

WEST NILE VIRUS PREPAREDNESS AND PREVENTION PLAN

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Public Health Division
Ministry of Health and Long-Term Care
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Preface

This following document is the West Nile Virus - Preparedness and Prevention Plan for Ontario, a technical reference document for Ontario's 36 health units to assist with the implementation of the Control of West Nile Virus Regulation – O.R. 199/03, made under the *Health Protection and Promotion Act*. It is referred to in this document as 'the Plan'. The material content in the 'Plan' incorporates the cumulative experience of public health with vector-borne diseases and their control across North America with relevance to Ontario's topography, climate, and vector species, with particular emphasis on our ongoing communication with the public health units of Ontario.

Risk Assessment

Under the Control of West Nile Virus Regulation, the local Medical Officer of Health (MOH) is required to conduct a risk assessment of the conditions pertaining to West Nile Virus (WNV) in the health unit. This risk assessment will identify the relative risk of human infection from WNV using surveillance information based upon mosquito information, equine infections, along with any human cases, and may include a number of other relevant information. Completion of the risk assessment in accordance with the Regulation will offer guidance to the appropriate WNV control activities for the MOH, and if needed, provides a review of appropriate vector (mosquito) control activities (i.e. larval/adult mosquito control measures) and their effective application. The Regulation requires the local municipality to which the risk assessment applies to undertake those measures necessary for vector and disease control when directed to do so by the MOH.

In addition, under the Control of West Nile Virus Regulation, the MOH is also required to maintain a means to record, investigate, and report any confirmed or likely adverse or unintended human health effects attributed to mosquito control actions, and to report any non-human environmental adverse effects that he/she knows about to the ministry of the Environment and/or other relevant local or provincial authorities.

Acknowledgements

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- Ontario Ministry of Health and Long-Term Care (ministry)
 - Communications and Information Branch
 - Laboratories Branch (CPHL)
- Ontario Ministry of the Environment (MOE)
 - Standards Development Branch, Pesticides Section
- Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA)
 - Veterinary Science Unit, Livestock Technology Branch
- Ontario Ministry of Natural Resources (MNR)
 - Forest Management Branch
- Ontario Realty Corporation (ORC)
- Ontario Ministry of Transportation (MTO)
- Canadian Blood Services (CBS)
- Health Canada
 - First Nations and Inuit Health Branch (FNIHB)
- Public Health Agency of Canada (PHAC -formerly Health Canada)
 - National Microbiology Laboratory (NML), (formerly Health Canada, National Microbiology Laboratory (NML))
 - Centre for Infectious Disease Prevention and Control
- Canadian Cooperative Wildlife Health Centre (CCWHC)
- University of Guelph
- Brock University

The Public Health Division is also appreciative of the ongoing advice from the federal-provincial *National Steering Committee for West Nile Virus*^{*} and its subcommittees on mosquito surveillance and control and on human surveillance chaired by the Public Health Agency of Canada (PHAC).

The ministry would also like to thank the 36 public health units of Ontario for their work over the past years and their input into the West Nile Virus Preparedness and Prevention Plan.

Editorial Note:

Commencing with the 2005 Plan, the Ministry of Health and Long-Term Care, when using the shortened three letter form of 'West Nile virus', will utilize 'WNV'. Previously, the common practice was to use "WNV" as the shortened format.

^{*} The *National Steering Committee for West Nile Virus* is the scientific body through which Canada's human case definition for WNV is reviewed and updated.

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Executive Summary

Public Health Preparedness and Prevention Plan - “The Plan” An Overview

The West Nile virus (WNV) Plan builds on the experience Ontario’s public health system has had with West Nile virus since 2000. The document incorporates new findings over the same period, and represents the Ontario field guide to the work. The Plan also is in conformity with the Municipal Mosquito Control Guidelines of Health Canada, Centre for Infectious Disease Prevention and Control. The Guidelines for Surveillance, Prevention and Control (3rd Revision – 2003) published by the Centers for Disease Control and Prevention (CDC), Atlanta, was also consulted for relevant information toward Ontario’s Plan.

The Plan is designed to provide the planning basis for a provincial approach to the preventing and controlling of WNV by the 36 Public health units. The health units provide the first line of public health protection in Ontario, along with our major ministerial partners in Ontario (MOE; MNR; ORC; OMAFRA and the MTO).

The implementation of the Plan is based upon the local health units undertaking a risk assessment within their jurisdiction, taking into consideration all relevant factors to inform decisions involving appropriate actions as required by the Control of West Nile Virus Regulation.

I. Introduction

Continuing the Work

At the February 2006 *National Meeting on West Nile Virus and Other Non-Enteric Zoonotic Diseases* held in Montréal, Dr. Robbin Lindsay, Chief, Field Studies, Public Health Agency of Canada, speaking to Long-Term Strategies for Mosquito-Borne Disease Prevention, noted in part:

“Localized “hotspots” for virus amplification and risk of human disease will likely be maintained within some/many jurisdictions. The disease burden will vary within jurisdictions from year to year, driven by abiotic and biotic factors, and will continue to be weighed against the costs of prevention strategies relative to competing public health priorities. Mosquito control is the most expensive component of the WNV program. Resources to support surveillance and to control activities is likely to diminish in the foreseeable future as disease incidence stabilizes and WNV becomes “normalized” in public and political arenas.

Managing WNV means to maintain regional appropriate surveillance and capacity to intervene—at least in areas of greatest risk—and to continue the analysis of regional data that look for correlates of predictors of human epidemics, and to commit to two planks of WNV prevention (personal protective measures [PPM] and Integrated Mosquito Management IMM).

Vital to all this is the sustainability of programs. Specifically, history has shown that support for mosquito management ebbs and flows, but the programs based on nuisance control seem to stand. To evaluate efficacy, cost assessment of WNV programs should be measured against cost to public health systems.

Undoubtedly, in the future, our prevention strategy will be more focused, with perhaps less mosquito management. Moreover, it will be necessary to shift responsibility to the general public and promote behaviour change.

Accordingly, we need to:

- maintain capacity for surveillance and control*
- continue commitment to current prevention strategies*
- evaluate and refine all aspects of prevention strategy*
- expend more energy on personal protective products and methods of improving compliance to personal protective strategies.”*

Background for West Nile Virus Illness

West Nile Virus (WNV) can cause morbidity and mortality in many species of birds and mammals, including humans. WNV is an arthropod-borne virus (arbovirus), and belongs to the family Flaviviridae. Within this family is the Japanese encephalitis serocomplex of viruses, which includes St. Louis encephalitis, Japanese encephalitis virus, Kunjin, eastern equine encephalitis and Murray Valley encephalitis.

Mosquitoes are the primary vectors of WNV, with species of the *Culex* genera being the main vectors of concern for Ontario. The WNV transmission cycle is primarily a “bird-mosquito-bird” cycle.

The urban cycle of the disease requires species of mosquitoes that feed on birds and people. These are known as “bridge vectors” and evidence is suggesting that the primarily vector species in Ontario are *Culex pipiens* and *Culex restuans*. While birds comprise the primary or reservoir hosts for the virus, mammals (including humans) function as incidental or dead-end hosts. WNV has been found in mammals such as horses, camels, cattle, mice, hamsters, dogs, bats, rabbits, squirrels and chipmunks.

WNV was named after the West Nile province of Uganda in which it was first isolated in 1937. Since then, it has been a well-documented cause of human disease in Africa, West Asia, and Eastern Europe. The first reported epidemics occurred in Israel during 1951-1954 and in 1957. European epidemics of WNV encephalitis have occurred in southern France in 1962, in south-eastern Romania in 1996, and in south-central Russia in 1999. The largest recorded WNV epidemic occurred in South Africa in 1974. A major epidemic, with considerable mortality, began in Israel in the latter part of 2000.

Prior to the summer of 1999, WNV had never been identified in the Western Hemisphere. The first known emergence of WNV in the Americas occurred in New York City in the late summer and fall of 1999, causing 61 confirmed human cases of encephalitis, seven (7) of which were fatal. The method of importation of WNV is unknown, but it may have arrived in an infected bird (including a migratory bird) or in mosquitoes. Genetically, the 1999 New York City strain of the virus most closely resembled a strain that was identified in Israel in 1998. Since its introduction into New York City in 1999, WNV activity has been found in Canada, the U.S.A, Mexico, the Caribbean and South America.

According to the latest CCWHC publication, the virus is now known to affect over 250 species of birds, 35 species of mammals and two species of reptiles over a large geographic area that, in Canada, spans from Nova Scotia to Alberta.

In 2001, WNV was confirmed for the first time in Ontario in birds. Since then, the virus has spread to other provinces across Canada. Ontario recorded no human cases prior to 2002. In 2002, the first human cases of WNV were reported in Canada in the province of Ontario.

Public Health Roles in Ontario

Health units

Health unit responsibilities with regard to infectious diseases are set out in the Ontario Public Health Standards (OPHS) and the *Health Protection and Promotion Act* (HPPA) and its Regulations.

For WNV control, health units are to carry out appropriate surveillance activities to permit risk assessments for WNV to be performed within their respective jurisdictions. Under the Control of West Nile Virus Regulation health units are required to take measures deemed necessary to prepare for and prevent, if possible, the contracting of WNV illness within their communities. Each health unit is to maintain a regular communication link with their public to ensure that current information on WNV within the health unit is widely shared.

As part of their surveillance work, health units are responsible for the collection and submission of mosquitoes to their mosquito service provider for laboratory analysis. The health units are to establish and maintain sample collection and disease investigation records. These results are required to be reported to the ministry to permit recording of the disease incidence in Ontario into various surveillance reports and maps for public health response coordination.

Due to the need for increased accountability for the funds spent on different programs, health units must provide an annual report. These reports will enable the ministry to evaluate the program and make improvements. These reports are due to the ministry by January 31st of the following year. The annual report shall include, but is not limited to the criteria listed in Appendix I.

As part of disease surveillance, health units investigate reported WNV-positive human cases, record their locations and exposures for analysis, and communicate relevant blood-donor or organ-donor information to the Canadian Blood Services and the Trillium Gift of Life Network. Further, the health units enter the results of their investigations of WNV cases into the integrated Public Health information System (iPHIS), or any other method specified by the ministry within one (1) business day of receipt of initial notification.

For those WNV Illness cases which may be travel-related, health units also coordinate an exchange of information with jurisdictions in which their patient may have traveled as part of the health unit investigation of the most likely location of exposure to WNV for the individual involved.

Ministry of Health and Long-Term Care

The ministry is a consultant to the health units for WNV preparedness, prevention and control. The ministry also supports the health units in their work through cost-sharing of

all WNV-related work through an up-loading formula established by the Minister annually.

The ministry cost-shares the mosquito testing services undertaken by the local Medical Officer of Health (MOH).

Further, the ministry will continue an ongoing provincial public communication and information program to maximize public knowledge of WNV Illness and its prevention, and will also support local communication work carried out by the health units. The ministry will also make the latest appropriate provincial data on WNV available on its public website.

In addition, the ministry will provide provincial data analysis based on information provided by the health units following their investigation of WNV case reports, together with the results of Ontario mosquito surveillance. The ministry maintains regular communication links with the Public Health Agency of Canada (PHAC) and with international contacts respecting WNV matters. The ministry also supports selected WNV prevention or control initiatives which may be proposed from time to time, and will share the information learned with the health units and PHAC if applicable.

Public Education, Risk Communication and Community Outreach

Communications Objectives

- Maintain high level of awareness of the threat of WNV and combat complacency in the face of perceived declining personal risk.
- Continue to build on social and behaviour change levels achieved in previous campaigns.
- Increase the number of people taking personal precautions on a regular basis to prevent mosquito bites and to eliminate mosquito breeding sites around the house.
- Increase awareness that WNV is also an urban threat.

Health Care Provider Outreach

Health care providers, especially those in acute care hospitals, must be informed about the human case definition for WNV Illness, which is a reportable disease in Ontario by Regulation. As in past years, the ministry will provide physicians, other health care workers and the public access to the latest information on the ministry website on human surveillance, clinical information and diagnostic testing. The ministry maintains liaison with the Ontario Medical Association in this outreach.

Many health units maintain a very close association with local hospitals as a routine component of their community disease surveillance.

Public Education Activities within Local Health unit Areas

Public

The public and other local community stakeholders will require information and updates about the surveillance activities and the risk assessment outcomes determined by the local Medical Officer of Health regarding vector control activities.

In terms of prevention measures, the general public education campaign message must be re-emphasized around personal protection against mosquito bites, including the application of approved insect repellent. Outdoor recreational, tourism groups and senior citizens' residences may be targeted for presentations and advice on personal protective measures. Parents, schools and day care centers need information on the use of DEET-containing or other registered repellents on children.

Public and stakeholder education is also needed at the local level to encourage "source reduction" to include eliminating major sites of standing water on private properties (residential or commercial) and on public properties (e.g., ditches, ponds, reservoirs, street catch basins, sewage treatment facilities, etc.). The importance of source reduction increases when vector larval development sites have been identified close to residential areas. Source reduction at the local and regional level may involve the municipal departments of Public Works or of Parks and Recreation as well as local conservation authorities, and, private property owners.

Furthering the public education message can also be accomplished with school children (both elementary level and high schools), adolescents and senior citizens' groups as well as other community-based organizations. All of these groups are beneficial resources that should be encouraged to undertake standing water surveillance/source reduction in local neighbourhoods. Increased awareness among the members of these groups will result in enhanced personal awareness. This may also result in local media coverage of activities which will further support health unit education or promotion activities.

Health units are encouraged to continue their active community development role in such WNV education work.

Planned Activities

- General public education messages reinforce protective clothing: wear shoes, socks, long pants, and a long-sleeved shirt when outdoors for long periods of time, or when mosquitoes are most active. Clothing should be light-colored and made of tightly woven materials that keep mosquitoes away from the skin. The use of mesh "bug jackets" or "bug hats" is recommended.

- If West Nile virus is found in a community, advisories will be issued to remind residents to:
 - Minimize unprotected time spent outdoors at all times, particularly between dusk and dawn when mosquitoes are most active.
 - Use mosquito netting when sleeping outdoors or in an unscreened structure and to protect small babies when outdoors.
 - Consider the use of mosquito repellents and use according to directions when it is necessary to be outdoors.

- With respect to personal property, general public education messaging should be reinforced to encourage the public to remove any type of standing or stagnant water. Emphasis will be to:
 - Clean up and empty containers of stagnant water such as old tires, flower pots, wheelbarrows, barrels or tin cans that are outdoors
 - Change water in bird baths at least once per week
 - Check swimming pools - remove water that collects on pool covers. Make sure the pool's pump is circulating
 - Turn over wading pools when not in use
 - Check and clear eaves troughs and drains: - Clear obstructions from eaves troughs and roof gutters throughout the summer
 - Make sure drainage ditches are not clogged
 - Check flat roofs frequently for standing water
 - Carry out regular yard and lawn maintenance: lawn cuttings, raked leaves or other decaying debris such as apples or berries that fall from trees should be collected and recycled or mulched so that organic matter does not end up in storm sewers as a food source for mosquito larvae
 - Turn over compost frequently. The compost pile is not off limits to mosquitoes
 - Fill in low depression areas in lawns
 - Trim dense shrubbery where mosquitoes like to rest

Local Source Reduction

Mosquito populations can be suppressed by reducing or eliminating their larval development habitats, a preventive strategy known as "source reduction". The major vectors of WNV in Ontario are the *Culex* species which tend to develop in natural or artificial "containers" of standing water. Other vectors of WNV, such as certain species of *Aedes* and *Ochlerotatus*, prefer to develop in temporary floodwaters or semi-permanent pools of water.

Municipal, local or regional authorities can engage in the following examples of source reduction activities:

- Conduct mapping of known or possible vector (mosquito) habitats. In addition to existing paper maps, mapping tools such as a geographic information system (GIS) with global positioning system (GPS) units are helpful. Should a municipal department (e.g. Public Works, Parks and Recreation, Roads or Transit) not have

GIS or GPS units, this service may be available through local conservation authorities, or the district offices of the MNR or from the regional offices of the Ministry of Municipal Affairs and Housing (MMAH).

- Monitoring mosquito larval populations ("larval dipping") in bodies of stagnant water or in ditches/depressions 24 to 36 hours after major rainfalls. Storm water management ponds located in urban settings must be maintained with grass cut low on the edges of ponds. Urban drainage ditches and ground depressions may be drained, filled in, or re-graded in order to prevent the accumulation of long-standing stagnant water or of periodic "rain pools".
- Wetlands must not be drained or altered in any way, unless there is an exceptional circumstance of significant human health risk from disease-vector mosquitoes. Consultation with, and permission from, the MNR and the appropriate conservation authority will be required.
- Store tires inside a garage or shed or other water-protected situation. Discarded tires left outside collect water after each rainfall and create perfect aquatic sites for female mosquitoes to lay their eggs. Tires that have a field function, such as being anchors for tarpaulins, should have several holes drilled in them to allow drainage.
- "Tire Drives" can be sponsored at the local level (i.e. encourage citizens to bring in discarded tires for recycling).
- Flush or vacuum storm drains and catch basins frequently and ensure that ditches drain properly to remove stagnant water. This should be coordinated with larval control programs.
- Monitor sewage treatment plants, sewage lagoons and retention ponds to ensure they are not developing vectors. Cut grass and remove vegetation around the banks of sewage lagoons.
- Every effort and initiative must be considered to eliminate vector (mosquito) development sites on public and private property. Initiate closer "personal service" contacts with community institutions (places of worship, homeowner associations, business groups, and community service clubs) or initiate door-to-door promotion of mosquito larval development source reduction to industrial, commercial, recreational and residential property owners.
- Adopt municipal "show-by-example" activities to encourage source reduction and promote these activities at shopping malls, schools, community centers, etc.
- Promote mosquito development source site reduction campaigns by inserting fact sheets in taxation or local flyers.
- Offer presentations or displays at retail garden outlets, seniors' centers, and gardening clubs in order to increase awareness among persons more susceptible to WNV illness (e.g. older adults).
- Consider enacting by-laws to require mosquito development site (source) elimination or reduction, particularly in urban areas.

II. Surveillance Indicators

Bird Surveillance

The year 2008 was the final year of the avian WNV surveillance program for the province of Ontario.

Bird submissions are dependent on the public to report dead birds to the health units. There has been a decrease in the number of dead birds submitted due to lack of interest from the public. Due to the decrease in dead bird submissions, the creation of a provincial mosquito vector surveillance database and the acquired knowledge about WNV in Ontario, the effectiveness of using dead bird surveillance data as an early indicator of risk has declined. The province will continue to use the mosquito vector surveillance database and other surveillance information to determine the human health risk of WNV in the province.

Human Surveillance

Objective

To detect and describe WNV illness in humans to help identify risk factors including areas of risk.

Background

Human Clinical Manifestations

The clinical manifestations of WNV illness and associated long-term conditions continue to be identified as scientific literature becomes available. Symptoms and complications can be found in the WNV human case definition. The most current case definition can be found in the Ontario Public Health Standards.

Planned Activities

The activities for human surveillance will be implemented throughout the healthcare system and involve practicing physicians, hospitals, public health laboratories, local Medical Officers of Health and the Public Health Division of the ministry. In addition, surveillance information is shared with Canadian Blood Services and the Trillium Gift of Life Network to ensure the safety of Canada's blood supply and organ donations.

Human surveillance is activated by the Ontario Public Health Laboratory (OPHL) reporting a positive WNV test result to the respective physician who then reports it to

the local MOH. Local health unit staff then interviews the individual testing positive for WNV or their physician. The health units enter the results of their investigations of WNV cases into the integrated Public Health information System (iPHIS), or any other method specified by the ministry within one (1) business day of receipt of initial notification.

Human surveillance is based on the use of the following information:

WNV Illness is based on the provincial surveillance case definition, “WNV Illness” can be considered to consist of two clinical pictures, “WNV Non-Neurological Syndrome” and “WNV Neurological Syndrome”. There is also a case definition for “WNV Asymptomatic Infection”. Data from the U.S.A. indicate that most WNV infections do not cause any disease. Approximately 20% of people infected develop a relatively mild illness (WNV Non-Neurological Syndrome), or as cited in public education literature, 4 out of 5 people who become infected with WNV do not show any symptoms.

Approximately 1 in 150 (0.7 %) of infections will result in severe neurological disease.

WNV Non-Neurological Syndrome (formerly known as “West Nile Fever”) is the milder form of WNV Illness. Clinical symptoms include a sudden onset of one or more of the following: fever, malaise, anorexia, nausea, vomiting, headache, eye pain, photophobia, arthralgia, myalgia, and maculopapular rash. The complete clinical spectrum may not yet be fully identified.

WNV Neurological Syndrome may include the symptoms of WNV Non-Neurological Syndrome. In addition to these symptoms, manifestations may include change in mental state, severe muscle weakness, acute flaccid paralysis, myelitis, seizures, polyradiculitis, and cranial nerve abnormalities including optic neuritis, ataxia and extrapyramidal signs.

Surveillance for West Nile Virus Illness (Case Definition)

Ontario’s WNV case definition is based on the Public Health Agency of Canada’s case definition, and is updated as needed from time to time to be consistent with the national case definition. Similarly, diagnostic test criteria are subject to change as new information becomes available.

WNV Case Recording on Ministry Website

The ministry will report human cases on the public website as reported by the health units.

Reportable Disease Requirements in Ontario

WNV Illness is both a *Reportable Disease* and a *Communicable Disease* under the *Health Protection and Promotion Act, Regulation 558/91 and 559/91*, respectively as of May 1, 2003.

Reporting responsibilities include:

Physician

Reports human WNV Suspect, Probable, and Confirmed cases, as per any reportable disease, to the local Medical Officer of Health

Local Medical Officer of Health

Reports information on human WNV Probable and Confirmed cases to the Infectious Diseases Branch (IDB) through iPHIS using the guidelines in the *Human Case Investigation Report for West Nile Virus*.

Note:

Health unit staff are asked to remind acute care hospitals in the Health unit area on a regular basis, at their discretion, from the end of June through the end of November to ensure ongoing reporting for WNV cases.

Modes of Transmission

The mode of transmission that accounts for the majority of human infections is mosquito transmission. Since 2002, several new modes of transmission were identified. These modes included human blood-borne transmission, vertical transmission via mother's milk and intra-uterine transmission, and transmission via occupational hazards in the case of laboratory employees and turkey ranch workers. Risk of transmission to hunters is also noted as a result of potential transmission from infected animal tissues. The CDC has reported the transmission of WNV to organ recipients from infected donors.

Blood-borne Transmission

Transmission of WNV via human blood and organs has been documented in several cases in the U.S.A. Initial and current reports are available in *Morbidity and Mortality Weekly Report (MMWR)* October 4, 2002/51(39): 879; February 7, 2007/56(4): 76.

Organ Transplant Transmission

In September 2005, West Nile virus (WNV) infection was confirmed in three of four New York State and Pennsylvania recipients of organs transplanted from a common donor. Two recipients subsequently had neuroinvasive disease, one recipient had asymptomatic WNV infection, and a fourth recipient apparently was not infected. This report summarizes the investigation. As a result, the CDC advises that clinicians should be aware of the potential for transplant-associated transmission of infectious disease. (Morbidity and Mortality Weekly Report (MMWR) October 5, 2005//54(Dispatch); (1- 3).

Vertical Transmission

Maternal Milk Transmission

Transmission of WNV from mother to infant via the mother's milk was considered the most likely source of an infant's infection in one case-report. The report is available from *MMWR October 4, 2002/51(39); 877-878.*

Intrauterine Transmission

Intrauterine transmission of WNV is documented in MMWR December 20, 2002/51(50); 1135-1136.

Occupational Hazards

Laboratory, Field and Clinical Workers

Initial reports of WNV infection in laboratory workers acquired through percutaneous injection while handling infected birds are available in MMWR December 20, 2002/51(50); 1133-1135. It is recommended that laboratory workers handling fluids or tissues known to be, or suspected to be, infected with WNV should minimize their risk for exposure. Laboratory workers should follow standard universal precautions and use good laboratory practices and techniques as outlined in their facility's policy for managing exposure to blood-borne pathogens when handling tissues or fluids known or suspected to be infected with WNV.

The Centres for Disease Control, National Institute for Occupational Safety and Health, posts their recommendations for protecting laboratory, field and clinical workers from WNV on their website at: www.cdc.gov/niosh/docs/2006-115

Turkey Ranch Workers

Given the report in respect of WNV infection being contracted through exposure to turkeys in the state of Wisconsin (MMWR October 24, 2003) it is prudent to ensure that such workers be given awareness training on modes of exposure to WNV. Included should be advice on the wearing of protective clothing and gloves, encouragement to frequently wash hands, and using DEET-containing or other registered repellents.

The training should also encourage them to report illness to their employer, particularly if it is compatible with the symptoms of WNV illness.

While the evidence to date is limited to turkeys, other poultry may present an occupational WNV risk to workers as well.

Hunters

As a result of the potential for transmission of WNV via infected animal tissues, the CDC in Atlanta, Georgia, has issued warnings to wild game hunters to take personal protective measures against being bitten by vectors, and to use prophylactic measures when handling animal carcasses. For information, hunters are directed to the website at: www.cdc.gov/ncidod/dvbid/westnile/q&a.htm

Special Protocols for Information Sharing between Health units and Associated Agencies

Protocols have been developed to report human WNV cases to the following agencies:

1. Health units to the Ontario Public Health Laboratory
2. Health units to the Canadian Blood Services (CBS)
3. Health units to Trillium Gift-of-Life for human organ donations

Health units should contact these agencies directly to obtain the most current reporting form.

Vector (Mosquito) Surveillance

Objective

To identify the local areas where the presence of WNV poses the most direct threat to humans through risk assessment, using surveillance data (particularly vectors) toward decision-making.

Background

Vectors are those mosquitoes that can transmit WNV from one organism to another. In Ontario, mosquitoes have been categorized into two types, bridge vectors and enzootic vectors. Enzootic vectors primarily feed on birds, and thus maintain the zoonotic cycle of viral transmission. Bridge vectors consist of mosquito species that feed on birds and mammals, and can transfer the virus to the human population. There is evidence that some species once believed to be enzootic vectors may also be bridge vectors, one such example is *Culex pipiens*. Although this species remains the primary enzootic vector, studies have shown that it will feed on mammals including humans. Within Ontario the majority of positive pools have been from *Cx. pipiens*, *Cx. restuans* and *Cx. pipiens/restuans*. Thus Ontario's main species of concern are *Cx. pipiens*, *Cx. restuans* and *Cx. pipiens/restuans*.

Extrinsic Incubation Period (EIP)

A WNV-infected mosquito does not indicate that the mosquito is necessarily a viable vector. If the virus is present in the mosquito's intestinal tract shortly after a blood meal, the mosquito may be infected but is unlikely to be able to transmit the virus. The virus must enter the mosquito's salivary glands through its system in order to transmit the virus. This *extrinsic incubation period* (EIP) is the time from ingestion of virus to the time it appears in the salivary glands. Therefore, if the mosquito's life span is less than the EIP, the infected mosquito cannot transmit the virus because it has not lived long enough for the virus to spread to the salivary glands. For most mosquitoes which carry the WNV this extrinsic incubation period is estimated from 10 to 12 days in ideal conditions and longer when conditions are less than ideal.

Ontario's Program

Ontario's program for vector surveillance is focused toward the prevention and the control of WNV and vector surveillance remains the mainstay for the prevention and control of WNV.

The purpose of vector (mosquito) surveillance is to help determine the immediate risk of contracting WNV in the Health unit. This data is used by the local Medical Officer of Health for risk assessments in the prevention and control of WNV illness.

The basic vector surveillance consists of adult mosquito trapping from spring to fall for:

1. the identification of trapped mosquitoes down to species level with suggested reference to the list of known WNV vectors in Appendix II
2. establishing the numbers of mosquitoes by species, and if requested by the MOH,
3. carrying out a Real Time Reverse Transcriptase Polymerase Chain Reaction (RT-PCR) test to determine the WNV status of three of the mosquito pools in the submitted sample. See Appendix III, IV

Analysis of mosquito surveillance data from across the province shows that more than 20 species/groups of mosquito species have tested positive for WNV. These species are now the focus of Ontario's viral testing. Surveillance data indicates that *Cx. pipiens*, *Cx. restuans*, *Cx. pipiens/restuans* are the main vectors of concern in Ontario. These species are again recommended to get prime attention for WNV viral testing.

Permanent and 'Flexible' Trap Locations

Trap locations may be permanent or 'flexible'. Permanent trap locations may be set by the health unit in the same community location year after year. "Flexible" locations may be added to determine the mosquito species and possible presence of WNV in new locations of interest. Having fixed and flexible trap locations gives the most useful representative coverage of the jurisdiction in most cases in Ontario. It also permits response to local concerns.

Secondary Vector (Mosquito) Surveillance for the virus of Eastern Equine Encephalitis (EEE)

Ontario has also initiated a secondary adult mosquito vector surveillance program focused upon *Culiseta melanura* which is the main enzootic vector of EEE. The surveillance for these vectors will be incorporated into the WNV surveillance programming across Ontario.

While Ontario has never had a human case of EEE, equine and emu incidences have occurred in recent years. EEE is regarded as an important mosquito-borne human disease because it continues to appear south of the Ontario border in the United States. The ministry will continue monitoring for the presence of the EEE vectors to determine the potential for human infection in Ontario.

This EEE program component will help the Medical Officers of Health in decision-making on control strategies, as well as building a historical entomological database around EEE should the disease manifest itself in the province.

It is recommended that the health units ask their mosquito testing service provider to test all *Cs. melanura* for EEE. Note: testing *Cs. melanura* for EEE will count as one of the three mosquito pools tested.

If a health unit experiences positive EEE activity in animals it may want to conduct temporary mosquito surveillance around the area. Health units can have their service provider conduct mosquito EEE viral testing on possible bridge vectors (as their budget permits): *Aedes vexans*, *Coquilleltidia perturbans*, *Culex salinarius*, *Ochlerotatus canadensis*, and *Och. sollicitans*. While all of these bridge vectors may be submitted for EEE testing, *Ae. vexans* and *Cq. perturbans* are some of the most abundant mosquito species found in Ontario, and a health unit may choose to focus on submitting these species for EEE testing. Surveillance around these incidences may only have to take place for a couple of weeks and should be based on scientific factors and local human risk in the surrounding area.

Selection of Mosquito Testing Service Providers

WNV mosquito species identification, enumeration, and viral testing, will be provided by qualified service providers as selected individually by the 36 health units. The mosquito testing service providers will be required to undergo a 'proficiency panel' verification test provided by the National Microbiology Laboratory (Winnipeg). Service providers are required to simultaneously report the mosquito surveillance data with the health unit and the ministry using the mosquito identification and viral testing templates provided by the ministry. This data will be provided to the ministry via the ministry's FTP site.

Under Section 271 (1) of the Municipal Act, 2001, health units are required to adopt certain business policies with respect to the provision of goods and services. Such policies have been required since January 1, 2005. Consequently, health units will be requested to affirm that they undertook an open and competitive process to select their mosquito testing service provider.

Vector (Mosquito) Consultancy for the Health units

The ministry provides entomological expertise through ministry staff resources directly to the health units as requested by the local Medical Officers of Health.

Ministry – WNV Vector Database

In 2006, the ministry established a provincial vector surveillance database which contains mosquito surveillance data. This data is uploaded to the ministry on a weekly basis from each of the mosquito testing service providers. The data includes trap locations, mosquito species abundance and distribution, as well as WNV-positive mosquito pools. The data is analyzed by ministry staff to produce weekly provincial WNV vector surveillance reports. This provides a comprehensive provincial picture of the WNV vectors. The weekly reports are issued by the ministry in confidence to the health units and the Partners to assist in assessing the human risk of WNV in Ontario.

The ministry will continue to provide weekly WNV vector surveillance reports.

Field Consultation and Training

Ministry staff will be available to provide field consultation to health units to review local mosquito surveillance programs.

Mosquito Traps to include 'Gravid' Trap Option

The mosquito traps utilized in Ontario are mainly CDC 'light' traps which use both CO₂ and light to attract host-seeking mosquitoes. In addition to the CDC traps, nine health units piloted the use of 'Gravid' traps in 2004. Gravid traps are designed to attract female mosquitoes that are looking for a site to lay their eggs. Gravid traps are frequently used to monitor for ovipositing *Culex pipiens*, *Culex restuans*, *Culex pipiens/restuans* and *Ochlerotatus japonicus* populations. Gravid trap set-up, transportation and operation are more resource-intensive than the use of the simpler CDC light traps and therefore may not be used as extensively.

Planned Activities

Vector (mosquito) surveillance will continue and include enumeration, identification and viral testing.

The ministry recommends that health units focus their mosquito WNV viral testing on *Cx. pipiens/restuans*, since they are the main vector of concern in Ontario. Information obtained will assist:

- health units with vector data for their risk assessment to support action decisions, including the decision to larvicide or adulticide (fogging) or to withhold immediate action;
 - in providing information about the risk to the public of acquiring WNV illness based on the presence of WNV within specific local areas.
 - health units in the initiation of timely control operations/intensify ongoing vector control operations to break the transmission and mitigate the risk to humans and other affected species.
 - health units in evaluating their control operations
- WNV mosquito enumeration, species identification and viral testing will be provided by qualified service providers as selected by each of the 36 health units. The mosquito testing service providers will be required to use the established WNV vector templates created by the ministry. The mosquito testing service providers are requested to provide ministry with weekly data during the WNV season. See attached listing of mosquito species to be reported upon if present in submitted samples Appendix II.
 - Health units are requested to have their mosquito testing service provider share the mosquito surveillance data concurrently with the ministry for monitoring and for posting on the ministry website.
 - Both CO₂-baited CDC light traps and Gravid traps may be used. This is the recommendation of the mosquito sub-group of the National Steering Committee for West Nile Virus chaired by the Public Health Agency of Canada.
 - The ministry will calculate the mosquito infection rates (IRs) and maintain a data sheet and records for reference by health units upon request.
 - The ministry will provide a weekly provincial WNV vector surveillance report to all of the health units.
 - The ministry website will record the WNV-positive mosquito pools as reported and confirmed by the mosquito testing service providers.

Equine (Horse) Surveillance

Objective

To monitor WNV in horses in Ontario to identify the geographic presence of WNV as an indicator of potential human exposure.

Background

Ontario equine WNV cases were first recorded in 2002. Since 2002, equine cases have occurred sporadically and in low numbers. With the introduction of an equine WNV vaccine, the utility of equine surveillance has been significantly reduced.

Equine Vaccine

An equine vaccination product is available from veterinary practitioners in North America. OMAFRA promotes the WNV vaccination of horses to veterinarians and the equine industry in Ontario. Equine practitioners can send serum or tissue samples to the Animal Health Laboratory in Guelph, or to other private veterinary diagnostic laboratories, for analysis. While there is no federal policy for action on equine WNV, laboratories must notify the Canadian Food Inspection Agency of any positive test result for equine WNV.

Planned Activities

Equine WNV cases will be reported to the ministry by OMAFRA. The Canadian Food Inspection Agency (CFIA) has made WNV in horses an immediately notifiable disease under its legislation, which requires diagnostic laboratories to report positive test results. There is no requirement to report results to OMAFRA, but informal agreements have been made with diagnostic laboratories to share this information. OMAFRA will place case data on their website for public reference and will also notify health units of positive cases in their respective jurisdictions.

OMAFRA's website will be linked from the ministry website to permit easy and timely access to the data without duplication. The OMAFRA website linkage is:

http://www.omafra.gov.on.ca/english/livestock/horses/facts/info_equv.htm

III. West Nile Virus Prevention and Control

Vector (Mosquito) Management

Objective

To control vector mosquito populations through the use of Integrated Pest Management techniques.

Background

Cx. pipiens/restuans are the primary vectors of WNV and are some of the most common mosquitoes found in urban areas. These mosquitoes breed quickly and use standing water containing decaying organic materials to lay their eggs. Common larval development sites include catch basins, discarded tires, poorly maintained bird baths, artificial containers, any refuse that allows standing water to puddle, clogged drain gutters, unused swimming and plastic wading pools, storm drains, pots and pans with standing water, standing pools of ground water and puddles that last for a week or more.

Planned Activities

Source Reduction Encouragement

- Targeting the elimination of larval development sites (referred to as Source Reduction) is the simplest and most effective larval control to reduce the number of vectors (mosquitoes). Emphasis should be placed on personal protective measures and the reduction of vector larval development sites on personal property. Local health units should emphasize elimination of larval development sites within their local communities at a resident level, including commercial sites, which are often significant sources of potential larval development.
- In addition, health units should inform local municipalities to appropriate larval control measures in municipally controlled bodies of water such as catch basins, ponds, sewage treatment plants, drainage systems, storm water management ponds, etc.

Direct Vector (Mosquito) Control Measures

- Vector control to manage larval populations for WNV or other vector-borne diseases requires larviciding involving the use of approved pesticides. Larvicides are usually dispensed in the form of pellets, granules or briquettes (ingots) that are dropped into pools or containers of stagnant water where vectors (mosquitoes) are developing. Larvicides can be biological or chemical products. Three products are currently

approved for larval vector control in Ontario: methoprene, *Bacillus thuringiensis israelensis* (Bti) and *Bacillus sphaericus* (*B. sphaericus*).

- Vector control to manage adult mosquito populations for WNV or other vector-borne diseases requires the use of an approved adulticide. Adulticides control the adult stage of mosquitoes or other flying insects. Adulticides are usually dispensed in the form of a liquid suspension in air using special equipment called ultra-low volume (ULV) application units. These units create a mist containing very small droplets of insecticide that are airborne for up to 30 minutes depending on weather conditions, killing any mosquitoes that are exposed to the droplets. Adulticides may be delivered by backpack sprayers, truck-mounted ULV equipment, or by aircraft. The only adulticide product currently approved for use in Ontario is malathion.
- For additional information on larvicides and adulticides, license and permit requirements and public notification, refer to the fact sheets and permit applicant guides posted on the MOE website at: www.ene.gov.on.ca and link to the West Nile Virus icon.
- The Pest Management Regulatory Agency (PMRA) also has several fact sheets posted on their website addressing larvicides and adulticides available at: www.hc-sc.gc.ca/cps-spc/pest/index-eng.php.

Decision-Making and Consultation

The decision to conduct larval vector (mosquito) control, including larviciding or adult vector (mosquito) control, including adulticiding in Ontario is established through the application of the provisions of *O. Reg. 199/03*. Seniors and immuno-compromised individuals are at relatively greater risk of serious illness, once infected with WNV, however, infection and serious illness have occurred in all age groups in Canada and the U.S.A.

The determination of where to apply control measures, particularly larvicide or adulticide, requires a local risk assessment. The assessment should weigh the level of risk to public health from the mosquito-borne virus based on the most current, available evidence of local WNV activity in the human population and in non-human species (WNV-positive mosquito pools, mosquito infection rates and reported equine infections). All of these factors, plus taking into account all other control measures available (e.g. mosquito larval development site source reduction) are to be considered in weighing the expected benefits and risks of pesticide use.

The local Medical Officer of Health is the appropriate official to make a decision after receiving the aforementioned information from health unit staff and other municipal or regional agencies and, if necessary, in consultation with provincial, federal or private sector authorities and experts.

The ministry's Vector-Borne Disease Unit of the Infectious Diseases Branch in the Public Health Division is available to the 36 health units to consult concerning any of these decisions.

General Decision-Making Factors: Larviciding and Adulticiding

A local risk assessment is the most critical prerequisite to decision-making regarding where and when to commence vector control. The assessment must be based on the most current and accurate data available. Consideration should include, but is not limited to the following:

- the local surveillance findings;
- the local vector distribution, vector density and species identification and mosquito infection rates of known or potential vector (mosquito) populations;
- evidence of WNV illness or mortality in the health unit jurisdiction, with consideration of the situation in adjacent jurisdictions;
- the trend in local human morbidity or mortality that indicates the relative urgency of the risk to human health;
- the demographic and geographic distribution of the human population at risk;
- the nature and location of the vector (mosquito) larval development site(s) to be treated, including the type of stagnant water, its proximity to human populations at risk and the ease of access for larvicide application;
- the time of season and local weather conditions (temperature, rainfall, winds);
- the relative effectiveness and safety of the pesticide product, as evaluated by federal authorities, and the regulatory requirements of provincial and federal authorities; and,
- community and stakeholders' attitudes towards the risks posed by the WNV versus the likely benefits and risks of larviciding or adulticiding in those locations identified by the risk assessment
- consideration of the calculated vector index

Registration and Regulation of Pesticide Use in Canada

Federal and provincial regulations regarding the use of larvicides or adulticides must be followed, as for any other registered pesticides in Canada.

For the provincial MOE regulations, refer to www.ene.gov.on.ca. For the federal authority, please contact the Pest Management Regulatory Agency via their Health Canada website at: www.hc-sc.gc.ca/cps-spc/pest/index-eng.php.

Larvicides

While there are several biological and chemical larvicides presently registered for use in Canada, the MOE is only authorizing three products under approved permit. The use of *Bti* (*Bacillus thuringiensis israelensis*) and *Bacillus sphaericus* (*B. sphaericus*) is approved for use in surface waters such as stagnant water in irrigation ditches, flood

ditches or pastures, marshes, woodland pools, standing ponds, or storm water retention and detention ponds. Methoprene and *B. sphaericus* are approved for use in catch basins and sewage and sludge lagoons for larval mosquito control to reduce the risk of WNV.

Bti and *B. sphaericus* are bacterial spores which are ingested by mosquito larva and release a crystallized toxin in the larva's stomach which causes damage to the larva's alkaline gut resulting in an inability to feed and subsequent death. Safety evaluation of *Bti* and *B. sphaericus* application for larval control have shown little or no risk to wildlife, non-target aquatic organisms or human health. The PMRA has approved *Bti* and *B. sphaericus* for full registration. *Bti* and *B. sphaericus* must be applied when mosquito larvae are present in various mosquito larval development sites as indicated on the product labels.

Methoprene is an insect growth regulator which mimics the natural juvenile growth hormone in insect larvae. Methoprene does not kill mosquitoes; it prevents the development of larvae and pupae into adult mosquitoes which can potentially transmit WNV and other vector-borne diseases. Methoprene is applied to catch basins and sewage lagoons and must be applied before larvae pupate.

Methoprene, when used in the approved manner, is not expected to pose unreasonable risks to wildlife, people, or the environment. The PMRA has approved the use of methoprene ingots under a temporary registration and has required that additional efficacy studies of the product be undertaken and submitted to PMRA.

For additional information on larvicides consult the Pest Management Regulatory Agency website at: <http://www.hc-sc.gc.ca/cps-spc/pest/index-eng.php>.

Product labels can also be accessed through the search link on the PMRA web site.

The permit applicant guides and fact sheets are posted on the MOE web site at: www.ene.gov.on.ca.

Larviciding Modes and Equipment

Two types of larviciding equipment may be used, for solid (granule or pellet) or liquid formulations. The equipment may be manually or power-operated, and hand or shoulder-carried, or can be mounted on All-Terrain Vehicles (ATVs), trucks or aircraft. All products must be applied by a licensed applicator.

Solid or "dry" larvicides may be applied directly by hand or from a tank (carried on the applicators back) that ejects the granules or pellets by means of a gravity-fed hopper, a manually-cranked dispenser, or a powered auger. These methods are useful for treating small areas (catch basins, ditches, or other containers or small bodies of water)

around which the applicator can position himself or herself appropriately and dispense small amounts of larvicide.

Methoprene in a briquet (ingot) formulation and *B. sphaericus* in a water soluble pouch formulation must be placed through the grates of catch basins (or by lifting the grate) and are intended to slowly release the larvicide over a period of time.

For treating larger areas, powered backpack blowers may be used to spread granules farther away from the applicator, and these blowers can also be mounted on All Terrain Vehicles (ATVs). Truck-mounted blowers are used, for example, to treat wide roadside ditches over a distance. Should very large areas need treatment, granule spreader systems can be mounted on fixed-wing or rotary aircraft.

Liquid larvicides (which are less commonly used) may be dispensed by a hand-held compressed-air sprayer or by a powered backpack sprayer. Like the powered granule blowers, these liquid sprayers may be mounted on ATVs or trucks to treat larger areas. Liquid larvicides are rarely applied by aerial means because liquid formulations do not penetrate heavy vegetation or wooded areas as well as solid formulations. Liquid formulations are often mixed with coarse sand and applied by helicopter or fixed-wing aircraft to allow the larvicide to penetrate the vegetation when large water bodies are treated.

Mechanical Means of Larval Control

There are also mechanical means of larval control. Some of these techniques have been site-tested, and include sonic devices (utilizing sound waves to disrupt larval development), and devices for the vacuuming or agitation of the standing water in containers (such as catch basins) to disrupt larval development.

Sonic Wave Treatment

One municipal experiment with sonic waves to destroy larval development demonstrated that the abundance of larvae in a catch basin was greatly reduced after treatment. However, in a few days, new larvae would hatch because the basin was open and the water in the catch basin remained.

The method, while effective in a very short frame of time, may be too labour intensive for practical application in a general municipal program. Nevertheless, it may be useful in selected circumstances where easy access is available to the catch basin or other holding container of relative size.

Screens

The application of fine mesh screens to the top of catch basins has proved to be an effective means to prevent mosquito entry into catch basins, particularly when installed

early in the season to prevent the laying of eggs. In addition, even when eggs hatched and developed into adults, the adults could not get out of the catch basin area because of the screening.

The installation of the screen however, requires major consideration. If the screen is applied to the top of the catch basin, it is relatively easy to fix to the grate and to clean frequently, to prevent leaves and debris from causing flooding following rain or other water deposits on the surface. Top installation is not practical on street catch basins because they do not stand up to the wear from continual traffic.

A potential application on the street basin is beneath the grate, but installation requires labour intensive lifting of the grate, fixing of the screen to the bottom of the grate and replacement of the grate. Regular maintenance is also required to keep the screen clear of water pools which are ideal for some mosquito species to breed.

Thus, it appears that in selected situations, mostly on private property or remote municipal sites, screening may be applicable, but only with an effective maintenance schedule to ensure that no water collects.

Vacuuming of Catch Basins

Vacuuming of the water from a catch basin has proved to be effective in that it removed the standing water together with any larvae. However, the water soon re-accumulates and permits the reintroduction of mosquito larvae into the catch basin.

Drilling of Drainage Holes into the Base of the Catch Basin

An experiment was conducted to drill holes in the bottom of the catch basin to drain any accumulated water to prevent egg-laying and larval development. The trials did not prove successful because the holes quickly became plugged with debris and began retaining water in the bottom of the catch basin. The drilling work was labour intensive and required specialized staff and equipment along with the lifting of the grate and providing of the protection for the workers on any traffic area.

Even if the drainage holes proved to be an effective relief to the accumulation of water, there was concern that the integrity of the catch basin's physical structure could compromise the safety of the street surface because of the potential weakening of the earth support beneath the catch basin and the inevitable settlement of the construction.

Adult Mosquito Control

Adult Mosquito Control – physical exclusion option

An often overlooked adult mosquito control measure is simple screening or the use of air curtains. The first type of exclusion is the use of metal or cloth meshing to

completely control mosquito access through doors, windows and over beds. The second type of exclusion uses a fan operated to provide a continual flow of air directed at doorways to keep mosquito from flying through the otherwise open door.

Maintenance for both modes is critical – holes or spaces in the physical curtains or equipment (or power) failures will obviously permit mosquito access to the previously protected areas.

Adulticiding Option (also known as ‘mosquito fogging’)

A local risk assessment is an essential prerequisite in the decision-making regarding the need to adulticide and where and when to start an adulticiding program. The decision is guided by Table 1 in the *O. Reg. 199/03 - Control of West Nile Virus Regulation*, and where and when to adulticide may be identified in the risk assessment of local conditions which present significant and immediate risk to public health. Adulticiding must be included as part of any assessment in order to consider the complete spectrum of control measures (refer to Appendix V). While larval control programs, including larviciding are an important means of proactive prevention, nevertheless, adulticiding is an option in the control of WNV.

A component of the risk assessment is drawn from experiences in other jurisdictions that have provided information on the other measures of prevention or control that have either been tried and shown to be inadequate, or would clearly not be effective if instituted anew. Hence, the “*General Decision-Making Factors: Larviciding and Adulticiding*”, along with factors in Appendix V should be considered.

Whether or not larviciding has already been done in a jurisdiction, the urgency of the threat to human health from mosquito-borne virus may dictate the need to adulticide as indicated by Table 1 in the *O. Reg. 199/03 - Control of West Nile Virus Regulation*. Since larviciding seeks to prevent the emergence of the next generation of mosquitoes, it will not immediately reduce the population of flying adults, a percentage of which will may be carrying the virus and seeking blood meals.

Contingency Adulticiding

The ministry has available to all Medical Officers of Health a contracted mosquito control service to adulticide with malathion within 48 hours notice in any Health unit in Ontario.

This service is initiated at a request from the local Medical Officer of Health, and is cost-shared when called upon. Both truck-mounted and backpack ULV modes of malathion delivery are available to the local Medical Officer of Health.

Backpack ULV capacity was added in 2006 to service circumstances where a Medical Officer of Health wishes to focus direct adult mosquito control in a very tightly defined area as identified to be an imminent WNV threat through the risk assessment process.

Prior to ULV treatment commencing, it is essential that the service provider (or the requesting Medical Officer of Health) serve appropriate community notice as required by law, no sooner than 48 hours in advance or no more than seven days before.

Pest Management Regulatory Agency (PMRA)

The Pest Management Regulatory Agency has reviewed the currently registered malathion ULV adulticide for label improvements. Furthermore, PMRA has completed an occupational and bystander risk assessment for its use in community-wide mosquito control programs and concluded that the product, when used according to label directions does not pose an unacceptable risk to bystanders or users.

For more information about specific adulticides, please contact the Pest Management Regulatory Agency via their Health Canada website at: www.hc-sc.gc.ca/cps-spc/pest/index-eng.php

Monitoring the Effectiveness of Vector Control Measures

A specific and immediate field evaluation of effectiveness for larviciding is continued sampling of larvae before and after treatment. To determine the efficacy of *Bti* or *B. sphaericus* in preventing 4th instar larvae and pupae development, the relative number of larvae collected before and after larviciding can be compared. The general aim of larviciding with *Bti* is to obtain 95% control within 24 hours of application after all label directions have been followed and after 48 hours of larviciding with *B. sphaericus*. To determine the efficacy of methoprene in preventing the emergence of adult mosquitoes, collection and rearing of live pupae to determine emergence inhibition rates is required.

Following adulticiding, the relative numbers of adult mosquitoes collected in light traps should be compared to the numbers collected immediately prior to the insecticide application and/or numbers collected in adjacent “untreated” areas.

Monitoring the frequency of local citizen complaints of mosquitoes or mosquito bites is less precise, but has been used as a more subjective method to evaluate nuisance control. Nevertheless, complaints could be used to determine the effectiveness of an agency’s treatment program, both larval and adult. There is some published information that the volume of complaints pre- and post-treatment gives a reliable indicator of the success or possible failure of the treatment over the entire treated area. The method may be beneficial when used along with other parameters to monitor the effectiveness of control measures.

Possible reasons for the “failure” of these control measures are varied. They may be related to incomplete consideration of the “*General Decision-Making Factors*”:

Larviciding and Adulticiding” or the factors noted in Appendix V. The impacts of larviciding or adulticiding may be extremely dependent on many variables affecting local conditions (i.e. weather conditions, mosquito counts, proximity to residential areas, etc.).

Weather conditions, for example, influence mosquito populations – their distribution (e.g. strong winds may blow mosquitoes in from outside the “control zone”) and the extent and rate of their development (e.g. high temperatures or humidity) and may affect adulticiding efforts to control adult mosquitoes over large urban areas.

Vector management programs vary between jurisdictions and differ over periods of time, therefore, it is difficult to make a generalization about the expected effectiveness of larviciding or adulticiding in preventing mosquito-borne virus transmission to humans. The insecticide products, however, have been evaluated and approved for their general effectiveness in reducing mosquito populations when used according to the label.

Surveillance of Potential Adverse Health Effects from Pesticide Exposure

Objective

To monitor for possible adverse health effects that are attributable to larvicide or adulticide exposure.

Background

Since exposure to any pesticide has the potential to cause adverse reactions, each health unit is required to ensure, as a minimum, that the advance community adulticiding notification requirements of the MOE are followed so that persons with pre-existing respiratory conditions (e.g. asthma) or sensitivities to pesticides have reasonable opportunity to take precautions to avoid or minimize exposure. The time period and methods of advance notification are found on the MOE website at: www.ene.gov.on.ca/envision/land/westnile/index.htm.

Under the Control of West Nile Virus Regulation (*O. Reg. 199/03*), Medical Officers of Health are to maintain a means to record, investigate and report to the ministry any confirmed or likely adverse or unintended human health effects attributed to mosquito control actions, and will report any non-human environmental adverse effects that he/she knows about to the MOE and other relevant local or provincial authorities.

Planned Activities

As part of active surveillance communications with local hospitals for WNV illness, health units should monitor for any reported cases of adverse health effects attributed to pesticide exposure from mosquito adulticiding or larviciding.

Following pesticide application, should persons indicate to the Medical Officer of Health that they are experiencing impact from control measures, the health unit may have to work with the MOE (District Office or regional pesticide specialist), the licensed exterminator, and/or municipal agencies involved in either the adulticiding/larviciding work or the local environmental monitoring, as well as with health care provider(s) in obtaining these persons' history of exposure in order to assess the nature or likelihood of any indicated exposure of affected persons. Appendix VI, VII, VIII provides information on malathion to assist the health units in the investigation and reporting of potential malathion exposure in case it was used for the adult mosquito control. Also, health units are advised to make arrangements with the health care providers in their communities to ensure that this reporting is as complete and timely as possible.

IV. Ongoing Professional Communication and Collaboration on West Nile Virus Issues in North America

Objective

To better understand the ecology of WNV in Ontario and to assess the effectiveness of surveillance, prevention and control methods toward the reduction of WNV illness as well as ensure financial and program accountability.

Background

With WNV being considered endemic in North America, and given the large number of vectors in Ontario, it is necessary to routinely monitor the success of the work being undertaken across the province, including that done through larviciding toward the reduction of the WNV vector population.

It is also necessary to maintain regular contact with colleagues throughout North America to ensure that we are current with the latest information on WNV surveillance and control.

Planned Activities

The ministry shall communicate with all health units through regular teleconferences.

The ministry e-mails information and materials on WNV matters to all health units regularly to share data and information of successes or problems.

The ministry will provide weekly WNV vector surveillance reports for Ontario to aid in local risk assessment responsibilities, and will provide health unit-specific analysis at the request of the local Medical Officer of Health.

The ministry actively works with the Public Health Agency of Canada through WNV data-sharing for epidemiological analyses.