



Lyme Disease

Joshua Watson, MD
Associate Professor, Pediatric Infectious Diseases
The Ohio State University College of Medicine
Nationwide Children's Hospital

MedNet21
Center for Continuing Medical Education

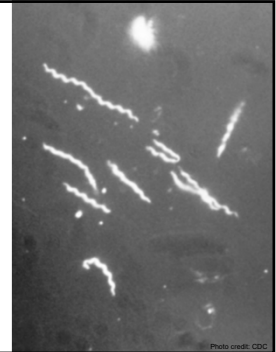
THE OHIO STATE UNIVERSITY
NATIONWIDE CHILDREN'S HOSPITAL

Lyme Disease *Borrelia burgdorferi*

- spirochete: motile, corkscrew-shaped bacteria
- *B. burgdorferi* sensu lato
 - *B. burgdorferi* sensu stricto
 - *B. mayonii* (rare)
 - *B. garinii*
 - *B. afzelii*

U.S.

Europe



AAP Red Book 2021 • Mandell, Douglas, and Bennett's Principles and Practice of Infectious Diseases

Photo credit: CDC

The Vector

- Blacklegged tick (*Ixodes scapularis*)
 - Widely distributed in eastern U.S.
- Western blacklegged tick (*Ixodes pacificus*)
 - Pacific coast states
- Feed on mammals, birds, reptiles, amphibians
- Other diseases carried: anaplasma, ehrlichia, babesia, Powassan virus

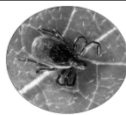
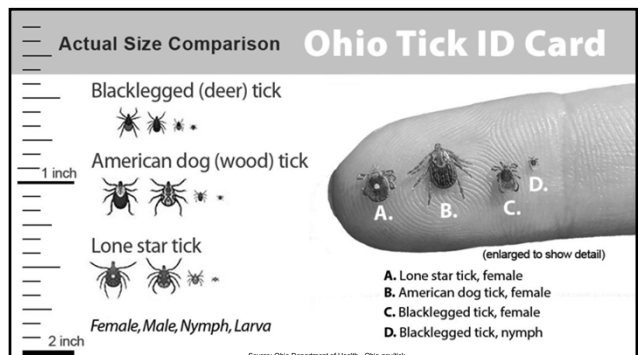
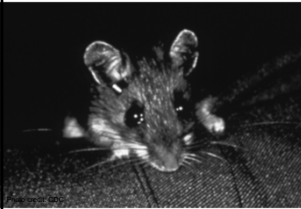


Photo source: phil.cdc.gov, Scott Bauer, Agricultural Research Service



Lyme Disease: A Zoonosis



- Reservoir: small rodents
 - In Eastern U.S., especially the white-footed mouse
- Dead-end hosts: white-tailed deer, humans

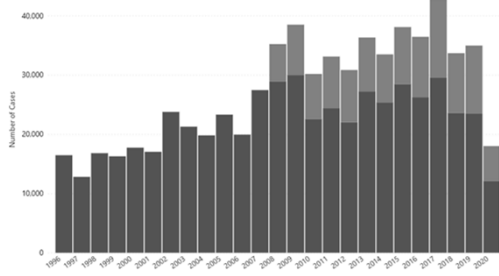
Lyme Epidemiology

- Annual cases (CDC):
 - Insurance records: ~476,000/yr
 - Nationally Notifiable Diseases Surveillance System (passive reporting):
 - » ~35,000 reported/yr
 - » Top 3 states in 2019: PA, NY, NJ
 - » Most common in June, July
 - » Bimodal age peaks: 5-9y, 55-59y

www.cdc.gov

Lyme Disease – Overall Cases by Year, United States

● Confirmed Cases ● Probable Cases



<https://www.cdc.gov/nndss/surveillance/data.html> CDC AA: nvlvhttp%3A%2F%2Fwww.cdc.gov%2F%2Fdata/surveillance%2Frecent-surveillance-data.html

Estimated Distribution of Blacklegged Ticks in Ohio, 2010-2022*



*Based on identification records from both passive and active surveillance conducted by the Ohio Department of Health. For more data, consult the Ohio Health Agency's annual reports, and contact your jurisdictional health officer.

Borrelia burgdorferi in Blacklegged Ticks in Ohio, 2010-2022*

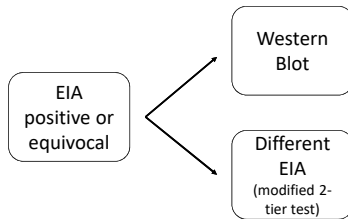


*"Host-collected" (collected ticks were tested by the Centers for Disease Control and Prevention. "Host-free" ticks were tested by private laboratories. BSL-2. "Passive" (collected ticks were 10 randomly selected ticks of 1 species or species group, and tested 10/10/2022).

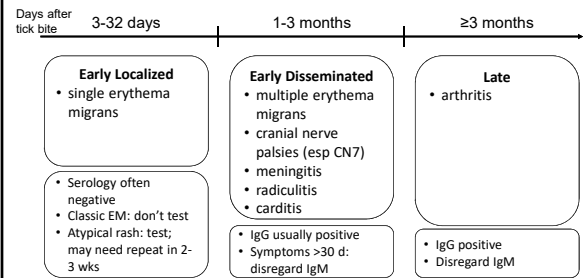
Source: odh.ohio.gov



2-Tier Testing



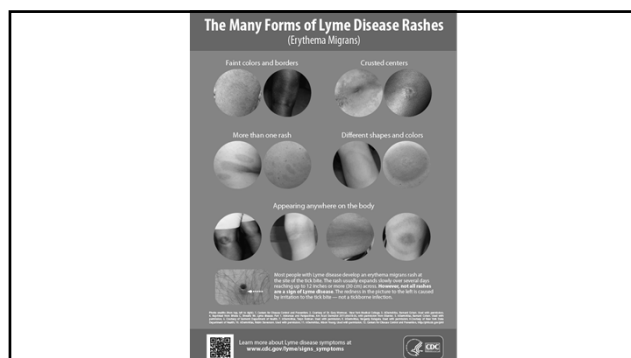
Lyme Stage & Serology



Erythema Migrans

- Classic: target lesion with central clearing
- Gradual expansion
- May have systemic symptoms:
 - Fever
 - Headache
 - Myalgia/Arthralgia
 - Fatigue
 - Lymphadenopathy





EM Treatment

- Single or multiple EM:
 - doxycycline x 10 days
 - amoxicillin x 14 days
 - cefuroxime x 14 days
 - azithromycin x 7 days (if cannot use above drug)
- Doxy in children <8y? OK for courses <21 days

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Facial Nerve Palsy

- Lasts 2-8 wks
- Usually resolves completely
- Treatment:
 - Doxycycline x 14-21 days
 - no impact on course of CN7 palsy
 - used to prevent late disease



IDSA Lyme Disease Guidelines: Lantos et al. *Clin Infect Dis* 2021

Facial Nerve Palsy

- Steroid?
 - If Lyme Disease known: unclear benefit vs harm
 - Patients ≥16y with CN7 palsy of unknown cause:
 - » steroid recommended within 72h onset
 - » based on benefit for idiopathic CN7 palsy



IDSA Lyme Disease Guidelines: Lantos et al. *Clin Infect Dis* 2021

Meningitis

- Lymphocytic pleocytosis
 - 50-250 WBCs, normal glucose, modestly inc. protein
- CSF:serum antibody index
 - simultaneous Lyme serology in CSF and serum
 - elevated level indicates intrathecal antibody production
- PCR in CSF: low-yield

Meningitis

- Potential accompanying problems:
 - papilledema, intracranial hypertension
 - » particularly in children
 - » may occur without CSF pleocytosis
 - CN palsies, radiculopathy
- Meningitis treatment:
 - doxycycline x 14-21 days
 - IV ceftriaxone x 14-21 days
- Other CNS: encephalitis, myelitis, cerebellar ataxia

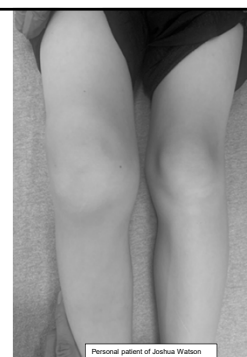
Carditis

- Varying degrees of AV block
 - complete heart block rare
- ECG for all patients with Lyme?
 - No. Only recommended if symptoms
 - » syncope, presyncope, palpitations, dyspnea
- Treatment:
 - doxycycline, amoxicillin, or cefuroxime x 14-21d
 - if hospitalized, ceftriaxone



Arthritis

- Mono- or oligoarticular
- Typically large joints (knee in >90%)
- Joint swelling & effusion out of proportion to pain
- Baker cyst may occur
- Diagnosis:
 - Serology (positive IgG)
 - PCR from synovial fluid or tissue



AAP Red Book 2021 • Principles and Practice of Pediatric Infectious Diseases

Personal patient of Joshua Watson

Lyme vs Septic Arthritis

	Lyme Arthritis	Septic Arthritis
Range of motion	Mildly limited	Severely limited
Systemic symptoms	Well appearing, often afebrile	Fever, irritability, malaise
Serum ANC	<10,000	≥10,000
ESR	<40	≥40
C-Reactive Protein (mg/dL)	<4	≥4
Joint fluid WBC (typical)	40,000-80,000	>50,000
Joint fluid differential	Neutrophil predominant in both cases	

ANC, absolute neutrophil count
Principles and Practice of Pediatric Infectious Diseases - Deanehan et al. Pediatrics 2013 - Baldwin et al. J Bone Joint surg Am 2016

Lyme Arthritis Management

- Initial treatment
 - doxycycline, amoxicillin, or cefuroxime x 28d
 - swelling may take weeks to resolve
 - some have no/minimal response
 - may develop inflammation of another joint during treatment
 - post-infectious inflammatory arthritis may develop

AAP Red Book 2021 • IDSA Lyme Disease Guidelines: Lantos et al. Clin Infect Dis 2021

Lyme Arthritis Management

- Mild residual swelling after initial treatment?
 - observation vs 2nd course of oral antibiotic
- No/minimal response to initial treatment?
 - IV ceftriaxone x 14-28d
- No/minimal response to IV course?
 - Refer to Rheumatology

IDSA Lyme Disease Guidelines: Lantos et al. Clin Infect Dis 2021

Treatment Summary

	Antibiotic	Duration (days)
Erythema migrans	Doxycycline	10
	Amoxicillin, cefuroxime	14
	Azithromycin	7
Cranial nerve palsy	Doxycycline	14-21
Meningitis	Doxycycline	14-21
	Ceftriaxone	14-21
Carditis	Doxycycline, amoxicillin, cefuroxime	14-21
	Ceftriaxone	14-21
Arthritis – initial	Doxycycline, amoxicillin, cefuroxime	28
Arthritis – refractory	Doxycycline, amoxicillin, cefuroxime	28
	Ceftriaxone	14 (up to 28)

IDSA Lyme Disease Guidelines: Lantos et al. Clin Infect Dis 2021

Post-Treatment Lyme Disease Syndrome

- Pain, fatigue, difficulty thinking lasting >6 months
- Cause unclear
 - autoimmune? persistent infection? other?
 - important to consider other diagnoses
- No proven treatment, but demonstrated harm from prolonged antibiotics
- Most gradually improve over months

<https://www.cdc.gov/lyme/postlds/index.html>

Prophylaxis

- High-risk tick bites:
 - Blacklegged tick
 - Occurred in highly endemic area
 - Tick attached for ≥ 36 hrs (ie, engorged)
- Must provide within 72 hrs of tick removal
- Doxycycline 4.4 mg/kg (200 mg max) x 1 dose

IDSA Lyme Disease Guidelines: Lantos et al. *Clin Infect Dis* 2021

Prophylaxis

NOT currently recommended in OH



Thank you!



Photo: agriculture.vermont.gov