Patient with known/suspected blacklegged tick bite (Ixodes scapularis)

**Lyme Disease Diagnostic Algorithm for Clinicians**

**Asymptomatic patient**
- Tick attached >24 hours
  - No risk of Lyme disease transmission
  - History of travel (see Box 1)
  - Time since tick was removed
    - >3 days: Watch for signs and symptoms 30 days post-exposure
    - <3 days: Consider post exposure prophylaxis where appropriate (Box 2)

**Symptomatic patient**
- Suspect Lyme disease based on symptoms and exposure history (See Box 1 for Lyme Risk Areas)

**Early localized disease (<30 days)**
- Erythema migrans (EM) rash (Box 3)
- Low-grade fever, fatigue, headache, arthralgia (may be intermittent)

**Early disseminated disease (<3 months)**
- Multiple EM rashes
- Low-grade fever, fatigue, headache, arthralgia (may be intermittent)
- Neurological (e.g. aseptic meningitis, cranial neuropathies – especially CN VII/Bell’s Palsy)
- Cardiac (e.g. 2/3° AV block)

**Late disseminated disease (≥3 months)**
- Oligoarticular arthritis (especially large joints)
- Neurological (e.g. encephalopathy, polyradiculoneuropathy)
- Retinitis (rare)

**Box 1: Lyme Risk Areas**
- Peel Region does not contain endemic areas for Lyme disease and no populations of blacklegged ticks have been identified.
- Individuals in Peel without a travel history may be exposed to infected ticks transported on birds and other animals.
- Only blacklegged ticks carry Lyme disease in Ontario
- Canada: [phac-aspc.gc.ca/id-mi/assets/images/tickinfo_map/lg-eng.jpg](http://phac-aspc.gc.ca/id-mi/assets/images/tickinfo_map/lg-eng.jpg)
- USA: Highly endemic in northeastern and north-central states
- Europe: Endemic from southern Scandinavia to northern Mediterranean; highest incidence in central and Eastern Europe.

Potential European exposure must be specified on lab requisitions.

**Box 2: Post exposure prophylaxis** for Lyme disease after a recognized blacklegged tick bite
- Adults: Doxycycline 200mg PO x 1 dose
- Children ≥8 years: Doxycycline 4 mg/kg, up to maximum dose of 200mg
- Doxycycline is contraindicated in pregnancy and for children <8 years
- No further testing/treatment required following post-exposure prophylaxis

**Box 2. Post exposure prophylaxis**
- Diagnosis based on clinical suspicion
- Laboratory testing of limited value in early localized disease
- See Box 4 for treatment
- Consider serology if diagnosis uncertain. If initial tests are negative AND symptoms persist, may repeat in 4 weeks

**Box 4**
- Consider serology if diagnosis uncertain. If initial tests are negative AND symptoms persist, may repeat in 4 weeks

**Box 5**
- Order serologic testing
- Work up differential diagnosis
- Consider initiating treatment if clinical suspicion high
- Consultation with infectious disease specialist, and/or other specialists, as appropriate, strongly recommended

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Box 3. Erythema migrans (EM)
- Rash is present in most cases (60-85%)
- Begins as red macule/papule at site of tick bite
- Rapidly enlarging to diameter >5 cm
- Often develops central clearing (Figure 1); some studies noted uncharacteristic variants of EM in 25-30% of cases, e.g. oval or irregular shape, no central clearing (Figure 2), dusky or bluish centre

Figure 1. – Erythema Migrans

Box 4. IDSA Guidelines for treatment of early localized Lyme disease
See complete IDSA guidelines for treatment of disseminated and late disease. (Available online at idsociety.org/Lyme/)
Consultation with an infectious disease specialist is strongly recommended.

<table>
<thead>
<tr>
<th>Adults</th>
<th>Children ≥8 years</th>
<th>Children &lt;8 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Doxycycline 100mg PO BID x 14-21 days (contraindicated in pregnancy)</td>
<td>• Doxycycline 4 mg/kg/day divided BID (maximum of 100 mg per dose) x 14-21 days</td>
<td>• Amoxicillin 50 mg/kg/day, PO, divided TID (max 1.5 g/day) for 14-21 days</td>
</tr>
<tr>
<td>Alternatives:</td>
<td>Alternatives: Amoxicillin or cefuroxime as below</td>
<td>Alternative:</td>
</tr>
<tr>
<td>• Amoxicillin 500 mg PO TID x 14-21 days</td>
<td>• Cefuroxime 500 mg PO BID x 14-21 days</td>
<td>• Cefuroxime 30 mg/kg/day, PO, divided BID (maximum 1 g/day) for 14-21 days</td>
</tr>
</tbody>
</table>

Box 5. Laboratory testing for Lyme disease
- Do not base management on a pending laboratory tick submission.
- Testing is not indicated for asymptomatic patients
- Limited value in early disease
- IgM usually within 2 weeks, IgG in most patients within 1 month
- Antibiotic treatment in early disease may reduce seroconversion
- Public Health Ontario Laboratory (PHOL) conducts two-tiered serologic testing to maximize sensitivity and specificity
- On PHOL requisition, specify the following:
  - Timing of exposure
  - Travel history/location of exposure
  - If suspicious of European-acquired Lyme disease, specify European travel on the requisition (a different assay is used)
  - Clinical signs and symptoms
- PHOL requisition is available at publichealthontario.ca/en/eRepository/General_test_fillable_requisition.pdf

Box 6. Tick surveillance and submission
- Tick testing is most helpful for public health surveillance in identifying risk areas.
- Lyme disease is transmitted by both adult and the immature ticks (called a nymph). Nymphs are very small (less than 2mm) and can easily go unrecognized.
- Peel Public Health accepts ticks for submission; contact our vector borne disease team at 905-799-7700; 905-584-2216 (in Caledon) or send us an email here: peelregion.ca/scripts/mailto.pl?mailto=healthline
- Forms for tick submissions can be found under the “Laboratory” section at this website: publichealthontario.ca/en/BrowseByTopic/InfectiousDiseases/Pages/IDLandingPages/Lyme-Disease.aspx#VwJ_evm6f3Q

Figure 2 – Blacklegged tick

Photo credits: James Gathany

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