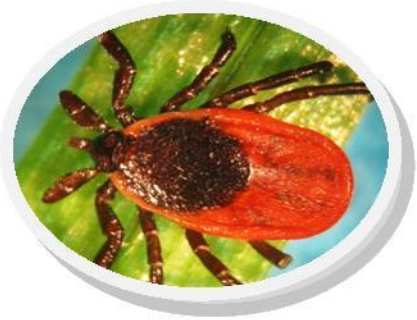
Vector-Borne Disease Program



2015 Summary Report

West Nile Virus, Eastern Equine Encephalitis and Lyme Disease Surveillance and Control Activities

BUREAU DE SANTÉ DE MIDDLESEX-LONDON HEALTH UNIT
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Vector-Borne Disease Program
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Vector-borne diseases are diseases that are transmitted to humans through the bite of an infected insect or arthropod such as mosquito or tick.

The major vector-borne diseases of public health importance in Ontario are West Nile Virus (WNV), Eastern Equine Encephalitis virus (EEE), and Lyme disease (LD). West Nile Virus and Lyme disease are present in Middlesex-London.

The Middlesex London Health Unit's (MLHU) Vector-Borne Disease (VBD) program seeks to prevent the transmission of WNV, EEE, and LD to residents, in part by reducing the spread of these diseases within local mosquito, tick, and bird populations. In addition, the VBD program works to increase knowledge, awareness and prevention efforts by enhancing education campaigns and community partnerships. In 2015, the VBD team continued to identify vector-borne disease activity and vector species (species capable of carrying disease) in the region through surveillance and sample identification. The team then took steps to mitigate the risk, including the application of larvicide in identified areas, which is ultimately required to prevent further disease transmission.

West Nile Virus

West Nile Virus (WNV) is transmitted through the bite of an infected mosquito. The transmission cycle begins when vector mosquitoes feed on the blood of an infected bird. Only vector mosquitoes can transmit WNV from a bird to a human. Once a mosquito bites an infected bird, it can carry WNV and possibly transmit the virus to humans. (PHAC, 2014)

The main mosquito species involved in the transmission of West Nile Virus are *Culex pipiens* and *Cx. restuans*. The *Culex* species are thought to be the primary bridging vector in the transfer of West Nile Virus from infected birds to humans. (GDG, 2015)

Temperature plays a key role in the development rate of many organisms, including viruses. In the case of WNV infected mosquitoes, a certain amount of heat and time is required for the risk of human infection to occur. The relationship between weather and mosquito abundance can be explained through the Accumulated Degree Days (ADD) model, which looks at hourly temperature trends. Average temperature less than 18.3°C (determined temperature threshold) is considered a 0 degree day, however if the average temperature is above 18.3°C on a given day (ex. 20.0°C), that day would have a 1.7 degree day. A high ADD number will increase the viral amplification capacity of mosquitoes, and speed up breeding and mosquito activity. Typically,

positive mosquito traps can appear in as few as 30 ADD, and a risk of positive human infection can appear when 180 to 200 consecutive ADD are observed. In 2015, the ADD number stayed below 50 in Middlesex-London, which was similar to what was observed in 2014. Even though there was one human case of WNV from within Middlesex-London, according to our service provider, G.D.G. Environnement, weather conditions were not ideal for WNV human cases in 2015.

2015 WNV Highlights

- Season length and sampling
    - Surveillance began April 17 and concluded September 28, 2015.
    - All samples collected in the field were identified and/or tested for WNV by the VBD team and/or its service provider.
- Surveillance and control of vector mosquito larvae at standing water sites and in catch basins
    - Approximately 250 standing water sites were monitored.
    - 26,454 mosquito larvae were identified from these standing water sites.
    - 883 treatments were applied to 12.51 hectares of standing water on public property.
    - 103,495 roadside catch basins were treated during three rounds of application.
    - 60.3% of the larvae collected in 2015 were identified as vector species. (67% of mosquito larvae identified since 2004 have been vector species.)
- Adult mosquito trapping and mosquito-viral testing
    - 112,385 adult mosquitoes were collected in traps by the MLHU and sent to G.D.G. Environnement for WNV testing.
    - Five traps (pools) of vector mosquitoes tested positive for WNV.
- Dead bird submissions and bird viral testing
    - 184 dead bird calls from the Middlesex-London area were reported.
    - 11 dead birds were accepted for testing in the Strathroy lab with five testing WNV-positive.
- Human Surveillance
    - One WNV human case was detected in Middlesex-London.

Mosquito Control

Early control measures ensure a significant reduction of mosquito populations each season. This contributes to a decrease in public exposure to WNV vector mosquito species and the incidence of adverse health outcomes related to WNV transmission. The surveillance and identification of mosquito larvae is an important aspect of the VBD team's Integrated Pest Management (IPM) control strategy. Identification of vector mosquito larvae is followed up by the treatment of those sites which contain WNV vector species.

Larvicide treatment is currently the primary method of mosquito control in Ontario. This comprehensive surveillance process includes the collection and identification of larval mosquito samples prior to planning and performing a larvicide treatment.

A notice of application of larvicides for the purpose of mosquito control appeared in local newspapers distributed throughout Middlesex-London. In early May of 2015, notices were printed in the Dorchester Signpost (May 6), The London Free Press (May 6), The Middlesex Banner (May 6), The Londoner (May 6), the Parkhill Gazette (May 7), the Glencoe-Alvinston Transcript & Free Press (May 7), the Strathroy Age Dispatch (May 7), and the Focus (May 7). Either the MLHU or its service provider, the Canadian Centre for Mosquito Management Inc. (CCMM), posted public notice signs at each standing water location following an application of larvicide to those identified mosquito habitats.

Bacillus thuringiensis israelensis (VectoBac ®) applied to standing water sites

A product with the active ingredient *Bacillus thuringiensis israelensis* (*Bti*) was the primary larvicide used to treat standing water sites, other than catch basins, this past season. The larvicide is biologically safe, only affects mosquito and black fly larvae when applied to standing water, and has a residual life of approximately 48 hours. VectoBac 200g® was used and is considered a "Class 2" pesticide by Canada's Pest Management Regulatory Agency (PMRA). The PMRA requires that Class 2 pesticides be applied by trained and licensed personnel.

In 2015, a total of 883 treatments were applied to 12.51 hectares of standing water identified as vector mosquito habitat on public property. Table 1 provides an overview of the number of *Bti* treatments applied by site type in Middlesex-London in 2015.

Table 1. Number of *Bacillus thuringiensis israelensis* (*Bti*) treatments applied by site type in Middlesex-London in 2015.

Site type	Number of treatments	Area treated in hectares (ha)
Ditch	182	1.13
Field pool	64	0.61
Pond	35	0.79
Storm water management facility	411	7.21
Woodland pool	191	2.77
Total	**883**	**12.51**

Methoprene (Altosid ®) applied to catch basins

Catch basins can provide one of the single most significant breeding sites for urban *Culex pipiens/restuans* mosquito populations. Catch basins trap water, this water often remains stagnant for an extended period of time, allowing organic matter to collect and mosquitoes to develop. It is imperative that these structures be identified and a timely application of larvicide is conducted.

Beginning June 9 and ending August 28, 2015, a total of 103,495 roadside catch basins were treated during three rounds of application. A total of 68.13 kg of Altosid® pellets were applied at an application rate of 0.7 grams/basin. In total, 968 briquettes were applied to non-roadside catch basins in Middlesex County. One application of Altosid® XR Briquets was also applied to non-roadside catch-basins, including: catch basins located in the backyards of residential properties [92]; catch basins located in municipal green spaces [213]; catch basins located on agency-owned or operated sites, such as government buildings, social housing units, long-term care facilities, and hospitals [595]; and pollution control plant catch basins [68].

Human Surveillance

The first human case of West Nile Virus infection in Canada was reported in Ontario in 2002. In 2015, there were 78 confirmed human cases of WNV reported in Canada, 33 of which were reported in Ontario with one of those cases being detected in Middlesex-London. In 2015, there were 2,060 human cases of WNV reported in the United States (PHO, 2015).

Human surveillance of reportable diseases, such as WNV, encourages the MLHU to continually develop and update strategies to reduce the incidence of vector-borne diseases. In order to understand the changing dynamics of WNV infection, and what can be done to reduce the risk to Middlesex-London residents, it is essential to monitor the presence of WNV in the community from year to year.

Table 2 provides an overview of Middlesex-London WNV surveillance findings from 2010 to 2015.

Table 2. Middlesex-London West Nile Virus (WNV) surveillance from 2010 to 2015.

	Year					
Surveillance item	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
WNV confirmed human cases	0	2	7	4	0	1
WNV-positive mosquito pools	2	11	17	4	4	5
WNV-positive dead birds	5	9	23	9	4	5

Eastern Equine Encephalitis

Eastern Equine Encephalitis (EEE) is classified as an alphavirus from the family *Togaviridae*. The main mosquito species involved in the transmission of EEE is *Culiseta melanura*. In the past, EEE has mainly affected horses; however, there have been a few EEE-positive mosquitoes identified in Ontario. (MOHLTC, 2011)

There have been no known EEE human cases reported to date within Canada; however, surveillance data from Ontario health units and the First Nations Inuit Health Branch has, in past years, identified the virus in some adult mosquitoes.

2015 EEE Highlights

- Season length and sampling
    - Surveillance began April 17 and concluded September 28, 2015.
    - All necessary samples collected in the field were identified and/or tested for EEE by the VBD team and/or its service provider.
    - Public Health Ontario's guidelines were followed to sample/test EEE vectors.
- Mosquito Surveillance
    - The VBD team identified a total of 7 *Culiseta melanura* adult mosquitoes; all of which were tested for EEE.
    - No EEE-positive mosquitoes were identified.
- Human surveillance
    - No EEE cases diagnosed in Middlesex-London residents.

Lyme Disease

Lyme disease (LD), a nationally reportable disease, is an infection caused by the bacteria *Borrelia burgdorferi*, which can be transmitted to humans through the bite of an infected tick. In Ontario, the LD bacterium can be transmitted to humans after being bitten by an infected blacklegged tick (*Ixodes scapularis*), also known as the deer tick. The distribution of blacklegged ticks, continues to expand throughout Ontario. Public Health Ontario has identified many risk areas across the province including an area in the Middlesex-London area.

2015 LD Highlights

- Season length
    - Ticks submitted through passive surveillance were received throughout the year.
    - Active surveillance began in April and concluded in October, 2015.
- Passive tick surveillance
    - 182 ticks were submitted to the MLHU in 2015.

    - 148 ticks (81%) were identified as non-vector species, which are unable to transmit LD.
    - 34 ticks (19%) were identified as blacklegged ticks, which are the vector species for LD.
    - 11 blacklegged ticks were acquired in the Middlesex-London area:
        - Eight (8) from the City of London, two (2) from Ailsa Craig and one (1) from Mount Brydges.
    - One blacklegged tick tested positive for LD, but the location of that exposure is unknown.
- Active tick surveillance
    - Tick dragging was conducted on 24 occasions at 11 different locations throughout Middlesex-London.
    - Tick dragging resulted in 23 non-vector dog ticks being collected.
    - No blacklegged ticks were identified during active surveillance.
- Local tick risk area
    - The northern area of Middlesex County has now been identified as risk area for potential contact with blacklegged ticks.
        - The risk area extended from the Pinery Provincial Park along the shore of Lake Huron.
- Human surveillance
    - 10 travel-related LD cases were confirmed in Middlesex-London residents.

Tick Surveillance

In 2015, the Middlesex-London Health Unit (MLHU) used a combination of passive and active strategies to determine the presence of ticks in the Middlesex-London area. Passive tick surveillance involved ticks being submitted to the MLHU by the public, healthcare providers and veterinarians; and then identifying the species in the Strathroy laboratory. Active tick surveillance involved the VBD team searching out and collecting ticks through tick dragging, in an effort to better understand population size and distribution across the region.

If the ticks collected were identified as blacklegged ticks, they were then sent to the London Public Health Ontario Regional Laboratory (PHORL) for species confirmation. If the PHORL confirmed a vector species, the tick was then sent for Lyme disease testing at the National Microbiology Laboratory in Winnipeg, Manitoba.

Local Risk Area Identified in Middlesex-London

Risk areas are places where blacklegged ticks have been found and where humans are more likely to come into contact with LD-positive ticks. In 2015, Public Health Ontario outlined/updated their Lyme disease risk areas to include a part of the Middlesex-London region. This new risk area extends into the northern part of Middlesex County extending from the Pinery Provincial Park risk area, along the shore of Lake Huron.

There is currently no effective strategy to control ticks. Therefore it was necessary that the VBD team increase its active surveillance efforts near the risk area to determine the prevalence of Lyme disease carrying ticks and whether local tick populations were expanding. Although tick dragging revealed no blacklegged ticks, had any been found they would have been identified and submitted for testing. In addition to the active surveillance conducted, the VBD team was notified by a resident living within the risk area that their veterinarian confirmed a blacklegged tick had been removed from their dog, and that the dog had not left their property.

Human Surveillance

The Middlesex-London Health Unit (MLHU) conducts human surveillance and collects epidemiological data to gain a better understanding of the incidence, prevalence, source and cause of local infectious diseases. Surveillance and data collection assist in determining risk factors for Lyme disease in the Middlesex-London area. To date, no locally acquired human LD cases have been reported; however, there were 10 travel-related confirmed/probable human LD cases reported to the MLHU in 2015.

Table 3 provides an overview of Middlesex-London LD surveillance findings from 2010 to 2015.

Table 3. Middlesex-London Lyme disease (LD) surveillance from 2010 to 2015.

	Year					
Surveillance item	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
LD confirmed/probable human cases	3*	2*	1*	5*	2*	10*
Tick submissions	46	73	87	145	91	182
Blacklegged ticks identified	2	2	10	8	20	34
Locally acquired blacklegged ticks identified	0**	1**	1**	2**	4**	11**

*all human Lyme disease cases were travel related
**includes ticks removed from humans and animals

Public Education

Public education and awareness campaigns are an important part of the effort to reduce the incidence of adverse health outcomes resulting from vector-borne diseases.

In accordance with the Ontario Public Health Standards, the VBD team works to increase public engagement and promote personal protection. This is done by planning and participating in various activities that increase awareness of vector-borne diseases across the region.

2015 Public Education Activities included:

- Attending and sharing resources at community events.
- Working with internal partners and making presentations to a variety of client groups.
- Targeting messages to individuals and groups living in rural areas, those involved in outdoor activities and/or those who frequent wooded or grassy areas.
- Collaborating with other MLHU service areas and community partners to promote preventive messages to a wide audience.
- Issuing media releases to inform the public when local vector-borne disease activity is detected.
    - Media coverage included 19 VBD program related stories featured in the news between May 6 and September 3, 2015.
- Issuing alerts on the MLHU's website and social media channels to inform and update residents about VBD team activities.

The Public Health Agency of Canada (PHAC) recommends a comprehensive plan to engage and educate the public through social media activities and campaigns targeting those who practice outdoor activities. As Lyme disease cases were again reported by Middlesex-London residents and blacklegged tick populations continue to expand within Ontario, the VBD team considered PHAC's pillars for LD action and awareness when planning 2015 public education and engagement activities. Personal protection messages were promoted through the MLHU's Twitter account and also at presentations and community events. The aim was also to reach residents who travel to risk areas both inside and outside of Middlesex-London. Added emphasis was placed on knowing the signs and symptoms of LD, proper tick removal and submission, and the practice of personal protective behaviours.

Complaint/Service Requests

In 2015, the VBD team received 519 complaint/service requests (CSRs) by phone, email, in person, or through the Health Unit's online reporting forms (Figure 1.). The

VBD team responded to all complaint/service requests within two business days. Intake, investigation, follow-up and reporting were handled by the VBD Coordinator and/or field technician. When required, VBD seasonal staff also helped in responding to CSRs.

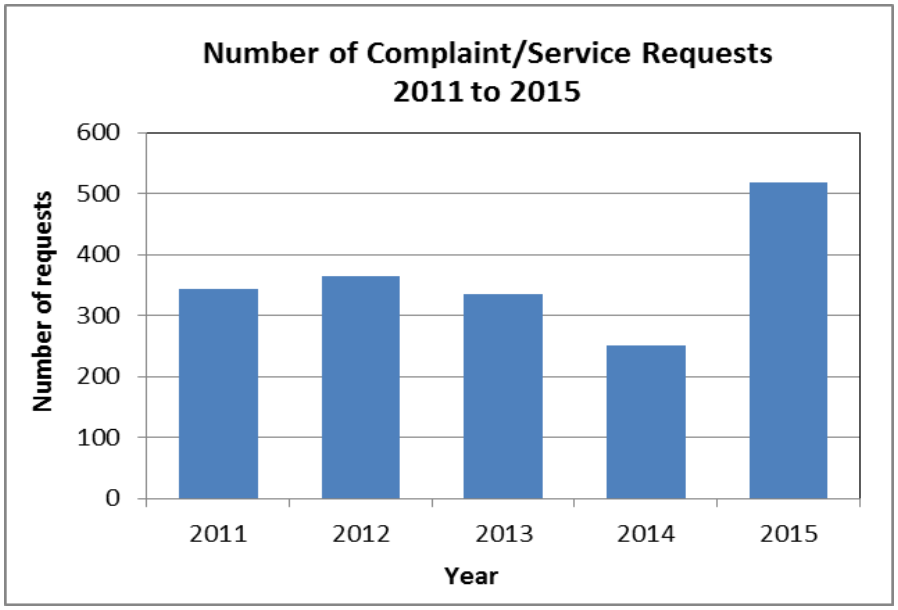

Figure 1. Total number of Complaint/Service Requests by year.

2016 Vector-Borne Disease Program

Looking ahead to 2016, the VBD team will continue to focus on tick and mosquito surveillance, public education, and mosquito control.

In order to adjust mosquito and tick monitoring, control, and public education strategies, it is important at the end of each season to review program outcomes and seasonal surveillance data.

In 2015, West Nile Virus was once again detected in Middlesex-London's bird, adult mosquito, and human populations. There were a significant number of WNV vector mosquitoes and a small population of EEE vectors identified throughout the season. This signifies the continued need for the VBD team to maintain its mosquito surveillance and control program, in order to reduce the possibility of WNV and EEE transmission during the 2016 year.

As Lyme disease cases continue to be reported by residents of Middlesex-London, the MLHU should focus efforts on LD promotion and prevention. Although no locally acquired cases of LD have been identified so far, local blacklegged tick submissions increased again in 2015; demonstrating the need for both continued passive and active surveillance, and public education.

The VBD team will continue to support public education strategies which inform residents about the services provided by the VBD team and the work it does to protect against vector-borne diseases. Consistent messages will continue to be used to help educate homeowners about the ways they can reduce or eliminate potential vector-borne related concerns and how to reduce the chances of VBD transmission.

The VBD team will once again align its program goals and initiatives with the MLHU Strategic Plan to better promote and protect the health of our community. By providing Middlesex-London residents with the right tools and information, residents can begin taking an active role in reducing vector-borne diseases in the community.

Works Consulted

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