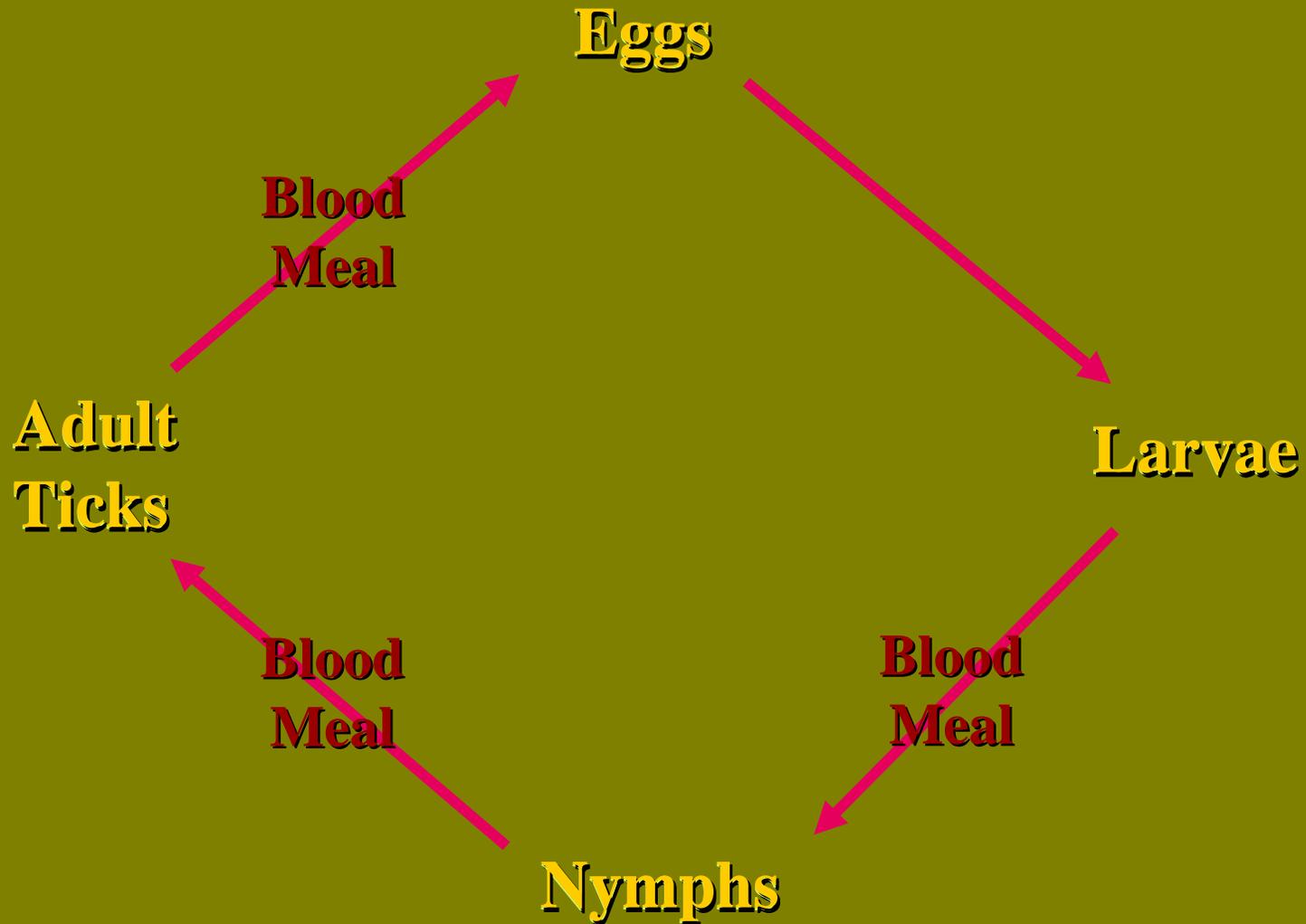


Ticks and Tick Borne Diseases in Virginia

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Tick Life Cycle



Tick Borne Diseases in Virginia: Rocky Mountain Spotted Fever, Lyme Disease, Ehrlichiosis, Babesiosis and Tularemia.

Three Important Vector Tick Species Found in Virginia

American dog tick

**Very
common**



Lone star tick

**Very
common**



Black legged tick (deer tick)

Uncommon or locally common



Vector Tick Species Found in Virginia

**American dog tick
(adult only)**



**Deer tick (adult and
nymph)**



Lone star tick (adult and nymph)

Rocky Mountain Spotted Fever (RSMF)

Causative Agent – Bacteria –
Rickettsia rickettsii

Tick Vector species –
American dog tick.



RMSF: Transmission

Transmission Season (90% of U.S. cases)	April-September
Minimum Tick Bite Duration for Transmission	3-6 hours

Tick Transmission of Rocky Mountain Spotted Fever (RSMF):

Larval and nymphal American dog ticks may become infected with *R. rickettsii* by feeding on several small rodent species that serve as reservoirs.

Infected, adult, female American dog ticks may also lay infected eggs that then become infected ticks.

R. rickettsii is detrimental to infected ticks, so very few infected larvae survive to become adult ticks.

Only Adult American dog ticks feed on humans, so only adult ticks can transmit RMSF to humans.

Fewer than 3% of adult ticks will be infected in epidemic areas.

Tick Transmission of Rocky Mountain Spotted Fever (RSMF):

Although the American dog tick is the principal vector of RSMF, several other Virginia tick species have been found infected with *R. rickettsii*.

Therefore, although uncommon, it is possible that RSMF could also be transmitted by lone star ticks or deer ticks.

Ehrlichiosis (Human Monocytic and Granulocytic)

Human Monocytic Ehrlichiosis (HME)

Causative Agent – Bacteria -
Ehrlichia chaffeensis & *E. ewingii*

Tick Vector Species – **Lone star tick.**



Human Granulocytic Ehrlichiosis (HGE)

Causative Agent – Bacteria -
Anaplasmosis phagocytophila

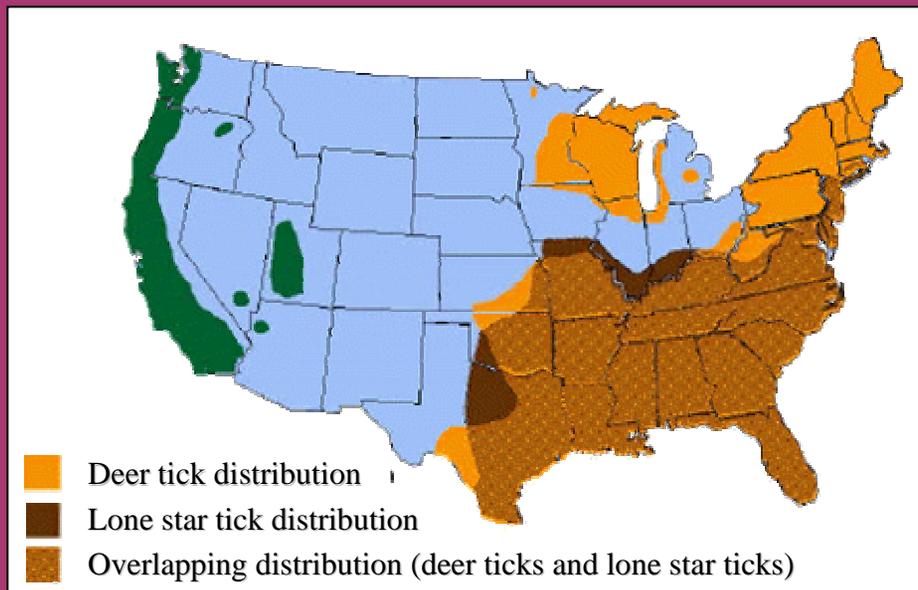
Tick Vector Species – **Black legged tick
(a.k.a. deer tick).**



Human Monocytic Ehrlichiosis (HME) Transmission

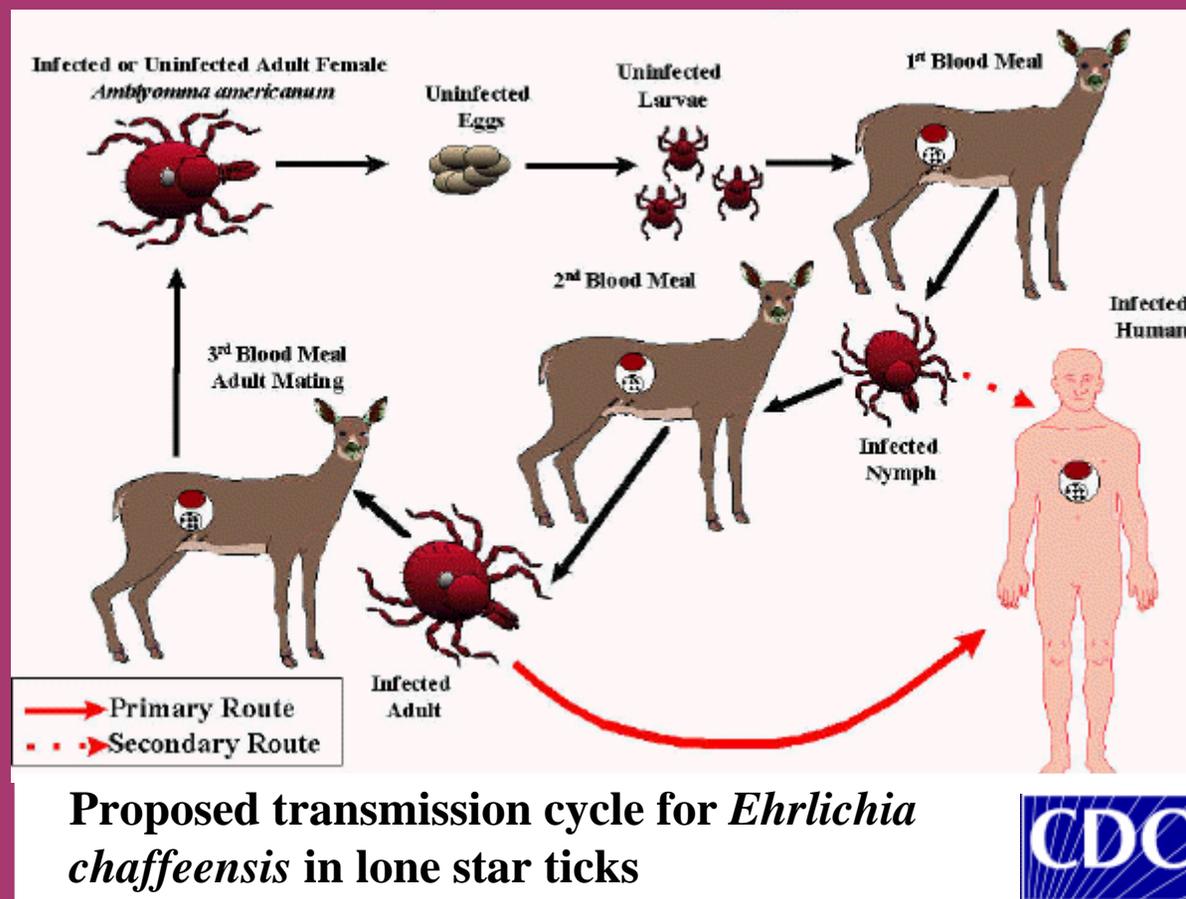
Transmission Season (when 80 to 90% of U.S. cases occur)	April-September
Minimum Tick Bite Duration for Transmission	24 hours

Most HME transmission occurs in the areas of southeastern and south central U.S. ( ) where **lone star ticks** occur.



Tick Transmission of HME:

White tailed deer serve as the primary disease reservoir where larval, nymphal and adult lone star ticks can become infected with *E. chaffeensis*.



Tick Transmission of HME:

Only nymphal and adult - lone star ticks feed on humans or transmit HME to humans.

Adult ticks are the most important vectors.

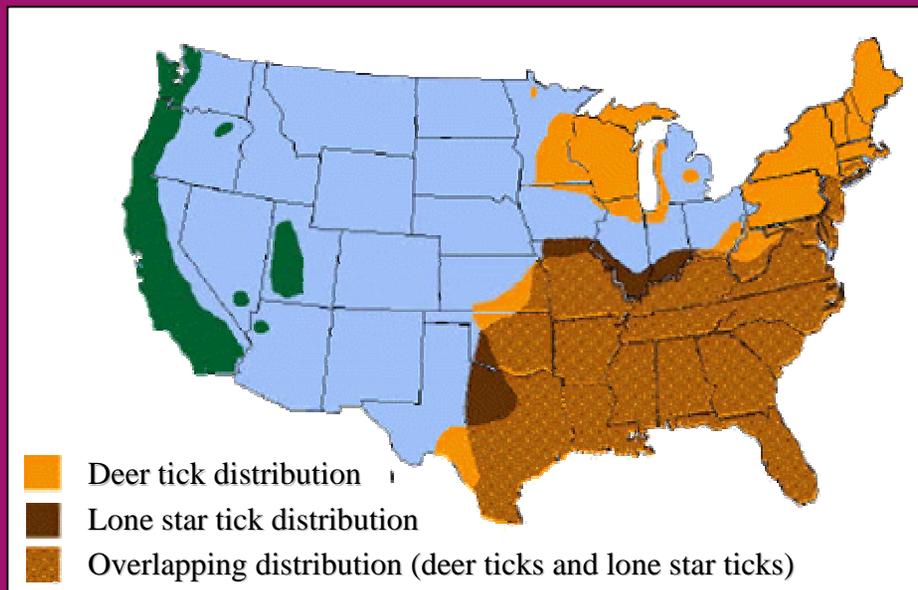
Dogs and deer may also serve as disease reservoirs where ticks become infected with *E. ewingii*.

Several other tick species have tested positive for *E. chaffeensis* and it is possible that American dog ticks play a small role in HME transmission.

Human Granulocytic Ehrlichiosis (HGE) Transmission

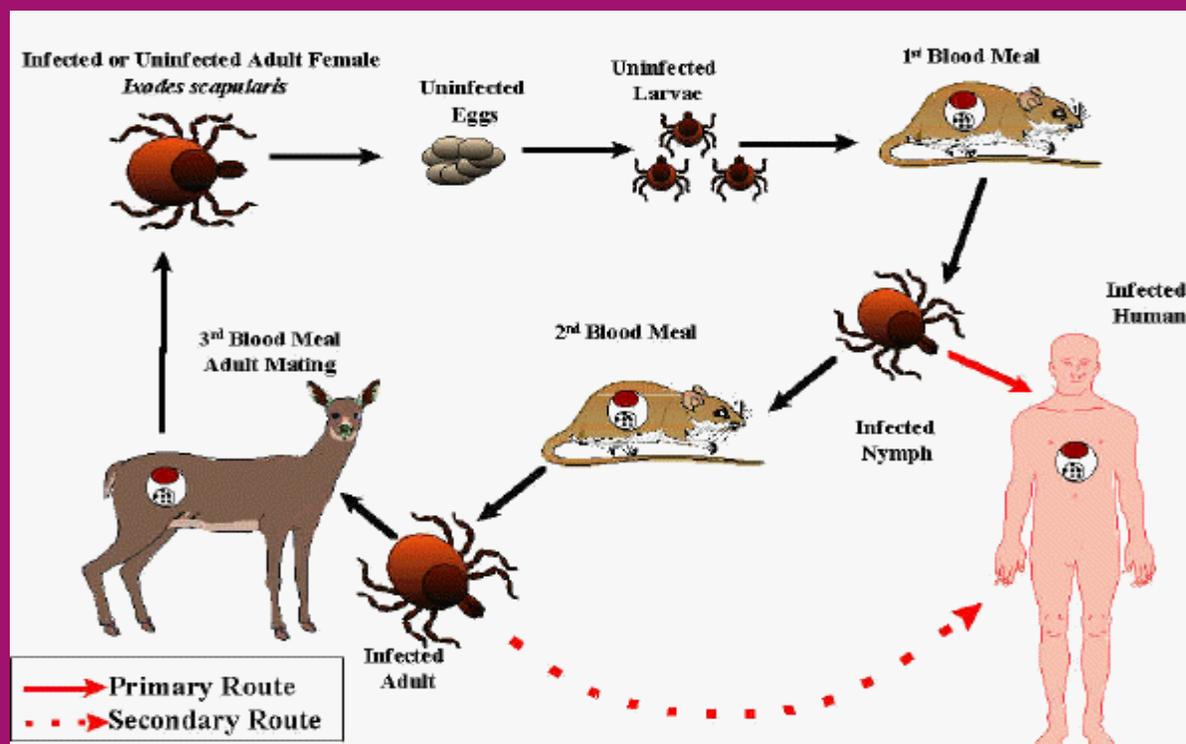
Transmission Season (when 80 to 90% of U.S. cases occur)	April-September
Minimum Tick Bite Duration for Transmission	24 hours

Most HGE transmission occurs in the areas of northeastern and north central U.S. (■) where **deer ticks** are common.



Tick Transmission of HGE:

Small rodents serve as the primary disease reservoir where larval, nymphal and adult deer ticks can become infected with *Anaplasma phagocytophila*.



Proposed transmission cycle for *Anaplasma phagocytophila* in deer ticks



Tick Transmission of HGE:

Only nymphal and adult - deer ticks feed on humans.

Both nymphal and adult deer tick stages can transmit HGE to humans, but nymphal deer ticks are more important as vectors.

Because the deer tick is involved in Lyme disease transmission, HGE may be common wherever Lyme disease is common.

No other tick species are known to play a role in HGE transmission.

Lyme Disease and Southern Tick Associated Rash Illness (STARI)

Lyme Disease

Causative Agent – Bacteria
(spirochete) – *Borrelia burgdorferi*

Tick Vector Species – **Black legged tick**
(a.k.a. deer tick).



STARI

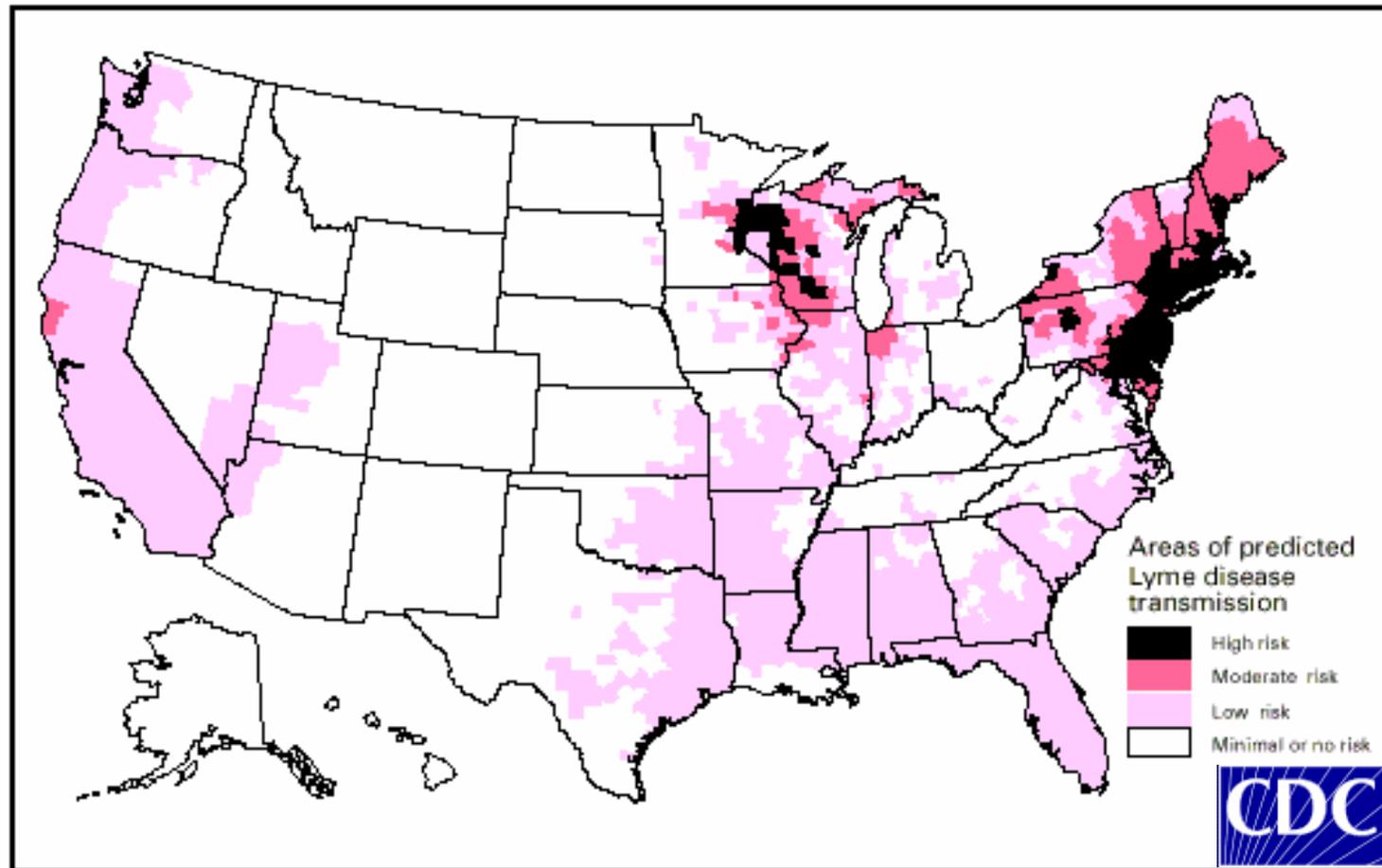
Causative Agent – Bacteria
(spirochete) – *Borrelia lonestari*

Tick Vector Species – **Lone star tick.**



Distribution of deer ticks and Lyme disease in U.S.

National Lyme disease risk map with four categories of risk



Note: This map demonstrates an approximate distribution of predicted Lyme disease risk in the United States. The true relative risk in any given county compared with other counties might differ from that shown here and might change from year to year. Risk categories are defined in the accompanying text. Information on risk distribution within states and counties is best obtained from state and local public health authorities.

Lyme Disease Transmission

Transmission Season
(when most cases occur)

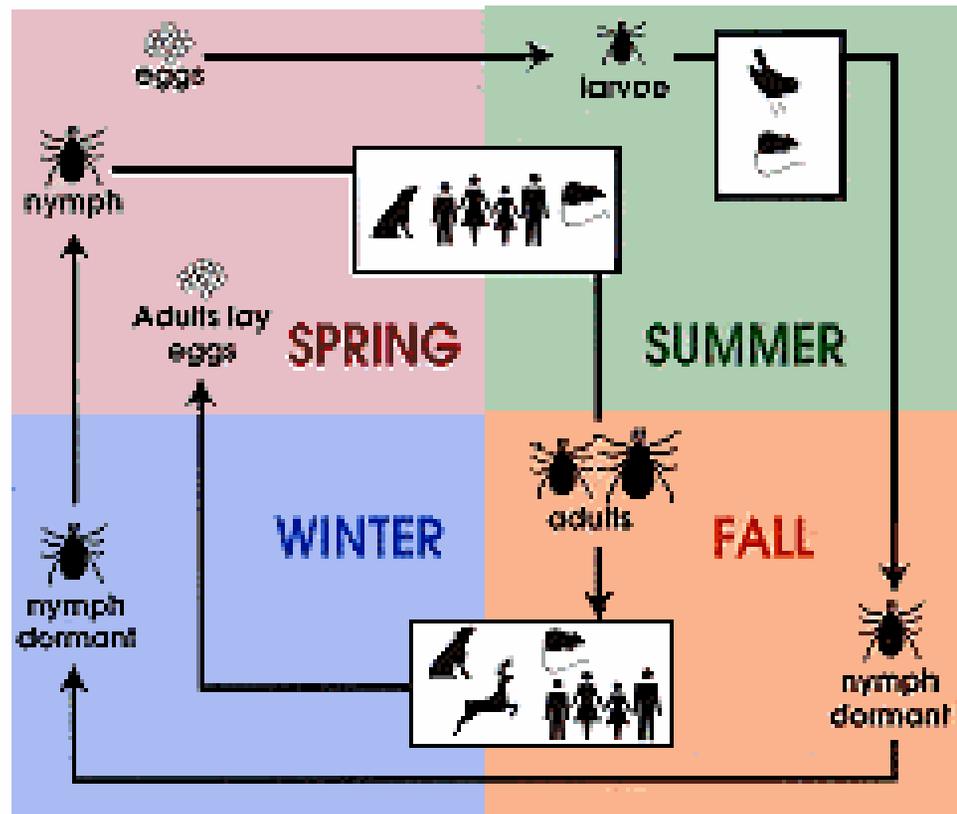
May-July (when nymphal deer ticks are feeding)

Minimum Tick Bite Duration for Transmission

24 hours



2-Year Life Cycle of the Deer Tick



American Lyme Disease foundation ALDF

Lyme Disease Transmission

Small rodents serve as food for larval ticks and as the reservoir hosts for Lyme disease.

Nymphal deer ticks feed on mammals (rodents, dogs, deer), and birds some of which may also play roles as reservoirs for Lyme disease.

Only nymphal and adult - deer ticks feed on humans or transmit Lyme disease to humans.

Nymphal deer ticks are the most important vectors.

No other tick species are known to play a role in Lyme disease transmission.

Transmission of Southern Tick Associated Rash Illness (STARI); a Lyme disease – like illness

Transmission Season (when most U.S. cases occur)	April-September
Minimum Tick Bite Duration for Transmission	24 hours

White tailed deer serve as the reservoir where larval, nymphal and adult lone star ticks pick up the *B. lonestari* pathogen.

STARI is transmitted to humans by both nymphal and adult lone star ticks.



Transmission of Babesiosis

Transmission Season (when most U.S. cases occur)

June-September

Causative Agent – Protozoa –
Babesia microti

Vector Species – **Black legged tick**
(a.k.a. deer tick).

Larval deer ticks feed on small rodents which serve as the reservoir hosts for *Babesia microti* .



Transmission of Babesiosis

Nymphal and adult - deer ticks transmit *B. microti* to humans.

Since its discovery in 1969, most human cases of Babesiosis have been recorded in the coastal northeastern states (New Jersey, New York, Connecticut, Rhode island and Massachusetts), but it has also occurred in Minnesota and Wisconsin.

Transmission of Tularemia

Transmission Season (when most U.S. cases occur)

May-August

Causative Agent – Bacteria –
Francisella tularensis

Although Tularemia can be spread in many ways (e.g., aerosol, contaminated water, deer fly bites, etc.) the majority of American cases result from transmission by tick vectors.

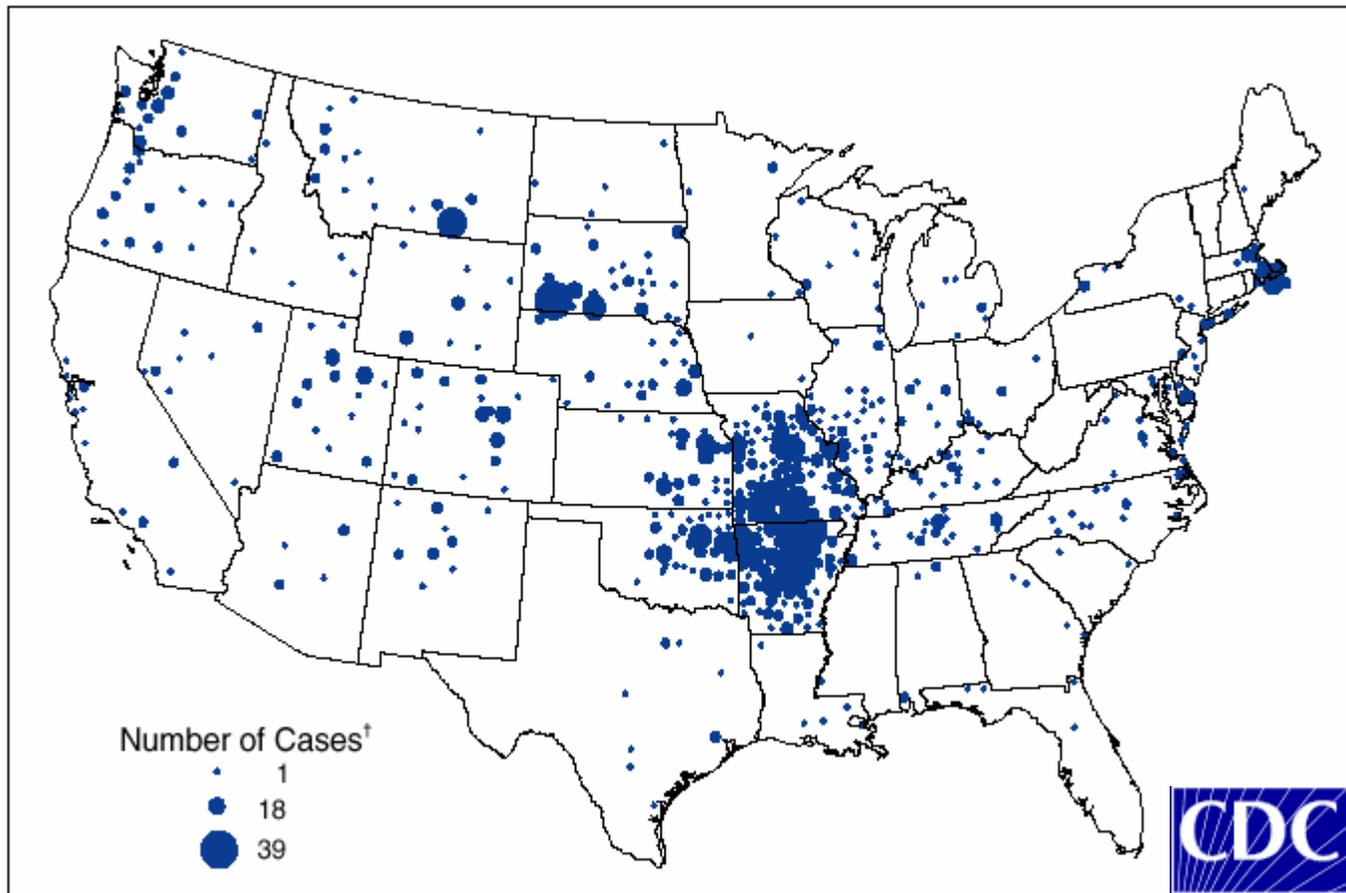
Tick Vector Species – American dog ticks and lone star ticks



Transmission of Tularemia

Larval and Nymphal and ticks are infected when feeding on rabbits and voles.

Reported cases of Tularemia in the United States, 1990 - 2000



Prevention of Tick Borne Diseases

Avoidance of Tick Habitats and Ticks

Avoid prolonged periods in tick habitats (humid forest environments with dense undergrowth and/or heavy leaf litter; tall weeds along forest margins, tree lines, forest trails and small forest clearings).

Wear repellents (DEET or Permethrin) on clothing and shoes.

Wear light colored clothing and tuck pants legs under socks.

Thoroughly check yourself (clothing and body) after spending time in tick habitats; use a full length mirror if possible.

Prevention of Tick Borne Diseases

Tick Removal

The transmission of tick borne diseases may require hours or days of feeding time, so prompt tick removal greatly reduces the chance of disease transmission..

Carefully remove tick using tweezers.

Wash and disinfect tick bite site.

Save tick in vial of alcohol for future identification. If you subsequently become ill, tick identification might provide a clue as to the nature of your illness.

Tick and Disease Control Tactics

Application of Insecticides

Residual insecticides can be sprayed on foliage brush and the ground around kennels, or in a perimeter around property. Granular insecticides can be broadcast over large areas of forest floor around residential areas.

Habitat Management

When in proximity to areas of human activity, brush and leaf litter that may serve as harborage for rodents and ticks can be mowed or removed.

Tick and Disease Control Tactics

Deer Management

Deer are the most important source of food for adults of several tick species.

Blood acquired from deer allows adult ticks to lay eggs.

Deer are also a source of several tick borne pathogens.

Reduction of local deer populations reduces the source of food and diseases for ticks.



Deer ears covered by hundreds of lone star ticks

Tick and Disease Control Tactics

Control of Ticks on Deer using a “4-Poster Device”

Experimental deer feeding station called a 4-Poster.



By applying insecticide to deer's ears, the 4-Poster has been able to reduce local tick populations by $> 95\%$ in several locations.

American Lyme Disease foundation

Tick and Disease Control Tactics

Rodent Management

Larvae and nymphs of many tick species feed on rodents and acquire pathogens. Reduction of local rodent populations will reduce the source of food and disease for ticks.

Control of Ticks on Rodents Using Treated Bait Stations

Studies are being conducted by the CDC using rodent bait boxes containing insecticide treated rollers that kill larval and nymphal ticks on wild rodent populations when rodents come to feed on bait.