Cyclospora: 2026 Update

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Agenda

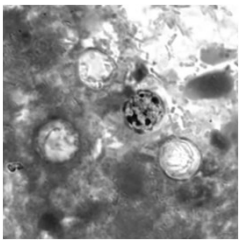
- Microbiology
- Epidemiology
- Clinical Features
- Treatment
- Prevention

Objectives

- Describe the features of the current cyclospora outbreak
- Recognize clinical pattern consistent with cyclosporiasis
- List testing modalities available to diagnose cyclospora
- Select appropriate antibiotic for patients with cyclosporiasis

Microbiology

- *Cyclospora cayetanesis*
- Obligate intracellular parasite
- Humans are the only host
- Oocysts 8-10 microns in diameter
- Discovered in late 1970s
- Outbreaks reported yearly since mid-1990s

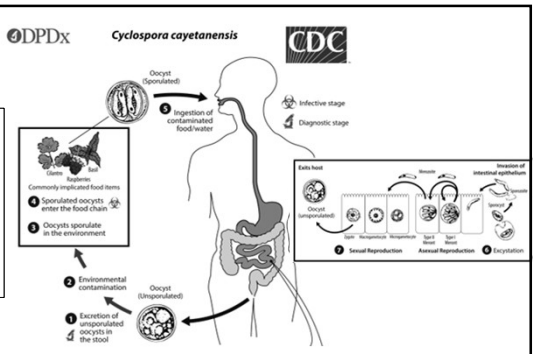


Hadjilouka A, Tsaltas D. Cyclospora Cayetanensis-Major Outbreaks from Ready to Eat Fresh Fruits and Vegetables. Foods. 2020 Nov 20;9(11):1703. doi: 10.3390/foods9111703. PMID: 33233660; PMCID: PMC7699734

Photo credit: Public Health Image Library

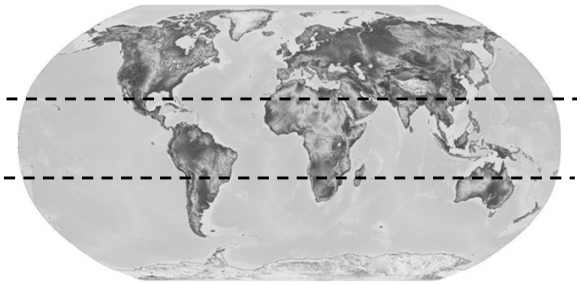
Sporulation requires 1-2 weeks in the environment.

Makes person to person transmission very unlikely.



Graphic Credit: https://www.cdc.gov/dpdx/cyclosporiasis/index.html

Global Distribution



Free Physical Map of the World (Robinson) – License: CC0 / Public Domain

Epidemiology

Risk Factors in Endemic Areas

- Contaminated water, food or soil
- Poor sanitation
- Contact with animals
- Low socioeconomic status
- Chlorine insensitive
- Seasonal – increased cases during summer months

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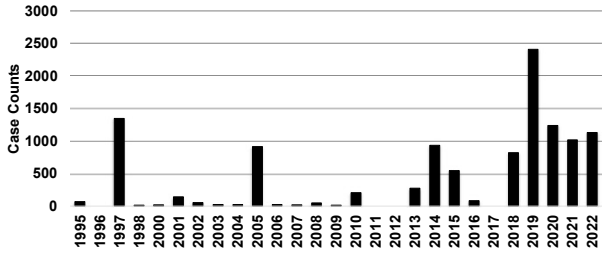
Epidemiology

Non-Endemic Areas

1. Returning travelers from endemic areas
2. Imported food from endemic areas
   - Fresh produce

Cyclosporiasis Outbreak Case Counts (USA, Canada, EU)



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Outbreak sources 1995 - 2022

- Basil
- Berries (raspberries, blackberries, blueberries)
- Cilantro
- Lettuce
- Salad Mix
- Sugar Snap peas
- Vegetable Trays
- Fruit Salad
- Cherry tomatoes

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2026 US Domestic Outbreaks

47 states reporting since May 1, 2026

Laboratory-confirmed domestic cases	10,468
Cases awaiting confirmation and/or investigation	12,255
Total	**22,723**
Hospitalizations	**517**
Mortalities	**2**

***Probable cases not included**

Source: https://www.cdc.gov/cyclosporiasis/php/surveillance/index.html

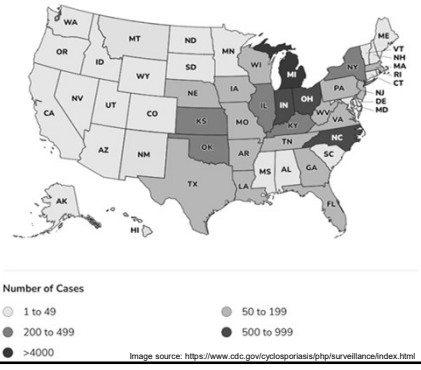


Image source: https://www.cdc.gov/cyclosporiasis/php/surveillance/index.html

Connected to shredded lettuce imported from Mexico

Sun LH & Roubein R. CDC Expands largest known cyclosporiasis outbreak to 15 states. Washington Post 08/04/2026.

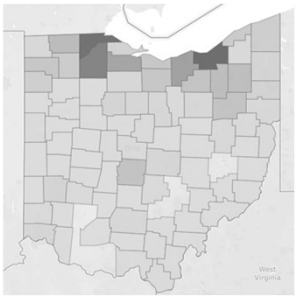
Image source: https://www.cdc.gov/cyclosporiasis/php/surveillance/index.html

Outbreak Sources (FDA update 8/5/26)

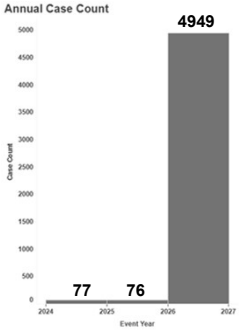
- Iceberg lettuce sourced from Mexico
  - 6358 confirmed cases from 15 states
  - 278 hospitalizations
  - 2 deaths
- 6 active cluster investigations without identified source

https://www.fda.gov/food/outbreaks-foodborne-illness/investigation-15-state-outbreak-cyclospora-illnesses-iceberg-lettuce-july-2026

Geographic Distribution 2026



Annual Case Count



Source: https://data.ohio.gov/wps/portal/gov/data/view/summary-of-infectious-diseases-in-ohio

Total Cases: 4,949	Hospitalization: 203 (4.1%)
Age Range: 1 - 98 years Median Age: 44 years	Illness Onset Range: January 1, 2026 - August 3, 2026
Sex:** Male: 2,176 (44.0%) Female: 2,764 (55.8%)	

Percentages may not sum to 100% as the sex of some records may be unknown.

Race:**		
American Indian Alaskan Native	3	0.1%
Asian	15	0.3%
Black	233	4.7%
Hawaiin Native Pacific Islander	2	0.0%
Multiracial	387	7.8%
Other	181	3.7%
Unknown	530	10.7%
White	3,598	72.7%

Ethnicity:**		
Hispanic Or Latino	224	4.5%
Non Hispanic Or Non Latino	3,643	73.6%
Unknown	1,082	21.9%

Source: https://data.ohio.gov/wps/portal/gov/data/view/summary-of-infectious-diseases-in-ohio

Clinical Features

Median incubation period: 7 days (2-14 days)

Symptoms:

- Frequent, watery diarrhea over several days
  - Can wax and wane
- Abdominal cramping, bloating
- Nausea, anorexia
- Fatigue, weight loss
- **Less common:** vomiting, fever, bloody diarrhea

Clinical Features

May be asymptomatic

Can have waxing/waning course over several days/weeks

Severe symptoms most often in young children and older adults and immunocompromised (ex: advanced HIV)

Differential Diagnosis

- Giardia
- Cryptosporidium
- Cystoisospora

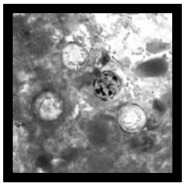
Diagnosis

Stool microscopy

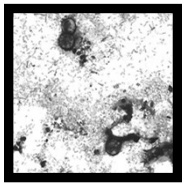
- Can shed low numbers or intermittently
- May need repeated tests if high index of suspicion

PCR

- Panel with multiple targets



Modified Acid Fast Stain



Safranin Stain

Photo credit: Public Health Image Library

Treatment

- Most immunocompetent hosts will recover without antibiotics, but course can be prolonged (weeks).
- First Line
  - Trimethoprim-sulfamethoxazole DS twice daily x7-10 days
- Alternative Regimens
  - Nitazoxanide 500mg twice daily x7 days
- Ciprofloxacin did not perform as well as TMP/SMX in RTC of PWLH

Verdier et al. Ann Intern Med. 2000 Jun 6;132(11):885-8. doi: 10.7326/0003-4819-132-11-200006060-00006. PMID: 10836915.

Treatment - Immunocompromised

- Immunocompromised hosts may need longer courses
- ART initiation is critical in patients with HIV
- Fluid resuscitation and nutrition support are critical
- Reach out to Infectious Diseases for immunocompromised patients for advice

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Prevention

- No vaccine available
- Cyclospora unlikely to be killed by routine chemical disinfection or sanitizing methods
- Washing produce cannot guarantee parasite's removal
- Heat food to 158◦ F
- Avoid consuming food or water that may be contaminated with stool.

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Lyme Borreliosis

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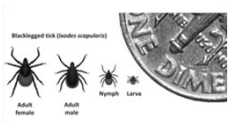
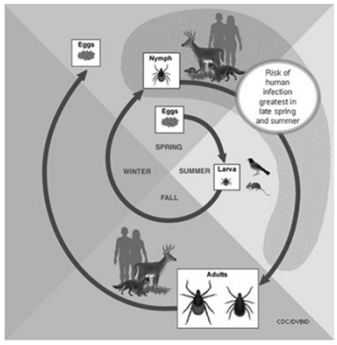
Lyme Disease (Lyme Borreliosis)

- *Borrelia burgdorferi* sensu lato complex
  - Vector-borne Bacterial disease - spirochetes
- Transmitted by Ixodes scapularis
- Forested areas - northeastern, north-central, and mid-Atlantic states, and in smaller areas within Pacific Coast states (*Ixodes pacificus)*
- Tick needs to be attached for more than 24 hours to transmit infection



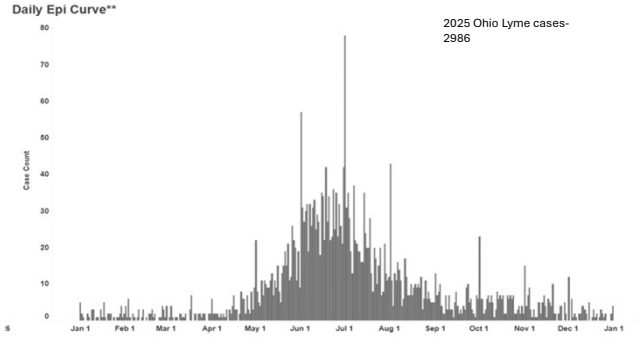
How Lyme Disease Spreads | Lyme Disease | CDC

Source: https://www.cdc.gov/lyme/causes/index.html



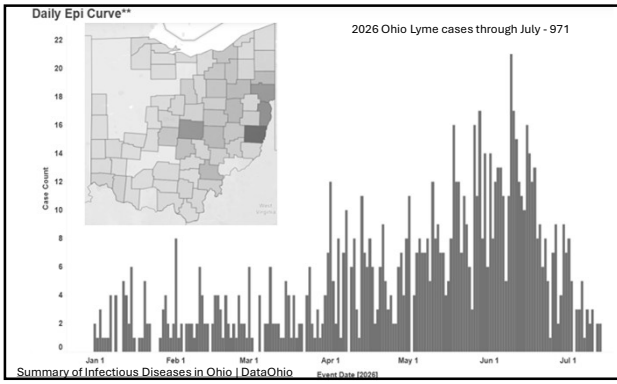
- 2-3 year life cycle
- After the egg hatches, the larva and nymph each must take a blood meal to develop to the next life stage
- females needs blood to produce eggs
- Nymph feeds on infected animals, typically rodents
- Nymphs or adult females can then spread the bacteria during their next blood meal
- Adult females do not pass *borrelia sp*. to their offspring

How Lyme Disease Spreads | Lyme Disease | CDC



2025 Ohio Lyme cases- 2986

Summary of Infectious Diseases in Ohio | DataOhio



2026 Ohio Lyme cases through July - 971

Summary of Infectious Diseases in Ohio | DataOhio

Ohio Lyme Disease Demographics

2025 - current

- Total Cases = 3957
- Hospitalization = 216 (6.6%)
- Age Range 1-95 (median 41 years)
- Sex
  - Male 2230 (56.4%)
  - Female 1727 (43.6%)

2015 – July 2016

- Total Cases = 259
- Hospitalization = 25 (9.7%)
- Age Range 1-85 (median 39 years)
- Sex
  - Male 146 (56.4%)
  - Female 113 (43.6%)

Why the increase in cases?

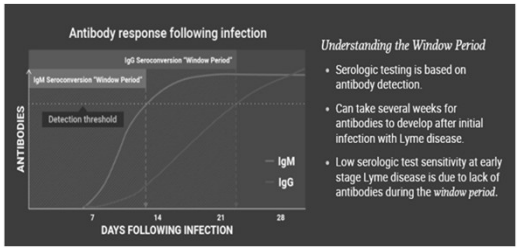
- **Warmer winter temperatures**, larger numbers of warm days during November and February, were associated with increased caseloads during the summer and fall months of both the current and following year
- Fewer warm days in winter associated with fewer cases
- **Above average precipitation** produced elevated cases for a 6 month period
- Dry conditions produced the opposite effect
- Ticks can become desiccated during dry conditions
- Wetter conditions allow ticks to leave their humid microhabitat conditions in search of bloodmeals

Joni Downs, Jim Downs, Victor Mesev & Saurav Chakraborty (2025) Climate-induced expansion of Lyme disease in east central Ohio, International Journal of Environmental Health Research, 35:9, 2717-2727, DOI: 10.1080/09603123.2025.2456966

Clinical Syndromes

- Erythema migrans
- Neuroborreliosis
- Carditis
- Arthritis

Testing Rationale



Lyme Disease | CDC

Testing Algorithms

- Need FDA clearance
- Standard Two-Tiered Testing (STTT) = an FDA-cleared first tier immunoassay followed by an FDA-cleared second tier immunoblot
- Modified two-tiered testing (MTTT) = 2 separate FDA cleared immunoassays

Reed, Kurt D. "Laboratory testing for Lyme disease: possibilities and practicalities." *Journal of clinical microbiology* 40.2 (2002): 319-324
Suggested Reporting Language, Interpretation and Guidance for Lyme Disease Serologic Testing Results

Standard two-tiered testing algorithm (STTT)

- Sensitive first-tier enzyme immunoassay (EIA) for detection of IgG and IgM antibodies combined (total antibodies)
  - Reported qualitatively as positive or negative
- If positive or equivocal, is followed by second-tier IgM and IgG specific immunoblot assays to increase specificity.
  - Immunoblot results based on the presence of bands, which correspond to antibodies against specific antigens
- As duration of infection increases, the human antibody response expands and more antibodies against additional antigens are produced

Reed, Kurt D. "Laboratory testing for Lyme disease: possibilities and practicalities." *Journal of clinical microbiology* 40.2 (2002): 319-324
Suggested Reporting Language, Interpretation and Guidance for Lyme Disease Serologic Testing Results

Standard two-tiered testing algorithm (STTT)

- In cases of suspected new infections, IgM immunoblots are interpreted as positive when patients are symptomatic for < 30 days and at least 2 of 3 bands are present
- IgG immunoblots are interpreted as positive when antibodies to at least 5 of 10 antigens are present
- After 30 days of symptoms cannot use IgM immunoblots results

Reed, Kurt D. "Laboratory testing for Lyme disease: possibilities and practicalities." *Journal of clinical microbiology* 40.2 (2002): 319-324
Suggested Reporting Language, Interpretation and Guidance for Lyme Disease Serologic Testing Results

Modified two-tiered testing (MTTT)

- Second-tier assay(s) are immunoassays, not immunoblots
- FDA cleared for the whole sequence
- Equivocal results on both steps are interpreted as an overall positive result.
- Equivocal result on either step, combined with a positive result on the other step, indicates an overall positive result

Reed, Kurt D. "Laboratory testing for Lyme disease: possibilities and practicalities." *Journal of clinical microbiology* 40.2 (2002): 319-324
Suggested Reporting Language, Interpretation and Guidance for Lyme Disease Serologic Testing Results

Testing pearls

- Patients may test negative if recently infected
- Antibody titers will remain elevated for months to years and cannot be used to determine cure
- False positive cross-reactions may occur in syphilis, rheumatoid arthritis, and Epstein-Barr virus infection
- IgM results should be disregarded after 30 days of illness
- Patients who receive antibiotic treatment early in disease may be less likely to seroconvert

Clinical Testing and Diagnosis for Lyme Disease | Lyme Disease | CDC

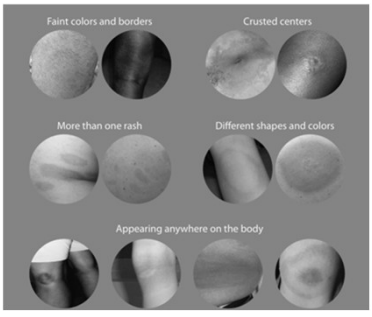
Drug	Adult Dose	Child Dose
Amoxicillin	500mg PO TID	50mg/kg divided TID (max 500mg per dose)
Doxycycline	100mg PO BID or 200mg PO Daily	4.4mg/kg divided twice a day (max 200mg daily)
Cefuroxime axetil	500mg PO BID	30mg/kg divided twice a day (max 500mg per dose)
Azithromycin	500mg PO daily	10mg/kg PO daily (max 500mg daily)
Ceftriaxone	2g IV daily	50-75mg/kg IV daily (max 2g daily)
Cefotaxime	2g IV q8	150-200mg/kg divided in 3-4 doses (max 6g daily)
Penicillin G	18-24 million units IV divided q6	200,000-400,000 units/kg q6 (max 18-24 million units daily)

Adapted from: Lantos PM, Rumbaugh J, Bockenstedt LK, et al. Clinical Practice Guidelines by the Infectious Diseases Society of America, American Academy of Neurology, and American College of Rheumatology: 2020 Guidelines for the Prevention, Diagnosis, and Treatment of Lyme Disease. *Neurology*. 2021;96(6):262-273. doi:10.1212/WNL.0000000000011151

Erythema migrans

- Red or Bluish-Red macular skin lesion expanding over the course of 3 to 30 days (average is about 7 days) at site of tick bite
- Occurs in 70-80% infected people
- Symptoms: lethargy, mild headache, mild neck stiffness, myalgias, arthralgias, regional lymphadenopathy
- Not EM –insect bite hypersensitivity, fixed drug reaction, Ringworm, pityriasis rosea rash, granuloma annulare rash, urticaria multiforme

Lyme Disease Rashes | Lyme Disease | CDC
BMJ 2020;369:m1041 http://dx.doi.org/10.1136/bmj.m1041



The Many Forms of Lyme Disease Rashes (Erthema Migrans)

Erythema Migrans

- Empiric treatment in patients with 1 or more compatible lesions
- If lesions are not consistent with EM, send AB testing
- If initial results are negative- resend AB 2–3 weeks later

Lantos PM, Rumbaugh J, Bockenstedt LK, et al. Clinical Practice Guidelines by the Infectious Diseases Society of America, American Academy of Neurology, and American College of Rheumatology: 2020 Guidelines for the Prevention, Diagnosis, and Treatment of Lyme Disease. *Neurology*. 2021;96(6):262-273. doi:10.1212/WNL.0000000000011151

Lyme Neuroborreliosis

- Diplopia, pain, hearing loss, or vertigo
- Meningitis
- Cranial neuritis – esp facial nerve palsy, can be B
- Serum Ab testing
- CSF – Simultaneous Serum and CSF Ab (can remain elevated for years)
  - CSF analysis typically has lymphocytic/monocytic pleocytosis
- IV ceftriaxone, cefotaxime, penicillin G, or oral doxycycline
- Can switch from IV to PO during treatment, except for spinal cord or brain parenchymal involvement
- LOT = 14-21 days

Facial nerve palsy

- Corticosteroids not recommended, but ultimately depends on clinical judgement

Lyme carditis

- Typically occurs within several days to about a month (average 21 days) after the initial illness/infection
- Peak incidence is seen in childhood and middle age; young adult and middle-aged men
- dyspnea, edema, palpitations, lightheadedness, chest pain, and syncope
- AV conduction defects
- Hospitalize patient with PR > 300 milliseconds, other arrhythmias, or myopericarditis
- Symptomatic bradycardia - temporary pacing if needed
- Recovery expected with 3-7 days
- IV ceftriaxone if hospitalized, can be switched to PO with clinical improvement
- 14-21 days of treatment

Forrester JD, Meiman J, Mullins J, et al; Centers for Disease Control and Prevention (CDC). Notes from the field: update on Lyme carditis, groups at high risk, and frequency of associated sudden cardiac death--United States. MMWR Morb Mortal Wkly Rep 2014;63:982-3.

Lyme Arthritis

- Marked swelling of 1 or a few large joints, most often the knee, with less pain than expected based on the degree of swelling
- <5 joints typically
- Small joint involvement of hands & feet unusual
- May mimic septic arthritis in children
- Start with serum AB testing; followed by PCR of synovial fluid or tissue if needed
- almost uniformly have an expanded IgG response, with at least 5 of 10 specific bands on B. burgdorferi IgG immunoblots using standardized scoring criteria

- Oral abx for 28 days
- 90% of patients responding within 1–3 months
- If not improved as defined by moderate to severe joint swelling with minimal reduction of the joint effusion on exam – can retreat with IV or PO; IDSA recommends IV ceftriaxone for 2-4 weeks
- Maximum therapy 8 weeks
- If fail 8 weeks – consider rheumatology referral

Steere AC, Levin RE, Molloy PJ, et al. Treatment of Lyme arthritis. Arthritis Rheum 1994; 37:878–88.

Drug	Adult Dose	Child Dose
Amoxicillin	500mg PO TID	50mg/kg divided TID (max 500mg per dose)
Doxycycline	100mg PO BID or 200mg PO Daily	4.4mg/kg divided twice a day (max 200mg daily)
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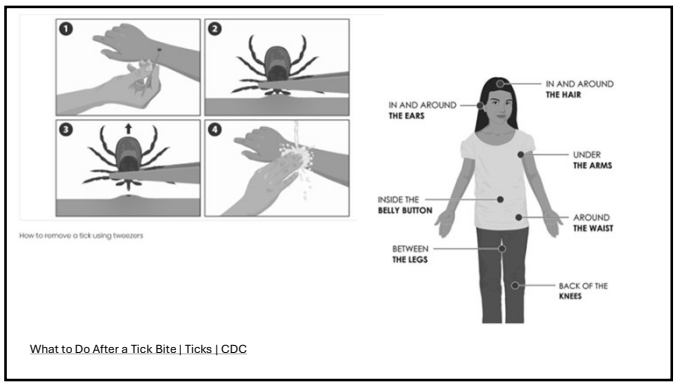
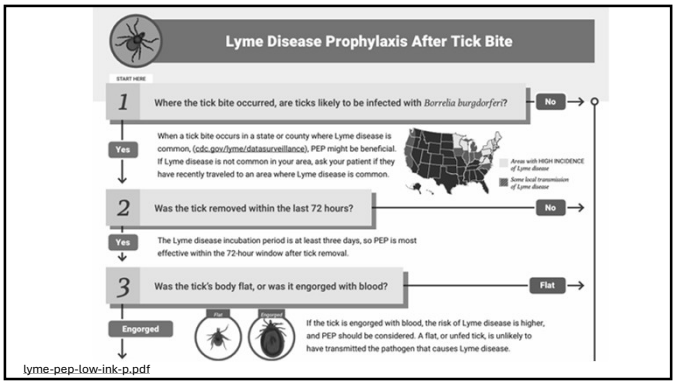
Preventing Tick Bites

- Be aware of tick habitats
- Treat clothing and gear with permethrin
- Insect repellent
- Check clothing and skin when indoors
- Check pets and gear
- Shower



What to Do After a Tick Bite | Ticks | CDC



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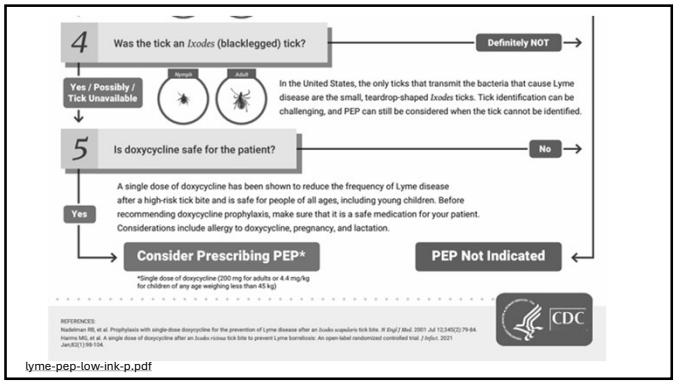

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