New Jersey Department of Health and Senior Services 1999

*Lyme disease is the most commonly reported tick-borne disease in the United States...*

# Do *YOU* know how to reduce your risk of contracting tick-borne diseases?

# Tick-borne Diseases of New Jersey

## *A Guide to Understanding and Preventing Transmission*

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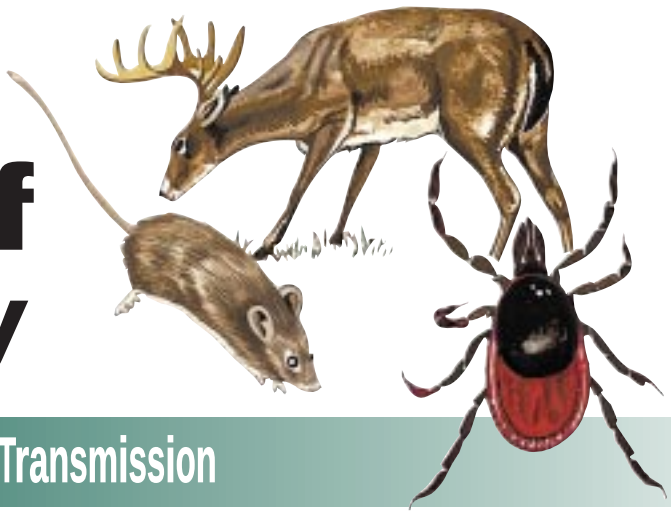

## A Guide to Understanding and Preventing Transmission

## INTRODUCTION

This pamphlet provides basic information about signs and symptoms, transmission, tick biology and ecology, and the current status of tick-borne diseases in New Jersey, with prevention and early recognition as the major goals. It should not be considered a substitute for the patient-physician relationship.

## BACKGROUND

Prior to the late 1970's, tick-borne diseases in New Jersey were relatively rare and not considered a major public health threat. Rocky Mountain spotted fever (RMSF) was the only tick-borne disease recognized in New Jersey at that time. The first cases of Lyme disease were reported in New Jersey in 1978 and since then, it has been the most commonly reported tick-borne disease in the United States. The majority of Lyme disease cases occur in the Northeast. New Jersey consistently ranks among the states reporting the most cases. Recently, several other tick-borne diseases have become a concern, including human granulocytic ehrlichiosis (HGE), human monocytic ehrlichiosis (HME), and babesiosis. The geographical distribution and public health importance of these emerging tick-borne diseases in New Jersey is not well understood at this point.

Three ticks, called vectors, are responsible for all tick-borne disease transmission in New Jersey:

1. **black-legged tick** or more commonly known as the **deer tick** *(Ixodes scapularis)*
2. **lone star tick** *(Amblyomma americanum)*
3. **American dog tick** *(Dermacentor variabilis)*

The adult stage of each tick species is shown in *FIGURE 1*.

Each of these species is a 3-host tick, meaning it must locate and obtain a bloodmeal from a host animal in each of its active developmental stages (larva, nymph, adult) to complete its life cycle *(FIGURE 2)*.

The role that various hosts play in the transmission cycles is critical to understanding tick-borne diseases. Certain animals provide a source of blood only and are termed maintenance hosts. Those that provide a bloodmeal and a source of disease organisms are called reservoir hosts. Certain hosts, such as birds, are also responsible for dispersal of ticks over

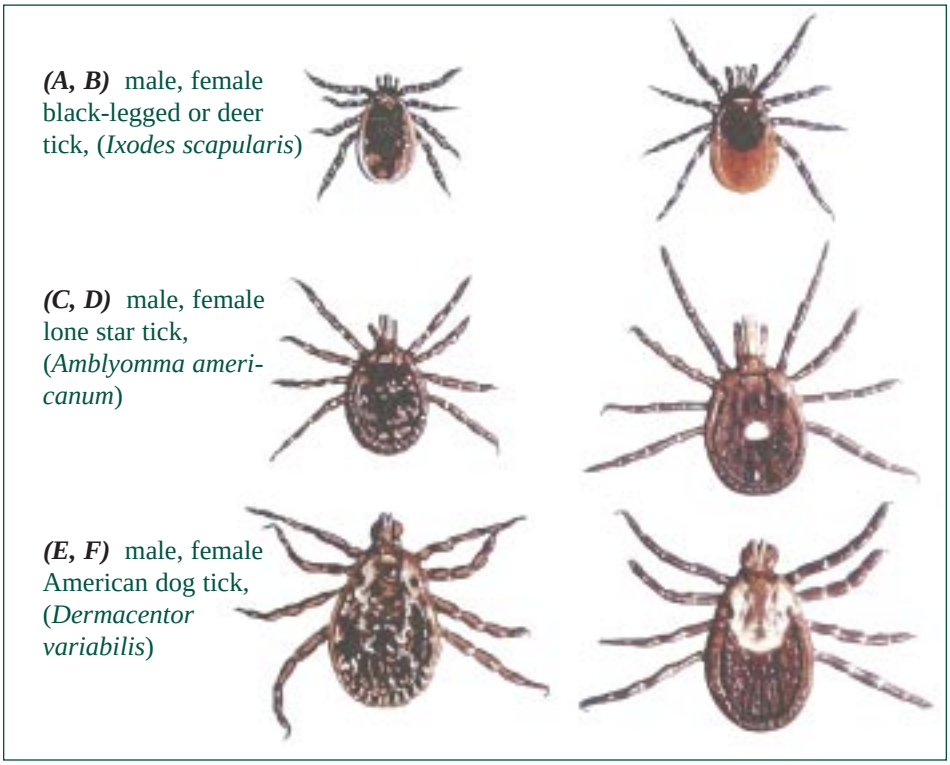


***FIGURE 1:*** Ticks of medical importance in New Jersey.

long distances. The ticks involved in disease transmission in New Jersey are not host-specific, that is, they will feed on a variety of animals. The type of host generally is determined by the behavior of the tick species and life stage. Humans are considered incidental hosts.

The transmission cycles of the various tick-borne diseases have both similarities and differences. Lyme disease, human granulocytic ehrlichiosis, and babesiosis share a common reservoir host (white-footed mouse) and tick vector (black-legged tick), both of which are most frequently encountered in forested habitats. Rocky Mountain spotted fever has a different reservoir host and tick vector (American dog tick), which exploits habitats quite different from the other tick species. Therefore, an understanding of these differences is important in reducing exposure to infected ticks and minimizing transmission risk.

Prevention and a discussion of the similarities and differences among the tick-borne diseases are highlighted in the following sections.

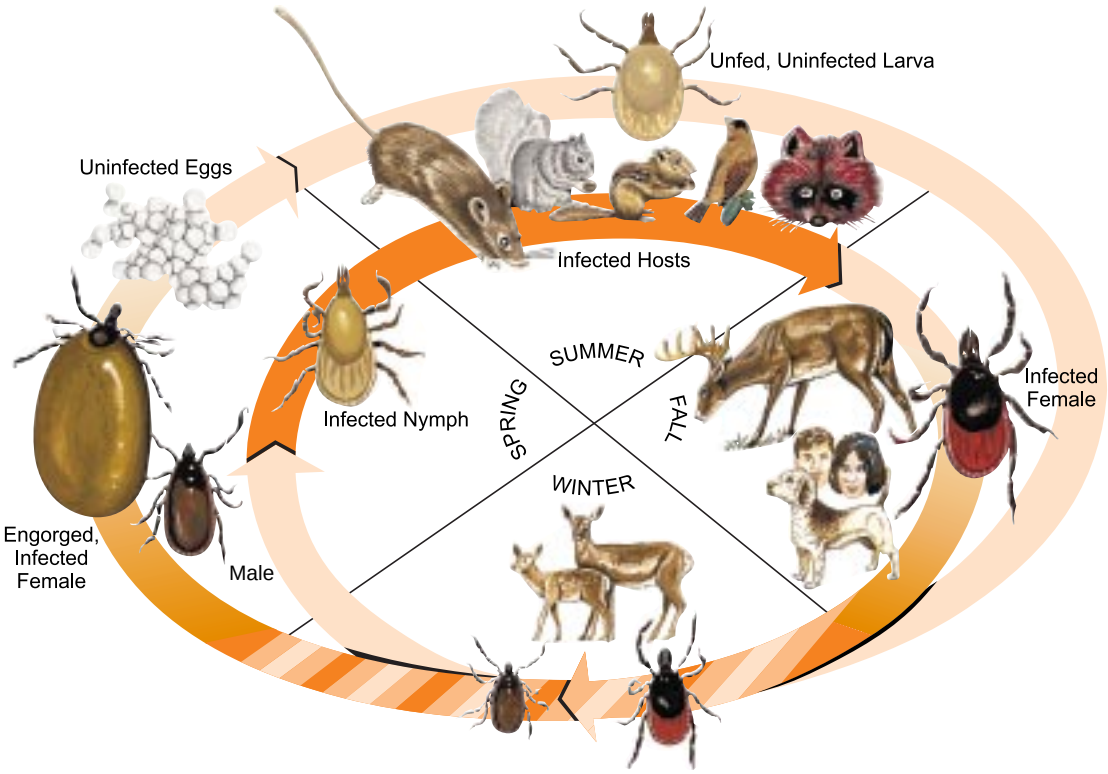


***FIGURE 2:*** Black-legged ticks and the Lyme disease transmission cycle (darker orange denotes higher transmission risk).

## PREVENTION

The best way to prevent tick-borne diseases is to avoid tick-infested areas, including woodland, wooded edges, and landscaped areas with dense ground cover, leaf litter, or shrubs. If this is not possible, take the following precautions when entering likely tick habitats.

✓ Wear light-colored clothing, making it easier to see ticks.

✓ Tuck pants legs into socks and shirts into pants. Ticks will be forced to crawl on the outside of clothing, where they can be more easily seen and removed.

✓ Use repellents. Personal repellents which contain DEET can be used on skin or clothing, while repellents containing permethrin should only be used on clothing. **Be certain to read label directions carefully.**

The risk of transmission can be reduced further by examining yourself and family members when returning from tick-infested areas and removing ticks before they have a chance to feed. Ticks require a relatively long time to insert their mouthparts and begin feeding. Ticks that are removed promptly are unlikely to transmit disease organisms. Ticks embedded in the skin should only be removed by grasping the tick with pointed tweezers as close to the skin as possible and applying firm, steady backward force until the tick becomes dislodged *(FIGURE 3)*.

Attempts to remove attached ticks with noxious chemicals or by burning will not work, may cause injury to the skin, and can increase the risk of transmission by causing the tick to regurgitate disease organisms into the body. After the tick has been removed, wash the skin area thoroughly to avoid infection.

***FIGURE 3:*** Recommended tick removal method.

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# TICK-BORNE DISEASES

## LYME DISEASE

**Description:** multi-systemic, inflammatory disease caused by a spirochete; characterized in early phase by a distinctive skin lesion known as *erythema migrans* (EM) which first appears as a red, raised area, but tends to expand in size over time, and may develop a centralized clearing; single or multiple lesions often accompanied or preceded by a variety of other symptoms including headache, fever, fatigue, malaise, joint pain, stiff neck, and nausea; incubation period 3-30 days; within weeks or months of the appearance of EM (early phase Lyme disease), neurologic and cardiac symptoms may develop; latter phase of Lyme disease, which may occur weeks to years following onset, marked by swelling and pain in the large joints, particularly the knees; in both early and advanced phases of Lyme disease, symptoms are often recurrent and may become chronic in untreated individuals
**Diagnosis:** clinical findings and serological (blood) tests; early disease based solely on the appearance of the EM lesion
**Treatment:** oral or intravenous antibiotics, depending on symptoms and stage of the illness; treatment most successful during early disease
**Causative Agent:** *Borrelia burgdorferi*
**Vector:** black-legged tick
**Reservoir:** white-footed mouse *(Peromyscus leucopus*)
**Distribution:** wooded rural and suburban environments statewide; originally thought to be a coastal phenomenon, but 50% of cases now reported from Hunterdon, Morris, and Somerset Counties
**Status:** >2,000 confirmed cases annually

## ROCKY MOUNTAIN SPOTTED FEVER

**Description:** rickettsial disease with sudden onset of fever, which may persist for 2-3 weeks in untreated cases, malaise, muscle pain, severe headache, chills, and conjunctivitis; a spotted rash may appear on the palms and soles in about 50% of cases, and may spread rapidly to other parts of the body; incubation period is 3-14 days; the fatality rate may reach l5-20% in untreated cases
**Diagnosis:** clinical presentation and serological testing
**Treatment:** tetracyclines for adults; chloramphenicol preferred for children under 8 and pregnant women
**Causative Agent:** *Rickettsia rickettsii*
**Vector:** American dog tick, with the lone star tick as a potential secondary vector
**Reservoir:** meadow vole (*Microtus pennsylvanicus*)
**Distribution:** meadows, fields, and woodland edge in rural and suburban environments throughout its range; may be encountered in urban settings
**Status:** average of 10 cases annually

## HUMAN GRANULOCYTIC EHRLICHIOSIS

**Description:** rickettsial disease characterized by fever, chills, malaise, headache, muscle aches and pain, nausea, vomiting, and cough; incubation period estimated to be 1-3 weeks; illness may be severe, fatalities rare (5%)
**Diagnosis:** clinical presentation and serological testing
**Treatment:** tetracycline or doxycycline
**Causative Agent:** *Ehrlichia* sp. closely related to *E. equi*
**Vector:** probably black-legged tick
**Reservoir:** white-footed mouse; also found in horses and dogs
**Distribution:** probably wooded rural and suburban environments statewide
**Status:** the first confirmed human case in New Jersey reported in 1997

## HUMAN MONOCYTIC EHRLICHIOSIS

**Description:** rickettsial disease characterized by fever, headache, muscle aches and pain, anorexia, diarrhea, abdominal pain, and confusion; incubation period estimated to be 1-3 weeks; illness may be severe, fatalities rare (2-3%); frequency and effects of persistent infections unknown
**Diagnosis:** difficult to establish in the acute stage of the illness, but should be considered with history of tick exposure within 3 weeks of onset; confirmed through serological testing
**Treatment:** tetracyclines for adults; chloramphenicol preferred for children under 8 and pregnant women
**Causative Agent:** *Ehrlichia chaffeensis*
**Vector:** probably lone star tick, possibly American dog tick
**Reservoir:** white-tailed deer *(Odocoileus virginianus)*
**Distribution:** probably wooded rural and suburban environments in central and southern New Jersey
**Status:** average 12 cases annually since 1995

## BABESIOSIS

**Description:** protozoan disease characterized by fever, chills, headache, muscle pain, fatigue and anemia, which may persist from several days to months; incubation period is variable, ranging between 1 week to 1 year; illness may be severe and potentially fatal
**Diagnosis:** identification of the parasite in red blood cells and serologic confirmation
**Treatment:** clindamycin and quinine
**Causative Agent:** *Babesia microti*
**Vector:** black-legged tick nymph
**Reservoir:** meadow vole and white-footed mouse
**Distribution:** wooded rural and suburban environments, particularly in coastal areas throughout its range
**Status:** the first confirmed human case in New Jersey reported in 1997

## LYME DISEASE-LIKE ILLNESS

**Description:** clinically indistinguishable from Lyme disease
**Diagnosis:** clinical presentation and serological tests
**Treatment:** oral or intravenous antibiotics, depending on symptoms and stage of the illness; treatment most successful in early disease
**Causative Agent:** *Borrelia lonestari*
**Vector:** lone star tick
**Reservoir:** unknown
**Distribution:** probably wooded rural and suburban environments throughout central and southern New Jersey
**Status:** *Amblyomma americanum* - transmitted Lyme disease first reported in New Jersey in 1984; percentage of Lyme disease cases that are actually Lyme disease-like illness unknown