- Property Owner Initiatives
- Biological Controls
- Chemical Controls

### Public Education

An essential reduction methods is to inform the public about West Nile Virus and the measures that can be taken to help prevent human illness, including mosquito breeding site reduction and personal protective measures.

The Muskoka-Parry Sound Health Unit is responsible for/offers a range of public awareness initiatives including, but not limited to, printed educational material, access to online information on the MPSHU website, and the timely delivery of press releases. Guidelines for residential source reduction and personal protective measures are included in this information.

### Surveillance

West Nile Surveillance enables the utilization of data on bird mortality and number/species/location of adult and larvae mosquito populations to serve as early detection of WNV activity in order to predict the risk of human illness.

Typically, infected birds can be found a month or more prior to human transmission while infected mosquitoes can usually be found several weeks before human transmission.

Surveillance of WNV is to be handled by the MPSHU. In 2002 the MPSHU implemented a 'dead bird' surveillance program, with development continuing as required in 2003.

### Source Reduction

Reducing the amount of standing water available for breeding can preventatively reduce Mosquito populations.

The following is a partial list of examples of source reduction actions, as outlined in the West Nile Virus: Surveillance and Prevention in Ontario, 2001 report issued by the Ontario Ministry of Health and Long Term Care.

**Municipal Initiatives**

- Use of Geographic Information System (GIS), Geographic Positioning System (GPS) or other mapping tools – available through the Ministry of Natural Resources – to determine permanent and temporary standing water sites that could be potential mosquito breeding areas. In some cases, improving drainage, filling in depressions or re-grading can eliminate these sites. Such changes to wetlands will require permission from the MNR and Conservation Authorities.

- Sponsored Tire Drives: Old tires lying in yards can be significant breeding sites for mosquitoes. Municipal initiatives to encourage citizens to bring in old tires for recycling could be beneficial.

- Monitor sewer lagoons or retention ponds to ensure that they are not breeding mosquitoes.

- Enact By-laws to require mosquito breeding site/source elimination or reduction.

- Construct and maintain ditches to improve drainage of water and contain run-offs.

**Property Owners' Initiatives**

- Reduce/remove standing/stagnant water in tire swings, birdbaths, small boats, wheelbarrows, etc…

- Keep swimming pools, spas and hot tubs chlorinated and tightly covered when not in use.

- Construct sumps so that water does not stand or screen to prevent mosquito entrance.

- Keep grass cut on a regular basis.

- Drain plastic covers on lawn furniture/outdoor equipment weekly.

- Ensure eaves thoughs and rain gutters are kept clean to allow proper drainage.

**Biological Controls**

Mosquitoes are affected by a host of natural enemies, including a wide variety of parasites, predators and pathogens. These natural controls help keep mosquito numbers down. However, natural predators can only be increased in specific situations to achieve additional levels of mosquito controls. The introduction or encouragement of natural mosquito predators such as fish (larvae eating), bats,
dragonflies and birds would most likely be ineffective as the mosquito population can explode after the spring snowmelt or heavy summer rain. There is also concern about non-native species that are introduced for mosquito control competing with indigenous species and creating an ecological imbalance.

## Chemical Controls

The following information on chemical controls for mosquito population control was released by Health Canada in May 2002.

*Larvacides:*

Larvacides are chemical agents that are used to destroy mosquito larvae and they are applied directly to standing water where larvae are developing. Generally the use of larvacide is preferred to adulticide (chemical used t destroy adult mosquitoes) because the more commonly used products nave minimal impact on human health, the environment and non-target species. They also destroy mosquitoes before they become blood-feeding females, which can disperse to other areas.

Larvacides can be used to control mosquitoes wherever larvae are present, but they are most effective when used early in the mosquito season (May to July).

*Adulticides:*

Adulticides are chemical agents that destroy adult mosquitoes. These products are usually applied to vegetation where mosquitoes rest, or are sprayed as fine droplets in the air to contact flying mosquitoes. Because adult mosquitoes can fly or disperse by wind, adulticides may need to be re-applied to maintain control of the mosquito population. As a result, this type pf control program is less effective than larvaciding or source reduction.

Adulticiding could be beneficial in areas where WNV activity is detected late in the season, if virus infected adult mosquitoes are active in a given area or if human causes of WNV are occurring.

However, the decision to use adulticides should only be seen as a last resort to prevent human infections and all other preventative measures should me used before and during any adulticiding campaign.

## Health and Environmental Risks Associated with the Use of Chemical Controls for the Purpose of Mosquito Control Programs

In Canada, pesticides are carefully regulated. Regulators at all levels of government work together to protect Canadians from risks posed by pesticides and ensure that pest control products do what they claim on the label.

Pesticides imported into, sold or used in Canada are regulated nationally under the Pest Control Products Act and are regulated by Health Canada's Pest Management Regulatory Agency (PMRA).

The PMRA has registered four chemicals for use in Mosquito Control Programs in Canada.

(Figure 1.1 & 1.2)

Figure 1.1

## PMRA List of Approved Chemical Agents for Mosquito Control Programs

| Chemical Name | Pesticide Type | Brief History | How it works | Health Concerns | Environmental Concerns | Relevant Points to Consider |
|---|---|---|---|---|---|---|
| **METHOPRENE** | Larvacide | First Registered for use in Canada in 1977.<br><br>Two products containing Methoprene registered for the control of mosquito larvae. | Granular or Pellet Form; applied directly to water.<br><br>Disrupts life cycle of mosquito, preventing maturity/reproduction. | Studies indicate that it is of low toxicity and poses little risk to people when used according to label instructions.<br><br>Has low acute oral/ dermal toxicity. | Shown to be non-toxic to ducks and practically non-toxic to fish.<br><br>Highly toxic to freshwater invertebrates, studies show that it has no lasting adverse effects on populations of invertebrates or other non-target aquatic organisms when used according to label instructions. | To be used in Peel Region in 2003. |
| **BACILLUS THURINGIENSIS SUBSPECIES ISRAELENSIS (Bti)** | Larvacide | Has been successfully been used worldwide as a biological pest control agent to combat mosquitoes and blackflies. | A bacterium found naturally in soils, it produces a protein crystal which is only toxic to mosquito and blackfly larvae.<br><br>Bti is applied directly to water where mosquito and blackfly larvae are found. The bacteria are suspended in the water where the larvae will ingest it; the larvae usually stops feeding within hours and dies within days. | Bti poses little threat to human health. There have been no documented cases involving toxicity or endocrine disruption potential to humans or other mammals over the many years of use in Canada. | Bti only becomes toxic in the stomach of mosquito and blackfly larvae. Because of this it does not affect other insects, honey bees, fish, birds or mammals. | To be used in Peel Region in 2003. |

# Figure 1.2
# PMRA List of Approved Chemical Agents for Mosquito Control Programs

| Chemical Name | Pesticide Type | Brief History | How it works | Health Concerns | Environmental Concerns | Relevant Points to Consider |
|---|---|---|---|---|---|---|
| **CHLORPYRIFOS** | Insecticide | Been Registered for use in Canada since 1970.<br><br>Registered for use in public health programs to control mosquitoes at the larval and adult stages.<br><br>A recent re-evaluation by PMRA resulted in a phase out of this insecticide around homes and residential areas; it is still an acceptable form of mosquito control as long as it is strictly monitored. | Controls the immature larval form of the mosquito which can be applied by ground equipment or applied aerially (as adulticide). | Not deemed toxic, but has been deemed a risk assessment. | Highly toxic to fish and crustaceans. | |
| **MALATHION** | Adulticide | Registered for use in Canada since 1953.<br><br>Registered for the use of control of mosquitoes at the larval and adult stages.<br><br>The preferred choice for ultra low volume aerial application to control adult mosquitoes.<br><br>Currently has the most safety information available. | An insecticide which kills insects at the larvae and adult stages. | No concerns for human health are currently stated. | EPA states that used in a mosquito control program it does not pose unreasonable risks to the wildlife or environment.<br><br>Degrades rapidly in the environment and soil and displays low toxicity to birds and mammals.<br><br>Highly toxic to insects, including honeybees. | To be used as a contingency plan for Peel Region in 2003.<br><br>Use supported by the US Environmental Protection Agency (EPA). |