

ABOUT TICKS

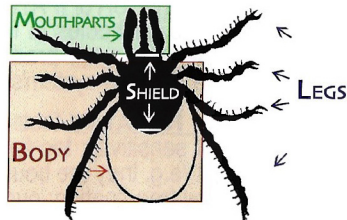
A tick's only food is the blood and fluid of its host. Ticks are arachnids, not insects. There are approximately 800 kinds of ticks.

4 LIFE STAGES OF HARD TICKS

1. **Egg** hatches to a larva.
2. **Larva** has 6 legs. It takes a blood meal and then molts to a nymph.
3. **Nymph** has 8 legs. It takes a blood meal and then molts to either an adult female or adult male.
4. **Adult** has 8 legs and sex differentiation to male and female.

Female has a small shield covering only the top 1/3 of its body. This leaves the rest of the body flexible so it can engorge with blood. When the female feeds the shield is pushed forward. The female takes a blood meal, mates, lays eggs, and dies.

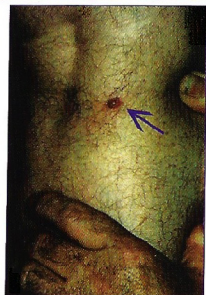
Male has a hard shield covering the full length of the tick. The male feeds for moisture, but can not engorge.



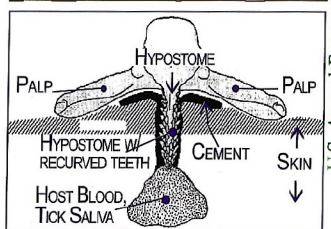
Ticks have 2 parts: "Mouthparts" & "Body." These are connected by muscles. The mouthparts are: 2 palps on each side (having sensory host-locating organs), a hypostome (a gutter-like concave 1/2 tube located on the underside) with recurved teeth (helps adhere to the skin) protruding from the top, and 2 chelicerae (with "teeth" on the protruding ends of the chelicerae) extending from the top.

A tick uses its teeth to slice and tear into the host's skin. The underside of the chelicerae is pressed against the open side of the hypostome to form a "straw" shape (common channel) used to suck the pooling blood. The tick secretes an anticoagulant to prevent blood clotting and a cement to help adhere itself to the skin.

TICK ATTACHED BEHIND THE KNEE



TICK MOUTHPARTS DURING FEEDING



U.S. Armed Forces

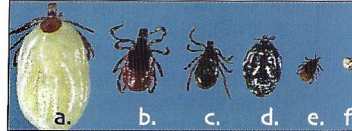
EASY TICK IDENTIFICATION

1. How many legs does the tick have? A larva has 6 legs, a nymph and adult have 8 legs.
2. Does it have a 1/3 shield? If yes, it is a female hard tick.
3. What are its markings? Compare your tick to the pictures below. This will give a rough idea of the genus of the tick.

LYME TICKS

Black-legged ticks and Western black-legged ticks look identical and both transmit Lyme disease.

- a. Engorged female.
- b. Unfed female - Brick body color with an all black shield.
- c. Male.
- d. Engorged (fed) nymph.
- e. Unfed nymph.
- f. Larva.



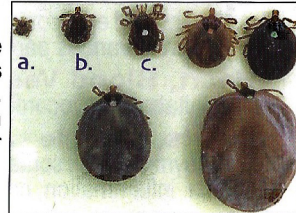
LYME TICKS

Black legged ticks and Western black-legged ticks look almost identical.



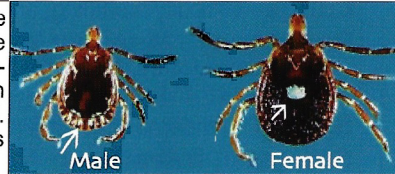
LONE STAR TICKS

a. Nymph b. Male c. Female unengorged. The rest are females in various stages of engorgement. Note the location of the white dot on engorged females moves from center to the front of its shield.



LONE STAR TICKS

Males have pale white lacey markings around the bottom of their shield. Females have a white dot on the bottom of their shield. These reddish-brown ticks have longer mouthparts.



DOG TICKS

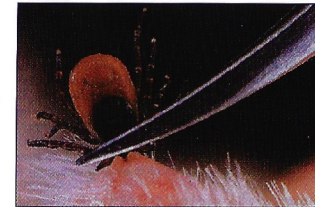
Females have silvery grey chalk-like marking on their shield. Males have silvery markings down the whole back.



PREVENTING TICK BITES

- Reduce exposure to ticks. Avoid tick-infested areas or sitting directly on the ground, and stay in the center of paths.
- Wear light-colored shirt and pants so you can more easily see ticks.
- Tuck long-sleeved shirt into pants and pants into socks to thwart a tick's effort to crawl underneath clothing and onto your skin.
- Use EPA-approved tick repellents. Wash-off repellents when you return inside.
- Do frequent visual tick-checks, and a naked full body exam upon returning inside.

Proper tick removal



Permission of NEJM

REMOVING TICKS

- 1 Place fine-point tweezers around the tick's mouthparts, next to the skin, and gently pull the tick out.
- 2 Place the tick in a small vial labeled with the victim's name, address, date, tick's level of engorgement, and estimated hours attached. Send the tick for evaluation, or keep it in case symptoms of disease begin. Mark this on your calendar.
- 3 Wash your hands, disinfect the tweezers and the bite site.
- 4 Call your doctor regarding potential treatment.
- 5 Visit the website www.Lyme.org for more information.
- 6 Watch for indications of a tick-spread disorder.

CAUTIONS

- Teach children to seek adult help for tick removal.
- Do not prick, crush, or burn the tick as it may release infectious fluids or tissue.
- Do not try to smother the tick (e.g. petroleum jelly, nail polish) as it has enough oxygen to complete feeding.

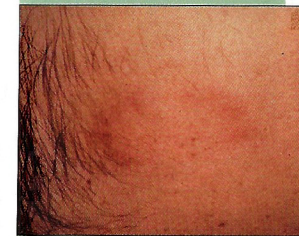
TO DONATE TO THE LDF

If you'd like to donate to the LDF, please consider going online to lyme.org and making a direct donation. Checks and cash donations through the mail, while risky, are also welcomed.

Direct

LDF accepts donations of cash, stock, by will, hosting fundraisers, expertise, and vehicles.

Tick-Spread Diseases Which is a LYME DISEASE RASH



PBS TV Special Recognitions
Dr. Ticked-Off
INTERCOM



Web Medinex
Certified Healthwell
Editor's Choice



National Institutes of Health
Public Education Lifespan



Study Web Academic Excellence Lifespan



Rotary Int'l District Governor's Award



Lifetime TV Special Faces of Lyme Rx Club Award Global Award

Lyme Disease Foundation ("LDF")

384-G Merrow RD, Tolland CT. 06084

1-860-454-8909

www.lyme.org

WORKING FOR SOLUTIONS TO TICK-BORNE DISORDERS SINCE 1988

Answer: All of them

LYME DISEASE

Lyme disease is a bacterial infection caused by a spirochete named *Borrelia burgdorferi*. The disease is cycled in nature, where specific ticks bite infected animals, ingest bacteria, then transmit the infection through subsequent feeding.



SWOLLEN KNEE



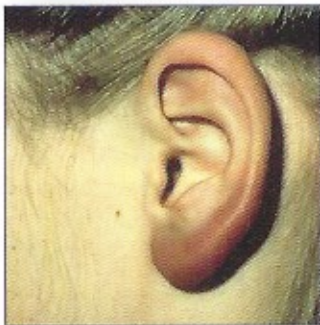
BELL'S PALS



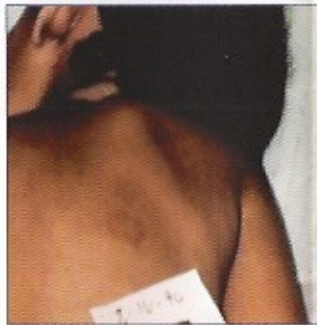
TRIANGLE RASH



MULTIPLE RASHES PER BITE



LYMPHOCYTOMA OF LOWER EAR LOBE



THUMB-PRINT SIZE



MULTIPLE RASHES



LARGE OVAL SHAPED RASH

OTHER TICK-BORNE DISORDERS

All tick-borne disorders tend to include: flu-like symptoms of fever, chills, malaise, headache, joint/muscle aches, & pain.

Babesiosis - Malaria-like protozoan parasite infection of the red blood cells. **Symptoms** can be mild to serious with a high fever and anemia. More severe in people with no spleen. **Transmitted by** the black-legged tick & probably western black-legged tick.

Bartonella (cat scratch disease) - Bacterial infection. **Symptoms** begin with a small red crusted mark that becomes swollen & discolored. Unique triad are swollen lymph nodes around ears, conjunctivitis, and exposure to vector. Extensive complications may occur. **Transmitted by** cat bites/scratches, Western black legged ticks, black legged ticks, and possibly brown dog ticks.

Colorado tick fever - Viral disease. **Symptoms** are characterized by a high fever and sometimes a faint rash. After a 2-3 day remission, symptoms recur accompanied by a drop in white blood cells. Complications may include encephalitis, heart problems, and severe bleeding. **Transmitted by** the Rocky Mountain wood tick & possibly the Pacific Coast tick.

Ehrlichiosis - Rickettsial infection that invades/kills white blood cells. **Symptoms** include vomiting, anemia, lung infection, decrease in white blood cells, elevated liver enzymes, sometimes a rash, a range of neurologic disorders, & death. Two forms exist - HME and HGE. **Transmitted by** the American dog, brown dog, lone star, black-legged, and probably Western black-legged ticks.

Master's "Lyme-like" disease - Bacterial infection. **Symptoms** mirror Lyme disease. **Transmission** is probably Lone star ticks.

Powassan encephalitis - Viral brain infection. **Symptoms** may include muscle weakness, pain behind the eyes, light sensitivity, seizures, partial or complete paralysis, hallucinations in sense of smell, aphasia (diminished ability to communicate), dementia, and death. **Transmitted by** the Rocky Mountain wood tick and sometimes the black-legged tick.

Relapsing fever - Multisystem bacterial infection. Symptoms similar to LD, but characterized by repeating bouts of fever lasting 2-9 days, alternating with no fever. Transmitted by soft ticks. Occurs primarily in western U.S.

Rocky Mountain spotted fever (RMSF) - Rickettsial infection. **Symptoms** include a reddish-to-black rash resembling measles starting on hands/ankles. Diagnosis and treatment must be made immediately or death can occur. **Transmitted by** Rocky Mountain wood, American dog, & Pacific Coast ticks. Possibly the lone star tick.

Tick paralysis - Paralyzing neurotoxin in saliva of female tick. **Symptoms** include loss of motor function, increasing paralysis starting in lower body, respiratory failure, and death. **Transmitted by** Rocky Mountain wood, American dog, and lone star ticks.

Tularemia - Bacterial infection. **Symptoms** include repeated fever spikes, swollen lymph nodes that ulcerate, conjunctivitis, & pneumonia. **Transmitted by** infected animals, contaminated water, & sometimes ticks (American dog, lone star, Rocky Mountain wood, Pacific Coast ticks).

LD SIGNS & SYMPTOMS

Lyme disease (LD) may start with general mild flu-like symptoms of fatigue, headache, muscle aches, and fever. About only 60%-70% of patients develop a skin rash days to weeks later.^a These symptoms can resolve and serious, multi-systemic problems may later occur. LD symptoms can imitate other diseases and can be misdiagnosed.

Skin - One or more erythema migrans (EM) rash, which varies in size and shape; may have rings of varying shades (reddish, purple, or bruised-looking) or be uniformly discolored; may be warm, smooth, or bumpy; may itch; and can be necrotic (crusty/oozy). The "bull's-eye" look is not the most common rash presentation.^a Multiple rashes per bite or rash(es) not at a bite-site indicates disseminated disease.

Later skin problems include lymphocytoma (benign nodule/tumor) and acrodermatitis chronica atropicans (discoloration/degeneration usually of the hands or feet).

Brain - Nerve conduction defects (weakness/paralysis of limbs, loss of reflexes, tingling sensations of the extremities); severe headaches; stiff neck; meningitis; dizziness or fainting; cranial nerve involvement (e.g. change in smell/taste; difficulty chewing, swallowing, or speaking; hoarseness or vocal cord problems; facial paralysis; drooping shoulders; inability to turn head; double vision; deviation of eyeball - wandering or lazy eye; drooping eyelid; light or sound sensitivity; change in hearing); stroke; abnormal brain waves or seizures; sleep disorders; cognitive changes (memory problems, confusion, decreased concentration); and behavioral changes (depression, personality changes).

Eyes - Vision changes, including blindness, retinal damage, optic atrophy, red eye, conjunctivitis, "spots" before eyes, inflammation or pain of various parts of the eye.

Heart, Blood Vessels - Irregular heartbeats, heart block, palpitations, myocarditis, chest pain, vasculitis.

Joints, Muscle - Joint pain (intermittent or chronic) usually not symmetrical; sometimes swelling; TMJ-like pain in jaw. Muscle pain, inflammation, cramps, or loss of tone.

Liver - Mild liver function abnormalities.

Lungs - Difficulty breathing, pneumonia.

Pregnancy - Miscarriage, premature birth, stillbirth, and neonatal deaths (rare). Congenital LD has been described in medical literature and textbooks.

Spleen - Tenderness, enlargement.

Stomach, Intestines - Nausea, vomiting, diarrhea, loss of appetite, anorexia.

^a FINDINGS FROM THE LARGEST LD TRIAL EVER CONDUCTED. PRESENTED BY MEDICAL DIRECTOR, SMITHKLINE BEECHAM, AT THE LDF/ILL. DEPT. OF HEALTH CONFERENCE.

FOR MORE INFORMATION VISIT WWW.LYME.ORG OR CONTACT THE LDF RE: INFORMATION ON BOOKS, VIDEO'S, & EDUCATIONAL PACKETS.

LDF, Box 332, Tolland, Ct 06084

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LD DIAGNOSIS

Lyme disease is a clinical diagnosis, based on signs/symptoms, with test results being a piece of information in the complete picture. A positive test can prove a patient is infected and demonstrate that the patient has become antibiotic-free. About 36% of culture-confirmed cases remain Western blot negative through infection.^a

LD LABORATORY TESTS

ANTIBODY TESTS

Antibodies are the immune system's response to "fight-off" infection. Tests strive to be both sensitive (detecting any LD antibodies) and specific (detecting just LD antibodies).

- **Titer** (ELISA or IFA) tests measure the amount of Bb antibodies in fluid.
- **Western blot** produces bands indicating the immune system's reactivity to Bb.

FALSE NEGATIVE tests occur due to: decreased test sensitivity; too low an antibody level to detect (e.g. they are bound to the bacteria); too few free-floating; current antibiotic or drug use; naturally low antibody production; the bacterium has changed, limiting immune system recognition; or bacterial strain variations.

FALSE POSITIVE tests occur due to test failure or cross-reactions to other antibodies.

DIRECT DETECTION TESTS

- **Antigen detection** test detects a unique protein in fluids of patients.
- **Polymerase chain reaction (PCR)** multiplies the number of Bb DNA to a measurable level.
- **Culturing** is growing bacteria.
- **Staining** marks Lyme bacteria in tissue.

LD TREATMENT

Treatment varies depending on how early diagnosis is made. No definitive treatment regimens have been determined and fail to occur with all protocols. No antibiotic is approved for use in disseminated Lyme disease. Infection that has disseminated may be treated with oral or intravenous antibiotics. Long-standing disseminated disease may require repeat courses of antibiotics.