

Active Tick Dragging: Standard Operating Procedure



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Public Health Ontario

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Introduction

Blacklegged ticks (*Ixodes scapularis*), are the primary vector for the agent of Lyme disease (LD), *Borrelia burgdorferi*, in eastern North America (Figure 1 and Figure 2). Tick surveillance can determine the establishment and geographic extent of blacklegged tick populations within a given area. Tick surveillance may be *passive*, via examining ticks brought into health units/physicians by members of the public, or via human cases reporting the location of their most likely exposure to public health. Tick surveillance may be *active* when public health professionals collect ticks from their natural habitat. Drag sampling is the active surveillance method used in Ontario and consists of dragging a white flannel cloth over and around vegetation where ticks may be present (Figure 3). Testing of ticks identified during tick surveillance can identify the proportion of ticks that carry tick-borne pathogens. This allows the risk of human tick-borne infection to be assessed locally.

Purpose:

The purpose of *Active Tick Dragging: Standard Operating Procedure (SOP)* is to standardize the methods used during tick dragging in Ontario and to improve the quality of the tick dragging data.

Goal:

The goal of this SOP is to improve the quality of tick surveillance data and allow for valid comparisons to be made across years and geographical locations within Ontario. High quality data will improve the accuracy of risk assessments that inform clinical and public health education and decision-making.

Location and Timing

Each health unit should determine through careful examination of LD information whether they have local areas of concern* for active tick surveillance. It is important to note that not all health units will have areas of concern. *Ixodes scapularis* are primarily found in or at the edge of woodland habitats (primarily deciduous or mixed deciduous forests). Due to the potential movement of deer and ticks into urban areas, heavily used public areas should also be considered for active surveillance if other surveillance indicators raise concerns about LD transmission. Spatial or temporal clusters of *I. scapularis* submissions, and/or the detection of locally-acquired probable or confirmed human cases of LD, should raise suspicions about the possible establishment of *I. scapularis* populations and provide useful information to

* Examples for determining an area of concern are: results from passive tick surveillance, occurrence of human cases and places heavily used by the public that have suitable tick habitat. The Medical Officer of Health should use their local knowledge to determine if multiple or single methods are needed for surveillance.

help determine where tick dragging should occur.

Prior to conducting tick dragging, public health units may want to seek permission to enter the area from which they are interested in gathering data (e.g. municipality, provincial/national park, local conservation authority). These bodies may also require a permit to remove the ticks from these lands.

Due to the small size of blacklegged tick larvae and nymphs, tick dragging should be conducted in the spring and fall, when adult ticks are most prevalent ([Figure 4](#)). This will aid in detecting the ticks and decrease the likelihood of a false negative designation for a location.

Do not perform drag sampling when it is raining, when the vegetation is wet (from rain or dew), or when temperatures are less than 4°C. Because of early morning dew, it is better to perform tick dragging in the late morning or afternoon. With cooler temperatures, the ticks are less active and wet conditions dirty the drag cloths very quickly, making it difficult to see any possible ticks.

Materials[†] – General Equipment

- * White coveralls (preferred) or white pants and long-sleeve shirt (NOT treated with repellent)
- * White socks (NOT treated with repellent)
- * Boots, preferably without eyelets (or use duct tape to cover holes)
- * Flagging or surveyor's tape (optional)
- * Mosquito head nets (optional and seasonal)
- * Datasheet (Appendix 1)
- * Cooler for transporting tick samples
- * Ice packs or wet ice for preserving ticks in the field
- * Pencils and permanent marker pens for collection vials
- * Thermometer (preferably digital)
- * GPS unit (optional)
- * Mobile phone (optional)
- * Magnifying glass to see ticks easier (optional)
- * Garbage bags (to contain used drag cloths, coveralls, etc. in car prior to disposal)

Materials – Tick Collection Equipment

- * 1m² piece of flannel cloth
- * 1.2m wooden stick (or plastic piping)
- * 3m piece of cord/rope

[†] adapted from AFPMB Technical Information Memorandum No. 26 (Clegern, 1990)

- * Duct tape
- * Needle-nose forceps and fine paint brush for transferring ticks
- * Labelled snap-cap plastic vials (for tick samples)
- * Filter paper
- * Plastic, re-sealable zipper storage bags
- * Paper towels

Methods

1. To make a drag cloth, attach a 1.2m wooden stick (or plastic piping) across the end of a 1m² sheet of cloth.¹⁻³ Then attach a 3m cord to both ends of the stick (or plastic piping) to use to pull the drag cloth through the environment ([Figure 3](#)). Extra pieces of cloth may be needed in the field as they can become soiled and damaged.
2. Sampling should be conducted for a minimum of three-person hours at each location of interest with a suitable habitat (i.e. woods, grassland, trail margins).^{2,4} The person(s) conducting the sampling should walk at a moderate pace through the environment ensuring that as much of the drag cloth as possible remains in contact with the ground and vegetation ([Figure 3](#)). Check the clothing of the collector and the drag cloth approximately every 40 to 50 paces for ticks.
3. Remove any ticks encountered on the drag (or on the clothing of the drag sampler) with fine forceps or a fine paint brush and place them into a collection vial. Clearly label the collection vial with the sampling location, date of sampling and collector's name. Collectors may place all ticks from a particular sampling location into a single collection vial and record an estimate of the number of ticks collected on the label.
4. Store tick vials in a cooler with ice while in the field and immediately transfer them to a freezer at the end of each day. Collectors should add moistened filter paper to collection vials, or place the vials in a sealable plastic bag containing moistened paper towel to ensure ticks do not die and deteriorate in the field. Specimens should be shipped to the National Microbiology Laboratory[‡] on freezer packs for species identification and possible diagnostic testing.
5. Complete data sheets (Appendix A) immediately after conducting sampling at each location. Remember: It is critical to keep detailed records of sites sampled even when ticks are not found (the localities with ticks will likely change over time). All data should also be entered in an electronic database and backed up.

[‡] Field Studies – Zoonotic Diseases and Special Pathogens
National Microbiology Laboratory
1015 Arlington Street
Winnipeg, Manitoba R3E 3R2

Personal Protection During Tick Surveillance

Persons performing tick dragging may encounter blacklegged ticks in the field and there is a possibility the ticks may attach and attempt to feed. Using personal protection can minimize the possibility of tick bites. For example, wear white clothing (pants, shirt, coveralls and socks) so that ticks are easy to see (dark tick on white background). Collectors should tuck their pants into their socks and/or boots and should not use repellents.

Do a complete check of clothing (and the drag cloths) when finished sampling at each location (i.e., in the field). When at home, carefully re-check your clothing and boots; and thoroughly check your skin for attached ticks. Use the “buddy system” to check areas that are not readily visible (e.g. your back, back of head, back of legs and arms). Ticks are frequently found on the head, neck, groin and underarms but may attach anywhere on the body, including the torso, arms, legs and ankles. Proper tick removal is especially important (Figure 5). Bite sites should be monitored; if symptoms develop, you should seek medical attention. It is important to remember that attached ticks do not immediately start to transmit *B. burgdorferi*. It takes 24 to 48 hours of attachment before the bacteria is transferred.⁵ Tick checks are thus an important tool for minimizing possible exposure to *B. burgdorferi*.

It should be noted that collectors are out in a natural setting and so there is a possible risk of injury (e.g. tripping). It is advised that collectors let others know their tick dragging locations, the times that they will be dragging and approximate return time. There is also the risk of encountering other people and wild animals while dragging; therefore, also consider conducting the dragging in at least teams of two and bring a mobile phone. Collectors should be aware of the risks in their regions.

References

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5. Centers for Disease Control and Prevention, National Center for Emerging and Zoonotic Infectious Diseases, Division of Vector-Borne Diseases. Lyme disease [Internet]. Atlanta, GA: Centers for Disease Control and Prevention; 2015 [cited 2015 Mar 18]. Available from: <http://www.cdc.gov/lyme/transmission/index.html>



Figure 1. Photograph of *Ixodes scapularis* showing all stages on a dime. Clockwise from bottom-left: larva, nymph, adult male, adult female. (R. Lindsay,PHAC)

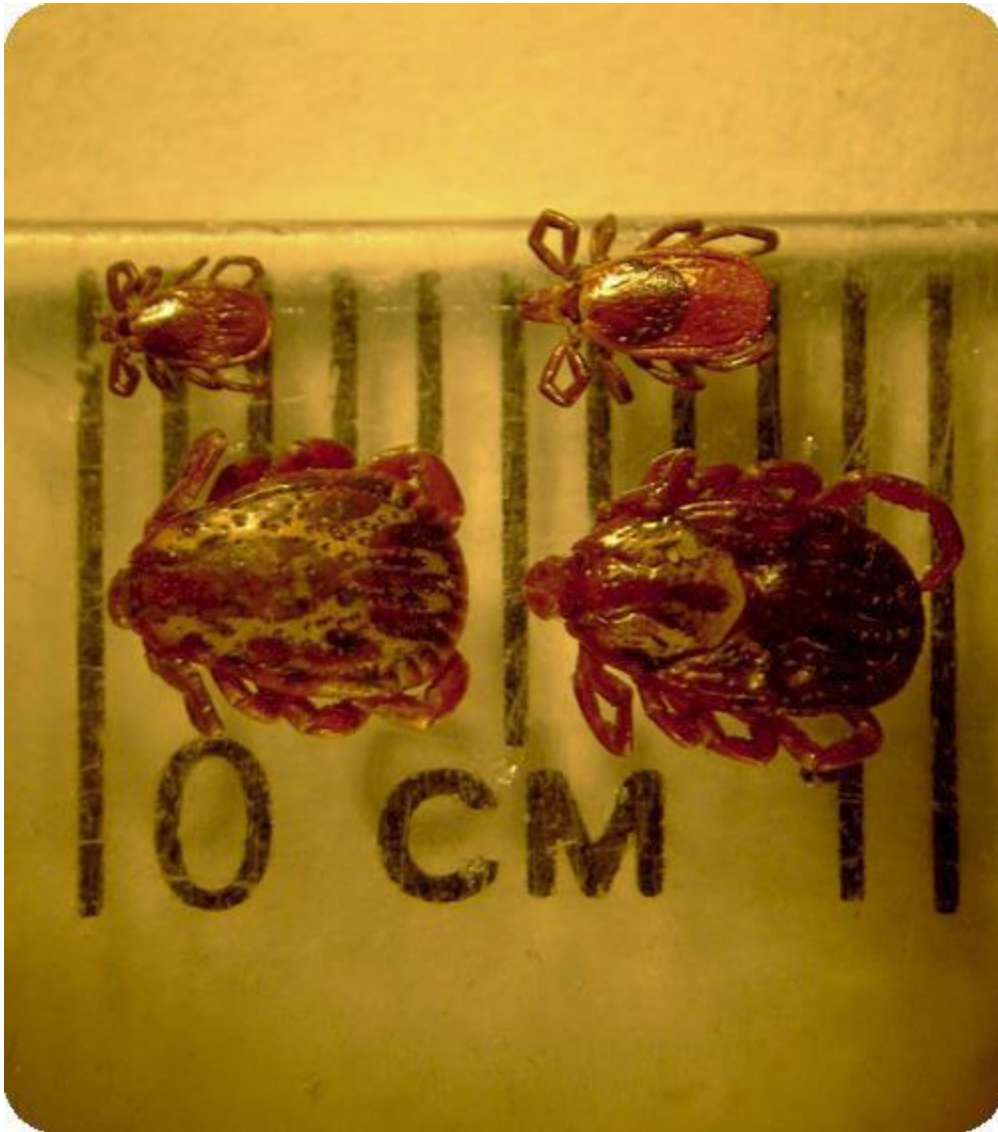


Figure 2. Comparison photograph between the American dog tick (*Dermacentor variabilis*) and blacklegged tick. Males are on the left and the blacklegged ticks are on the top. (R. Lindsay, PHAC)



Figure 3. A photographic example of a drag cloth for sampling ticks (Public Health Ontario)

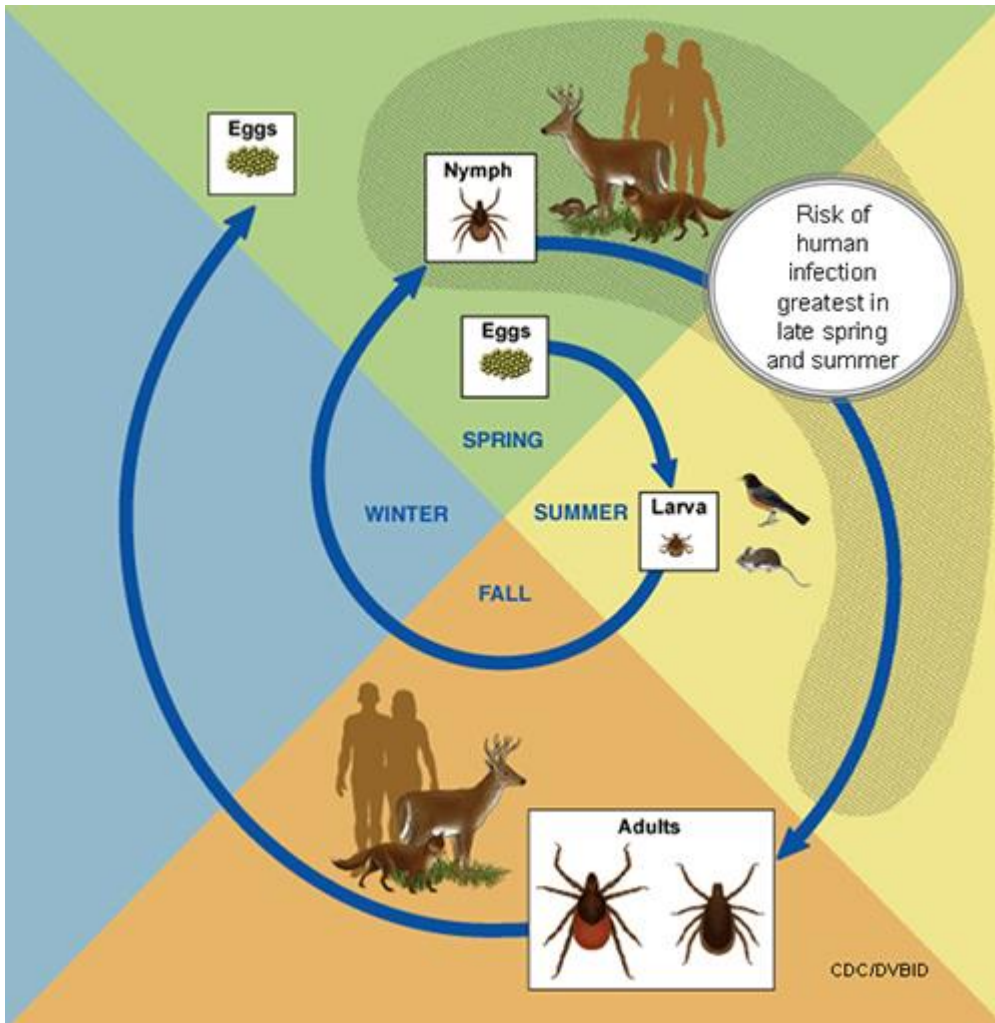
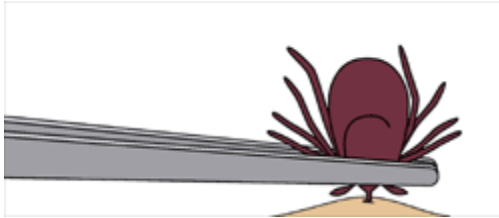


Figure 4. The life cycle of blacklegged ticks (*I. scapularis*) in relation to the transmission cycle of *Borrelia burgdorferi* (CDC 2014 <http://www.cdc.gov/lyme/images/lifecycle.jpg>).

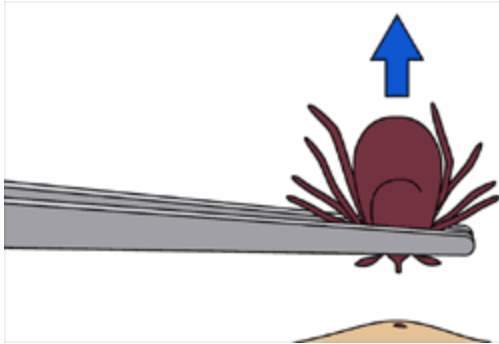
1. Use fine-tipped tweezers and protect bare hands with a tissue or gloves to avoid contact with tick fluids.

2.



Grab the tick close to the skin. Do not twist or jerk the tick, as this may cause the mouthparts to break off and remain in the skin.

3.



Gently pull straight up until all parts of the tick are removed.

4. After removing the tick, wash your hands with soap and water (or waterless alcohol-based hand rubs when soap is not available). Clean the tick bite with an antiseptic such as iodine scrub, rubbing alcohol, or water containing detergents. Watch for signs of illness such as rash or fever, and see a health care provider if these develop.

Figure 5. Methods for the safe removal of ticks from humans and animals (CDC, 2015 <http://www.cdc.gov/lyme/removal/index.html>).

Appendix A. Active Tick Submission Form

Drag sampler(s): _____

Date sampling conducted: _____

Location name and (GPS coordinates): _____

Location type: _____
(i.e., forest, field, trail)

Sampling start time: _____ Sampling end time: _____

Temp/%RH @ start: _____ Temp/%RH @ end: _____

General description of weather conditions during sampling (i.e., estimates of cloud cover, wind speed, periods of intermittent light rain): _____

Ticks of any type detected? YES _____ NO _____

Observer	Blacklegged ticks – <i>Ixodes scapularis</i>						Other tick species					
	On drag			On observer			On drag			On observer		
	Larvae	Nymph	Adult*	Larvae	Nymph	Adult	Larvae	Nymph	Adult	Larvae	Nymph	Adult
Total												

* Where practical, record adults as males: females (e.g., 3 M: 4 F)

Notes:

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