

INFECTIOUS DISEASE • VECTOR-BORNE

Lyme Disease

Borrelia burgdorferi • Tick-Borne Spirochete • Multisystem Illness

★ DIANE'S NGN NCLEX 2026 STUDY SERIES ★

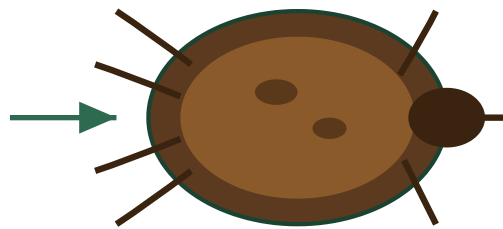
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Definition & Overview

What it is and why it matters

- **Lyme disease** is a bacterial infection caused by the spirochete *Borrelia burgdorferi*, transmitted to humans through the bite of an infected **black-legged (deer) tick** — *Ixodes scapularis* (East/Midwest) or *Ixodes pacificus* (West Coast).
- It is the **most common vector-borne illness in the United States**, with peak transmission in late spring and summer when nymph ticks are active.
- The tick typically must remain attached for **≥ 24–36 hours** for bacterial transmission to occur — prompt tick removal dramatically reduces risk.
- Untreated infection progresses through **3 stages** and can cause multisystem complications affecting skin, joints, heart, and nervous system.

Borrelia burgdorferi



***Ixodes scapularis* (Black-Legged Tick)**

The deer tick must remain attached ≥24–36 hours to transmit Borrelia burgdorferi

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Pathophysiology (Simplified)

From tick bite → multisystem infection

- 1 **Tick attachment.** Infected nymph or adult *Ixodes* tick attaches to skin in a warm, hidden area (groin, scalp, axilla, behind knee).
- ↓
- 2 **Bacterial transmission.** After ≥24–36 hours, *Borrelia burgdorferi* migrates from the tick's midgut into the human bloodstream via the bite.
- ↓
- 3 **Local skin invasion.** Spirochetes multiply in the dermis, triggering an expanding inflammatory response — **erythema migrans (bull's-eye rash)** appears in 3–30 days.
- ↓
- 4 **Hematogenous spread.** If untreated, bacteria disseminate through blood and lymph to joints, heart, and CNS within days to weeks.
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- 5 **Chronic immune response.** Persistent infection causes inflammatory arthritis (especially knees), neuroborreliosis, and carditis (AV block).

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Signs & Symptoms — The 3 Stages

Recognize the progression timeline

Stage 1: Early Localized

3–30 DAYS POST-BITE

- 🎯 **Erythema migrans** (bull's-eye rash) — hallmark sign
- Flu-like syndrome: fever, chills, fatigue
- Headache, neck stiffness
- Muscle & joint aches (myalgia, arthralgia)
- Swollen lymph nodes

Stage 2: Early Disseminated

DAYS–MONTHS LATER

- Multiple EM rashes across body
- **Bell's palsy** (facial nerve droop)
- Meningitis: severe headache + stiff neck
- 🚑 **Carditis** — AV block, palpitations, syncope
- Peripheral neuropathy, eye inflammation

Stage 3: Late Disseminated

MONTHS–YEARS LATER

- 🚑 **Lyme arthritis** — recurrent swelling, esp. **knees**
- Encephalopathy: memory, mood, sleep problems
- Peripheral neuropathy: numbness, tingling
- Chronic fatigue, cognitive fog
- Acrodermatitis (rare, late skin change)

Expands ≥ 5 cm · usually painless · NOT itchy



Erythema Migrans — "Bull's-Eye" Rash

EM appears in ~70–80% of cases — absence does NOT rule out Lyme

🚑 RED FLAG findings — escalate immediately:

- **Cardiac symptoms** — bradycardia, syncope, palpitations, chest pain → suspect *Lyme carditis* with AV block (requires hospitalization + cardiac monitoring)
- **Neurologic deficits** — sudden facial droop (Bell's palsy), severe headache + nuchal rigidity, focal weakness → suspect *neuroborreliosis* or meningitis

- **Severe joint swelling** with effusion (especially knee) — refer urgently

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Priority Nursing Interventions

ABCs · Safety · NCLEX prioritization

● Assessment Priorities

- **Assess the rash** — note size, shape, location, expansion (mark border with pen + date)
- Obtain **exposure history** — hiking, camping, gardening, geographic area, recent tick bite
- Perform a **full skin inspection** including scalp, groin, axilla, behind knees
- Assess **neuro status**: facial symmetry, LOC, headache, neck stiffness
- Monitor **cardiac rhythm** — ECG for AV block in suspected disseminated disease
- Assess joints for swelling, warmth, ROM (especially knees)

● Action Priorities

- **Administer antibiotics** as prescribed — start within 72 hours of suspected exposure for prophylaxis when indicated
- Educate on the **full antibiotic course** — do NOT stop early when feeling better
- **Remove attached ticks** properly with fine-tipped tweezers, grasp close to skin, pull straight up — do NOT twist or crush
- Apply **cool compresses** to rash; manage fever with acetaminophen
- For carditis: place on **continuous cardiac monitoring**, prepare for possible temporary pacemaker
- For arthritis: NSAIDs, joint rest, physical therapy referral

💡 **NCLEX Priority Rule:** In a client with confirmed Lyme disease, **cardiac involvement (AV block, syncope)** is **ALWAYS the top priority** over rash, arthritis, or fatigue. Apply ABCs — circulation/conduction first.

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Pharmacology

Treatment by stage and population

DRUG / CLASS	USE	KEY CONSIDERATIONS
Doxycycline (<i>tetracycline</i>)	First-line for adults & children ≥ 8 yrs; early Lyme, prophylaxis, mild disseminated	Photosensitivity (sunscreen!); GI upset; NOT for pregnancy, lactation, or children < 8 (stains teeth, slows bone growth); avoid dairy/antacids near dose
Amoxicillin (<i>penicillin</i>)	Alternative for children < 8 yrs, pregnant, or lactating clients	Assess for penicillin allergy; GI upset, rash; give with or without food
Cefuroxime (<i>2nd-gen cephalosporin</i>)	Alternative for those who can't take doxy or amoxicillin	Cross-sensitivity with penicillin (~10%); GI upset; give with food
Ceftriaxone IV (<i>3rd-gen cephalosporin</i>)	Severe/late disseminated: neuroborreliosis, meningitis, advanced AV block, refractory arthritis	14–28 day IV course; monitor for biliary sludging, allergic reactions; central-line considerations
NSAIDs (<i>ibuprofen, naproxen</i>)	Adjunct for arthralgia, Lyme arthritis pain	Take with food; monitor for GI bleed, renal effects; not a substitute for antibiotics

⚠ **Jarisch-Herxheimer reaction:** Within hours of starting antibiotics, spirochete die-off can cause a transient **worsening of fever, chills, headache, and myalgia**. Reassure the client — this is expected, self-limited, and does NOT mean treatment failure. Continue therapy.

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NCLEX Test Traps

What students confuse — sort it now

Trap 1: "No bull's-eye rash = no Lyme"

- ✗ Ruling out Lyme because the EM rash is absent
- ✓ Up to 20–30% of clients NEVER develop EM. Diagnose clinically + serology when exposure history fits.

Trap 2: Doxycycline in everyone

- ✗ Giving doxycycline to a 5-year-old or pregnant client
- ✓ Doxy is contraindicated in children < 8, pregnancy, and lactation → use amoxicillin instead.

Trap 3: Improper tick removal

- ✗ Burning the tick with a match, applying petroleum jelly, twisting, or squeezing the body
- ✓ Use fine-tipped tweezers, grasp close to the skin, pull straight up with steady pressure. Clean with antiseptic.

Trap 4: Stopping antibiotics early

- ✗ Stopping doxycycline when symptoms improve at day 5
- ✓ Complete the full 10–21 day course; early termination → relapse and late-stage complications.

Trap 5: Missing the cardiac red flag

- ✗ Prioritizing the rash over the client's new bradycardia and dizziness
- ✓ Cardiac involvement = ABCs priority. Lyme carditis with AV block is a medical emergency.

Trap 6: Confusing Bell's palsy

- ✗ Calling sudden facial droop in a hiker a stroke
- ✓ In endemic areas with recent outdoor exposure, suspect Lyme neuroborreliosis. Test before ruling out CVA.

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Patient & Family Education

Prevention + safe self-care



Prevention Before Outdoors

- Wear **long sleeves and pants**; tuck pants into socks
- Choose **light-colored clothing** — easier to spot ticks
- Apply **DEET 20–30%** repellent to skin; **permethrin** to clothing and gear
- Stay on cleared trails; avoid tall grass, leaf litter, brush
- Treat pets with veterinary tick prevention



After Outdoor Exposure

- **Shower within 2 hours** of coming indoors
- Perform full-body **tick check** — scalp, behind ears, axilla, groin, behind knees, waistband area
- Tumble dry clothes on **high heat for ≥ 10 minutes** to kill ticks
- Inspect pets and gear; brush off any ticks outdoors
- Monitor bite site daily for 30 days for expanding rash

Tick Removal — Teach the Client:

1. Use **fine-tipped tweezers** (or a tick-removal tool).
2. Grasp the tick **as close to the skin as possible**.
3. Pull **upward with steady, even pressure** — do NOT twist, jerk, or crush.
4. Clean the bite area and your hands with soap and water or alcohol.
5. **Save the tick** in a sealed bag/container in case identification is needed.
6. Watch for rash or symptoms for 30 days. Call the HCP if any develop.

When to call the provider: expanding rash, flu-like symptoms, joint swelling, facial droop, palpitations, severe headache, or stiff neck after a known or possible tick bite.

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Memory Boosters

Mnemonics & pattern recognition

"BULLSEYE" — Recognize Early Lyme

- B** Bull's-eye rash (erythema migrans, ≥ 5 cm)
- U** Unwell — fatigue, malaise, flu-like
- L** Lymph nodes swollen
- L** Low-grade fever, chills
- S** Stiff neck, headache
- E** Exposure — hiking, camping, endemic area
- Y** Yields to doxycycline (first-line)
- E** Educate on prevention + full antibiotic course

"TICK" — Safe Tick Removal

- T** Tweezers (fine-tipped, close to skin)
- I** Inspect entire body daily after exposure
- C** Clean bite area + hands with antiseptic
- K** Keep watching for rash/symptoms $\times 30$ days

"BAD HEART" — Late Disseminated Red Flags

- B** Bell's palsy (facial droop)
- A** Arthritis — knees, recurrent swelling
- D** Dizziness / syncope (AV block)
- H** Headache — severe, with stiff neck
- E** Encephalopathy — memory, mood, cognition
- A** AV block on ECG $\rightarrow$ cardiac emergency
- R** Rash recurrent or multiple
- T** Tingling / neuropathy

Pattern Recognition Tips

- **24 hours rule:** Ticks must usually feed ≥ 24 –36 hours to transmit Lyme. Early removal = prevention.
- **"Tooth or tick, age 8":** Doxycycline is OK for kids age 8 and up; younger $\rightarrow$ amoxicillin.

- **"Knees, Nerves, Node (AV)"** = the 3 N's of late Lyme: arthritis (knees), neuropathy, AV node block.
- **Two-tier testing:** ELISA first → if positive/equivocal, confirm with Western blot.

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NCJMM Clinical Judgment Scenario

Apply the 6-Step NCSBN Clinical Judgment Measurement Model

Scenario: A 34-year-old client presents to the clinic 10 days after a weekend camping trip in Maryland. They report fatigue, low-grade fever, headache, and an "expanding red ring" on the back of the left thigh. The lesion is 8 cm across with central clearing. Vital signs: T 100.6°F (38.1°C), HR 88, BP 122/76, RR 16, SpO₂ 98%. The client states they removed "a small black bug" 9 days ago. The HCP suspects early localized Lyme disease.

1 Recognize Cues

Expanding erythematous ring with central clearing (~8 cm), low-grade fever, fatigue, headache, recent tick removal, outdoor exposure in endemic area.

2 Analyze Cues

Classic **erythema migrans** + flu-like symptoms + tick exposure = textbook **Stage 1 Lyme disease**. No cardiac or neuro findings yet — must screen.

3 Prioritize Hypotheses

Priority: early localized Lyme disease.
Rule out: cellulitis, ringworm, allergic reaction, viral exanthem.

4 Generate Solutions

Begin **doxycycline 100 mg PO BID × 10–21 days**, draw ELISA serology, educate on full course, sun protection, rash monitoring, and tick prevention.

5 Take Action

Administer first dose, document rash size/border with date, screen for cardiac (ECG if indicated) and neuro findings, provide written tick-removal and prevention teaching.

6 Evaluate Outcomes

Rash should fade within 1–2 weeks.
Fever resolves in 24–48 hours.
Reassess for new symptoms — joint pain, facial droop, palpitations — at follow-up. Confirm full course completed.

★ Diane's NGN NCLEX 2026 Study Series · Lyme Disease · Vector-Borne Infectious Disease ★

Content drawn from standard NGN NCLEX 2026 nursing references — this topic was not present in personal notes.