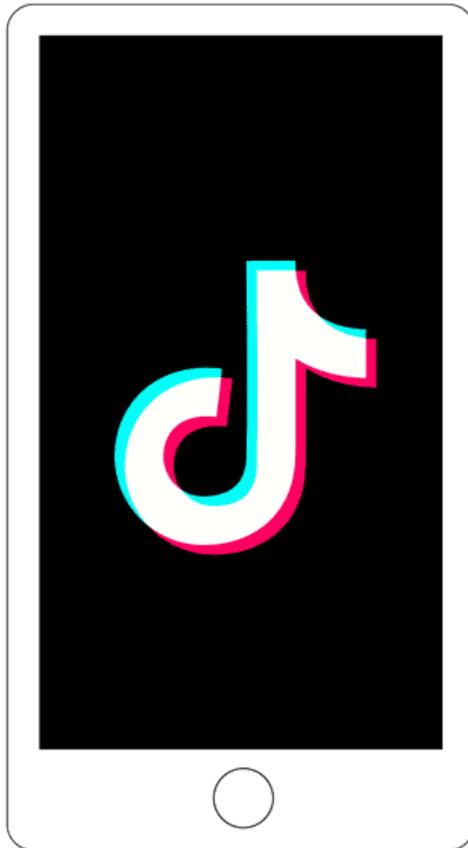


November 15, 2022
Ron Galbraith MD
Tick Talk



Objectives

1. Know when to suspect a tick-borne infection
2. Know how to approach diagnosis of common tick-borne infections
3. Be able to manage common tick-borne infections

Nomenclature and Tick Vector

Disease	Organism	Tick Vector
Lyme Disease	<i>Borrelia burgdorferi</i>	<i>Ixodes scapularis</i>
Babesiosis	<i>Babesia microti</i>	<i>Ixodes scapularis</i> *
HME (human monocytic ehrlichiosis)	<i>Ehrlichia chaffeensis</i>	<i>Ixodes scapularis</i>
HGA (human granulocytic anaplasmosis)	<i>Anaplasma phagocytophilum</i>	<i>Ixodes scapularis</i>
RMSF (Rocky Mountain Spotted Fever)	<i>Rickettsia rickettsia</i>	American dog tick Rocky Mountain wood tick AZ – Brown dog tick

Rickettsiaceae

When to suspect tickborne illness

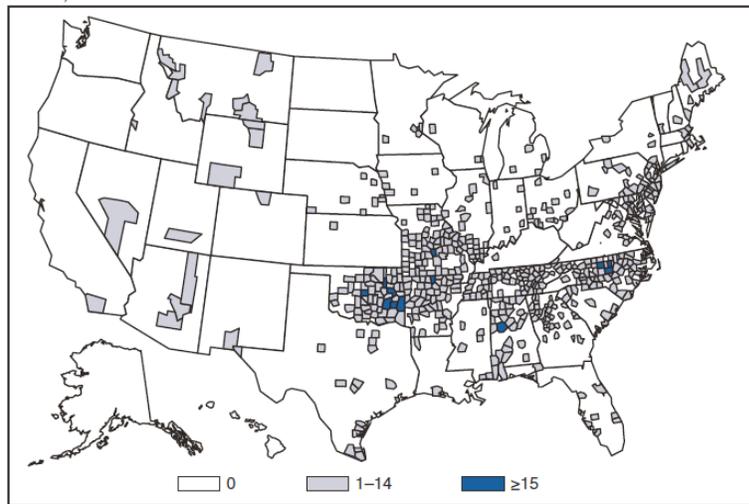
1. Geography/season and exposure to ticks
2. Atypical clinical presentations
 - nonspecific febrile illness +/- rash/cytopenias
 - sepsis of unknown origin
 - not responding to typical antibiotics

When to suspect tickborne illness

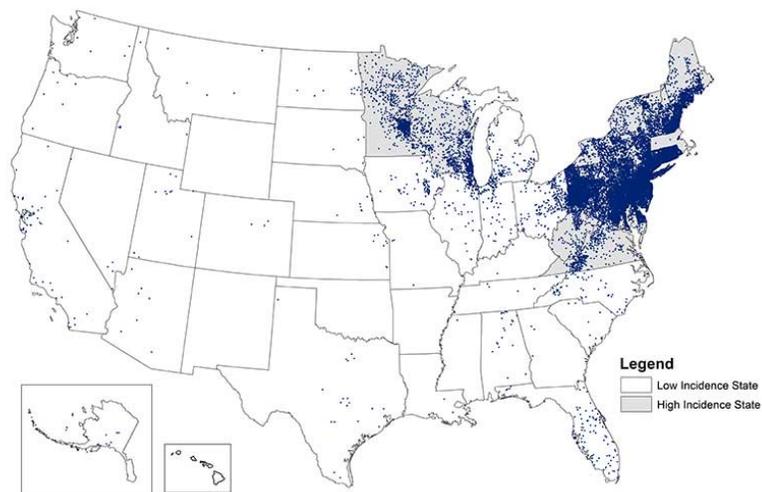
Geography, season, and exposure to ticks*

- typically, can occur any time in the year but peaks in summer

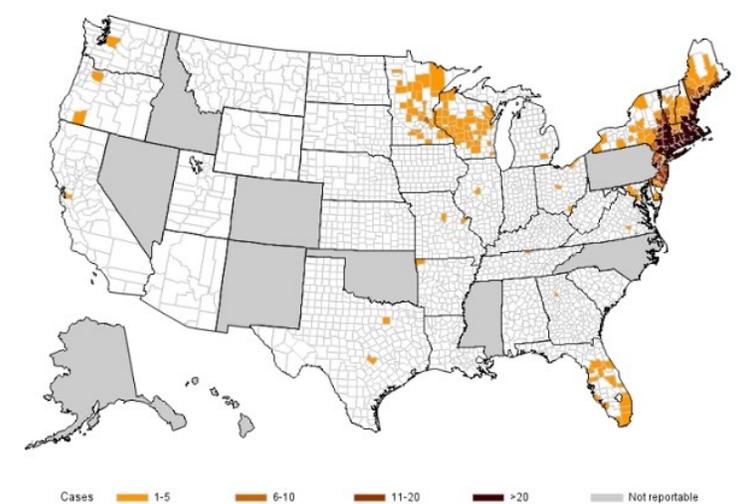
RMSF



LYME

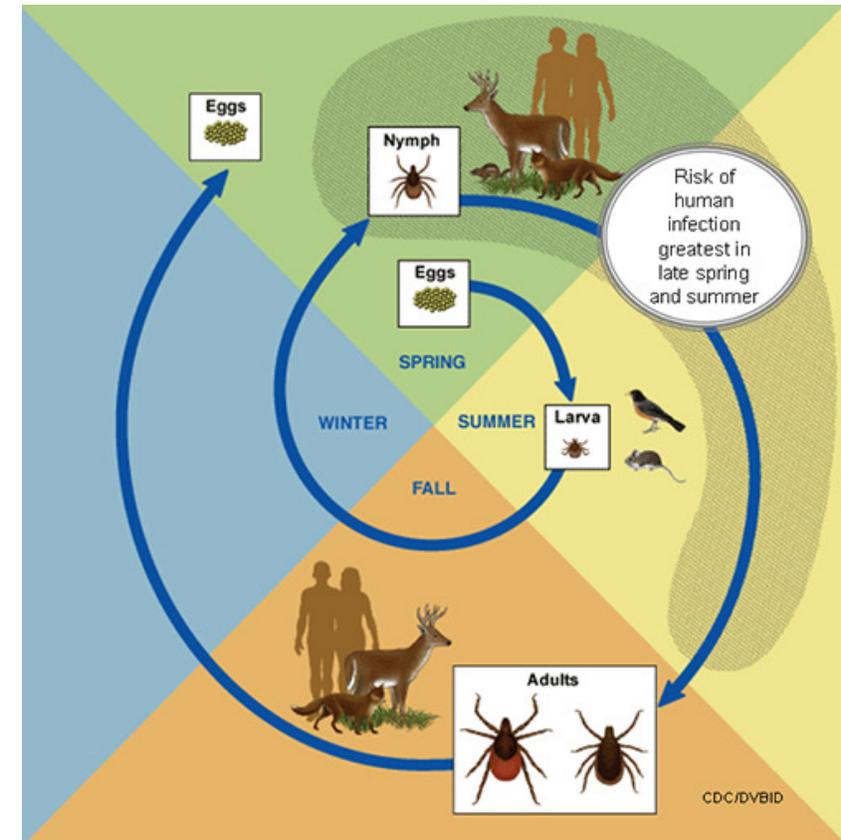


BABESIOSIS



When to suspect Ixodes scapularis-borne infections

Organism	Tick vector
<i>Borrelia burgdorferi</i> (Lyme)	<i>Ixodes scapularis</i>
<i>Ehrlichia chaffeensis</i>	<i>Ixodes scapularis</i>
<i>Anaplasma phagocytophilum</i>	<i>Ixodes scapularis</i>
<i>Babesia microti</i>	<i>Ixodes scapularis</i> (also transfusion)
<i>Rickettsia rickettsia</i> (RMSF)	American dog tick Rocky Mountain wood tick AZ – Brown dog tick



Microbiology

Organisms are different from what we normally see in the hospital

	Rickettsiaceae	Lyme = Borelia burgdorferi	Babesia = Babesia microti
	RMSF, HME, HGA	Lyme Disease	Babesiosis
Type of organism	Intercellular gram negatives	Spirochete (like syphilis)	Red cell parasite like malaria
visualization	Can see Erlichiosis in monocytes, Anaplasmosis in granulocytes	Only see light microscopy	Can see in rbcs in light microscopy

Different clinical presentation by organism

- “Rickettsiaceae”
 - Very ill, ~FUO, don’t improve with vancomycin/zosyn; RMSF rapidly progressive
 - Very ill + rash (palms/soles)
 - thrombocytopenia, leukopenia, mild transaminitis
- Lyme
 - Rash
 - In endemic areas, on differential diagnosis for clinical syndromes in different systems
- Babesia
 - hemolysis

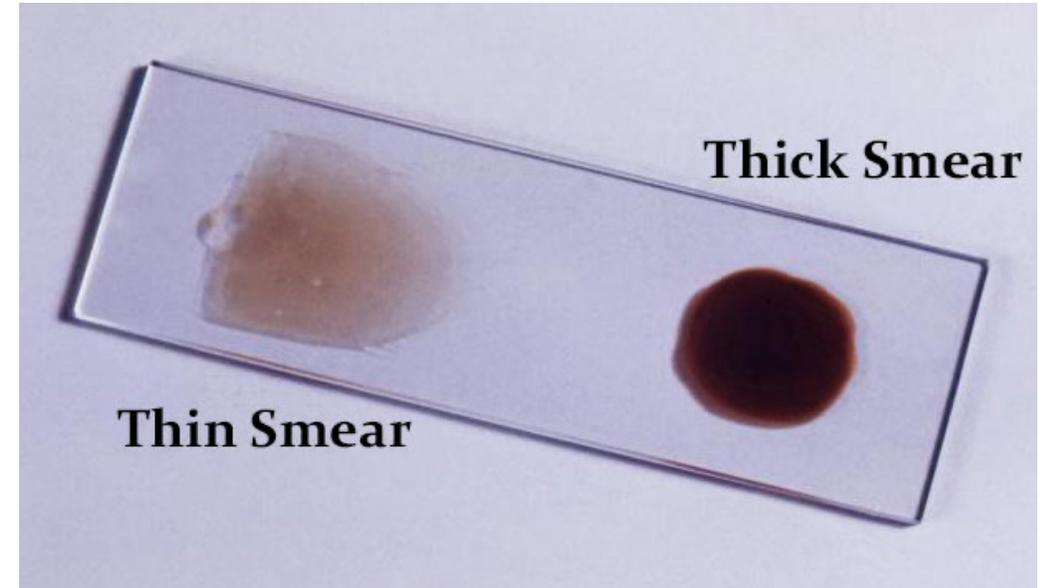
How do you make diagnosis?

You typically are treating empirically and won't get lab results in time to make clinical decision

Can't culture these

Old school, low sensitivity but quick and worth a try

- Look for the organisms with a microscope
 - Buffy coat to isolate wbcs to see Anaplasma (in monocytes) and Ehrlichia (in granulocytes)
 - Thick smear to see Babesia in RBCs



Laboratory confirmation

- “Rickettsiaceae”
 - PCR testing is available but slow
 - Ehrlichiosis/Anaplasmosis, whole blood PCR widely available and highly sensitive
 - RMSF – PCR less sensitive in early samples, should be sent within 14d of onset while symptomatic, preferred samples are whole blood or skin biopsy of rash
 - IFA (immunofluorescence IgG antibody assay) is most widely used serologic test, looking for 4 fold increase in 2-4 weeks after acute samples
- Babesia
 - Thick smear is pretty good, can be sent to reference lab for PCR testing

Lyme diagnosis

Updated CDC Guidelines 2019 but still using serology

- two tiers

- 1. sensitive EIA (enzyme immunoassay) or immunofluorescence assay
 - If that is negative, then no further testing
 - If that is equivocal or positive then confirm with
- 2. Western blot or (more specific,) EIA as a second test

How do you typically treat?

“Rickettsiaceae” – never delay doxycycline

Lyme

- Doxycycline
- Amoxicillin, Ceftriaxone
- Prophylaxis with doxy 200mg x1 if they meet all criteria
 - Attached deer tick x 36+ hours
 - Can start ppx within 72h or tick removal
 - Local infection rates of ticks with *B burgdorferi* is >20%
 - Doxycycline not contraindicated

Babesia

- Mild
 - Azithromycin/atovoquone
- severe
 - Clinda/quinine
 - Azithromycin/Atovoquone

Case 1

45M is transferred to BUMC for evaluation for persistent fevers, headache, nausea/vomiting who developed a rash after admission at IHS Kayenta.

After 3 days, no improvement despite empiric vancomycin and piperacillin/tazobactam



Case 1



Case 1

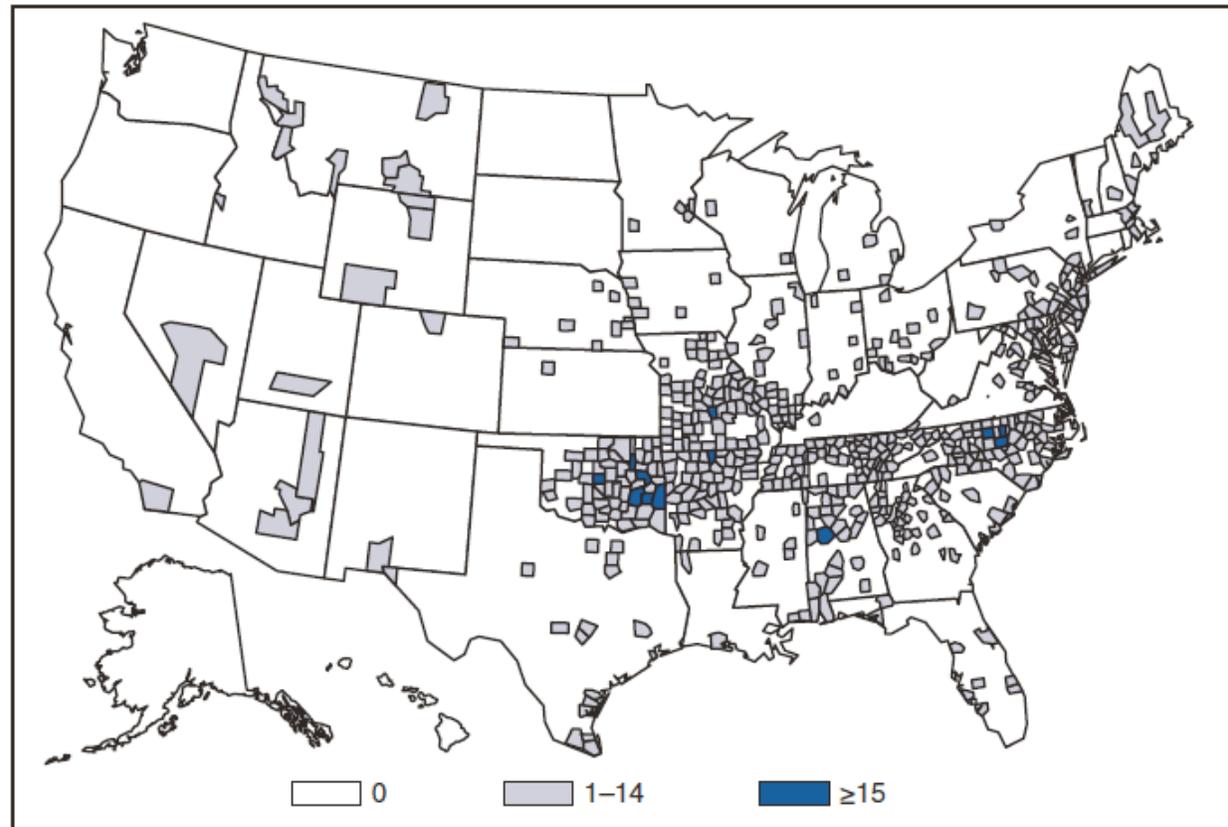
labs notable for

bcx ngtd, gc/ch neg, RPR NEG

Next reasonable treatment

- A. Add ceftriaxone
- B. Add penicillin IM injection
- C. send Rickettsia serology panel
- D. Stop antibiotics, start methylprednisolone
- E. Add doxycycline

Case 1: RMSF – typically not in AZ/NM, or even in Rocky Mountains



Case 1: RMSF

Diagnosis

- Typically treat empirically
- Confirmatory testing
 - serial serology
 - skin biopsy/blood pcr

Management

- doxycycline

Case 2 – you are doing an away rotation in July in New York City

56M from Long Island p/w fever, malaise, myalgias

Exam notable for no rash, fever to 102

Labs:

- COVID-19 NEG x3
- Wbc 1.5, Hg 14, Plt 80
- AST/ALT 240/300
- Lyme EIA NEG
- Blood cultures neg

Case 2

He is still febrile and ill appearing despite 3 days of vancomycin and zosyn, your next step in management is:

- A. add po doxycycline
- B. Add po azithromycin
- C. Stop vancomycin/zosyn, start IV ceftriaxone
- D. start methylprednisolone

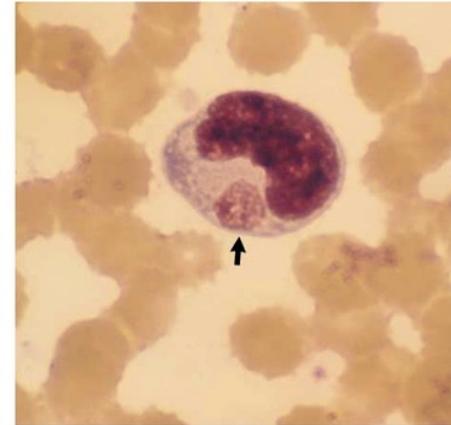
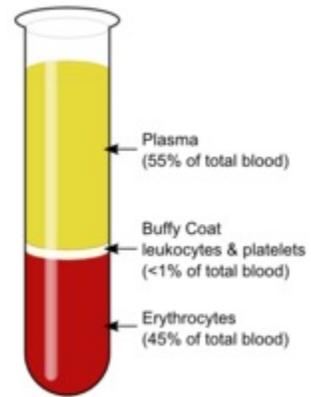
Case 2: Ehrlichia and Anaplasma

Diagnosis

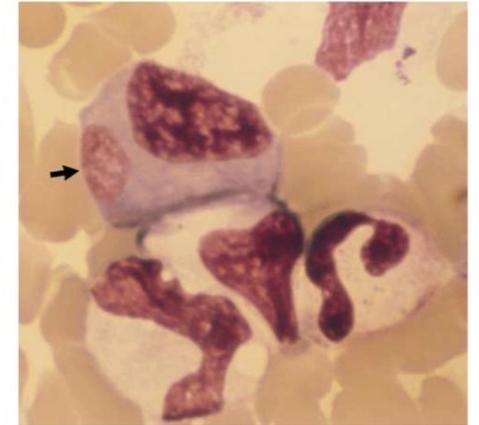
- “buffy coat”
- antibodies

Management

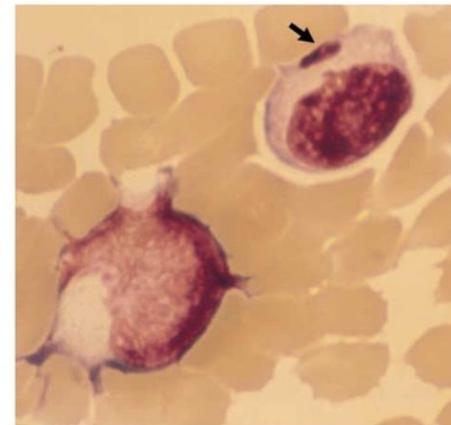
- doxycycline



A



B



C

Case 3 – Still in New York City

54W with htn/hl/dm p/w rash 2-3 weeks after hiking in Hudson Valley, does not recall being bit by a tick



Case 3

Lyme antibody testing neg

Most reasonable next step in management is:

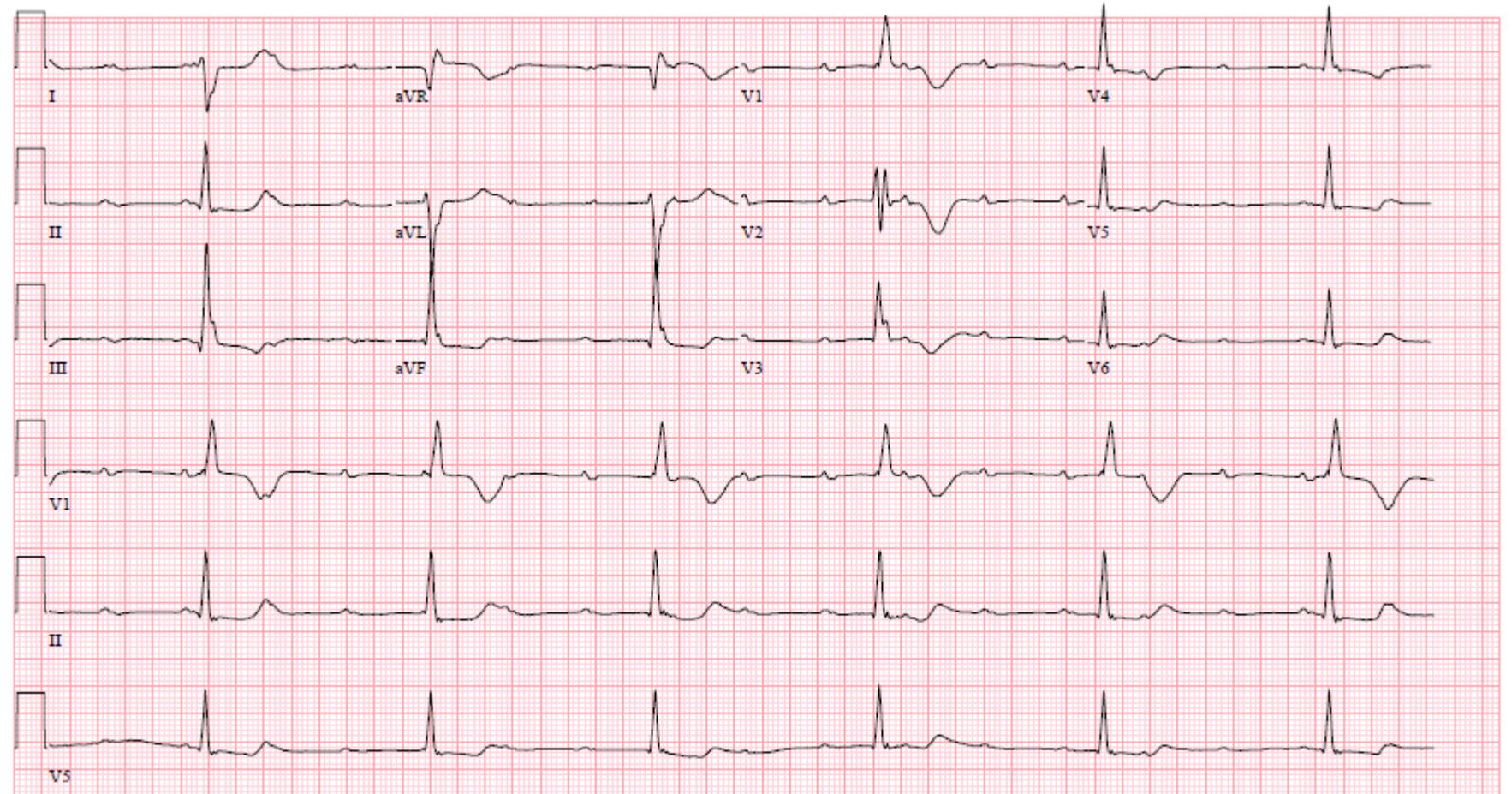
- A. Doxycycline 200mg x1 dose
- B. Doxycycline 100mg bid x 1 week
- C. Repeat Lyme testing in 2 weeks
- D. Send Ehrlichia and Anaplasma ab

Case 3 – Erythema migrans

Characteristics	N %
homogenous	59%
Central erythema	32%
Central clearing	9%
Punctum present	31%
Vesicular/ulcerated	7%
Blue center	2%

Case 4 – still on rotation in NYC ER

32M from Long Island
with no pmhx p/w
episode of syncope in
setting of fatigue



Case 4

Labs:

- TSH wnl, troponin neg x1, electrolytes wnl
- Lyme serology: EIA positive, Western Blot pending

What is the next step in managing the patient?

- A. Wait for Western blot and echo
- B. Place permanent pacemaker if initial blood cultures are negative
- C. start IV ceftriaxone treatment
- D. start PO doxycycline treatment

Case 4: Stages of Lyme disease – *Borrelia burgdorferi*

*Need to be able to recognize heart block

Lyme is caused by *Borrelia burgdorferi*, a spirochete like syphilis, similar in its stages

Of note, there can be long periods of latent infection

Stage	Time from onset (bite)	Organs involved
Early localized	< 1 month	Skin
Early disseminated	Weeks-months	Skin, CNS, Cardiac
Late	Months-years	Arthritis (knees), rarely CNS
Post		Not caused by live organism

STARI

“Southern Tick-Associated Rash Illness”

Erythema migrans + mild flu like illness temporally associated with Lone Star tick

Thought to be a *Borrelia* spp but not proven

Not just in Southeast anymore



Case 5

32M from case #3 improved initially with high dose ceftriaxone, back to normal rhythm, just prior to discharge developed fever and malaise

- Exam – somewhat ill appearing, conjunctival icterus
- Labs-
 - Hg 8.5 (2 days prior 15)
 - Cr 1.7 (1.1 at baseline)
 - LDH 500, Tbili 4.0, dbili 1.0, haptoglobin 5 (low)

Case 5

Your next step in treatment is

- A. Continue ceftriaxone, add doxycycline
- B. Stop ceftriaxone, start doxycycline
- C. Continue ceftriaxone, add azithromycin + atovaquone
- D. continue ceftriaxone, add methylprednisolone

Case 5: Babesia microti

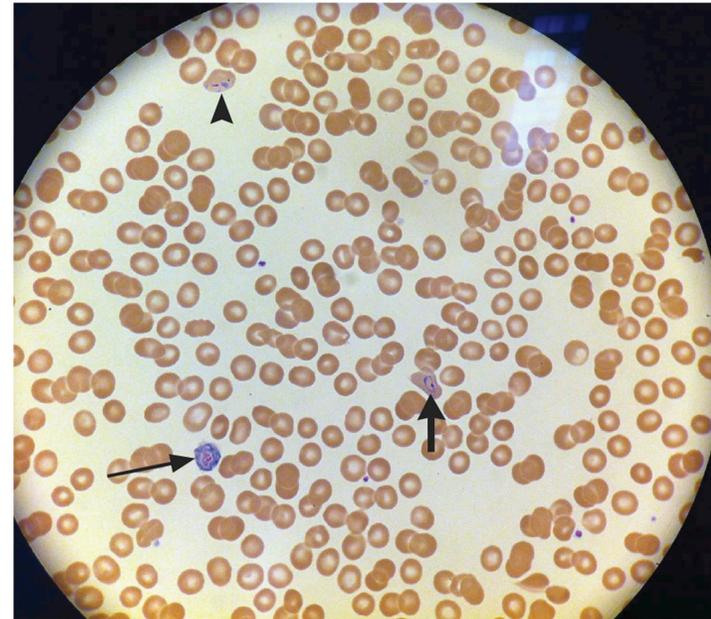
*Need to be able to recognize hemolysis

Diagnosis

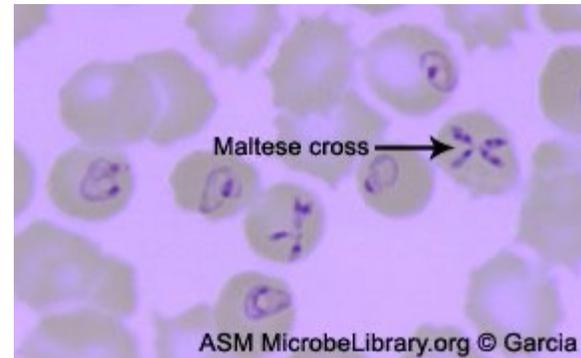
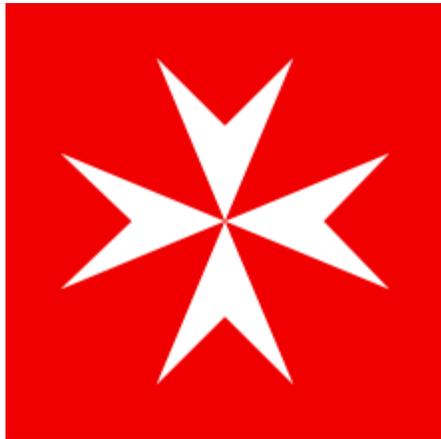
- Can be caused by blood transfusion, blood is screened in endemic areas
- Coinfections along with Lyme not uncommon

Treatment

- atovoquone/azithromycin



Case 5: “maltese cross”



Take home points

Tickborne illness come from (1) rickettsia group (2) Borrelia and (3) Babesia; and have different clinical syndromes

Suspect tickborne illness with geographic/seasonal tick exposure and when not improving with standard hospital treatment

Rickettsia group causes acute febrile illness, sometimes rash

Borrelia (Lyme) causes rash then disseminates throughout body

Babesia causes hemolysis

When in doubt, give doxycycline

Thank you

Any questions?

references

[Cdc.gov/parasites/babesiosis/index.html](https://www.cdc.gov/parasites/babesiosis/index.html)

Mandell. Principles and Practice of Infectious Diseases

Board review book

[Azdh.gov/preparedness/epidemiology-disease-control/rocky-mountain-spotted-fever/index.php#surveillance-monitoring](https://www.azdhs.gov/preparedness/epidemiology-disease-control/rocky-mountain-spotted-fever/index.php#surveillance-monitoring); accessed 7/15/2020

[May 25, 1995](#)

N Engl J Med 1995; 332:1417

DOI: 10.1056/NEJM199505253322105; Erlichiosis, images in clinical medicine NEJM

[November 6, 2014](#)

N Engl J Med 2014; 371:1833-1837

DOI: 10.1056/NEJMcps1313772 “A Chilly Fever”

references

[Azdhs.gov/documents/preparedness/epidemiology-disease-control/rocky-mountain-spotted-fever/rmsf-handbook.pdf](https://www.azdhs.gov/documents/preparedness/epidemiology-disease-control/rocky-mountain-spotted-fever/rmsf-handbook.pdf)

<https://www.cdc.gov/dpdx/diagnosticprocedures/blood/specimenproc.html>