# U.S. Tickborne Diseases You Shouldn't Miss on Blood Smear [2/2021]

## EHRLICHIOSIS

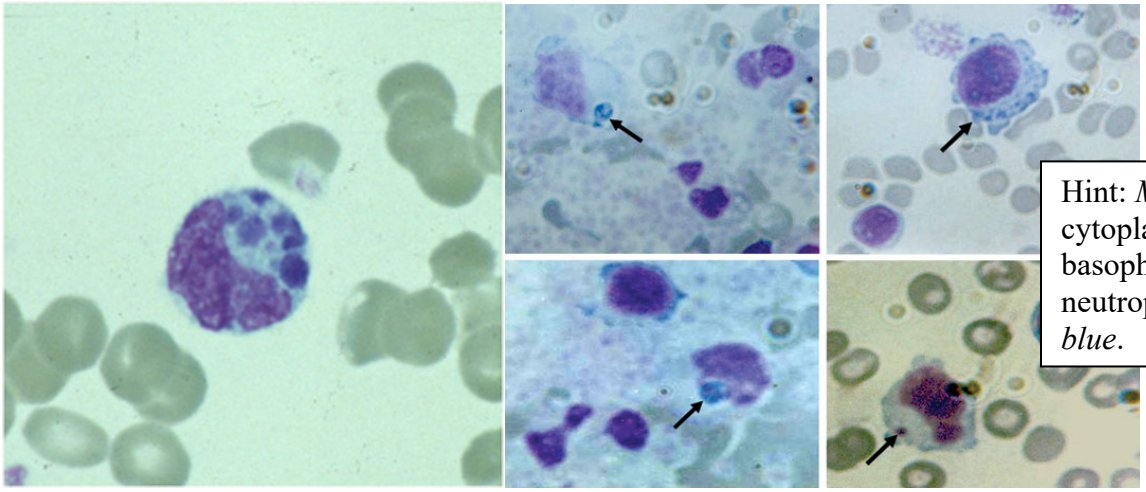
- Ehrlichia chafeensis & other species, Gram neg, round/elliptical bacterium in monocytes
- **"RMSpotlessF", "Human *Monocytic* Ehrlichiosis or HME"**
- F, C, HA, myalgias/arthralgias (usually) without rash
- **SE/SCentral US** — 30% in Oklahoma, Missouri, Arkansas; global
- Summer, age over 50

- Woods, tall grasses, golfers looking for balls in the "rough", **white tail deer**
- **Lone star tick** (Ambylomma, white spot) - most people don't ever feel a tick attached

**Dx:**

- Acutely by **clinical** suspicion
- Lab - Look for purple **morulae** inside **monocytes** on Wright stained peripheral smear - increased yield if you spin blood down & examine a Wright stained smear of the "buffy coat" layer (concentrated WBC)
- Definitive - **PCR or paired IGM/IGG** 2-4 weeks apart

- **Treat empirically with doxycycline pending diagnostics** (neg result doesn't rule it out)
- **Treat suspected cases empirically with doxycycline (same with RMSF)**. Rifampin if no doxy.



Hint: *Monocyte* cytoplasm stains more basophilic than neutrophils→they're *blue*.

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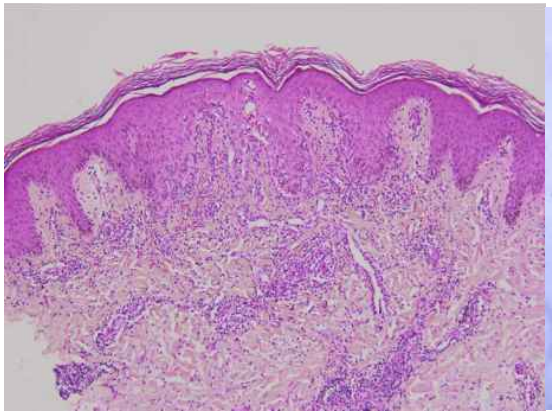
## SPOTTED FEVER RICKETTSIOSIS (INCLUDING ROCKY MOUNTAIN SPOTTED FEVER)

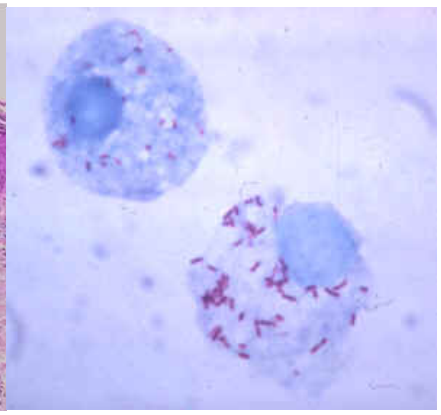
- Rickettsia rickettsia
- F, C, HA, myalgias/arthralgias *without early rash*
- Macular rash/petechiae occurs **late**, ~ up to a week into illness, wrists/ankles, palms/soles
- Edema hands & feet
- **SE/SCentral US -** North Carolina, Oklahoma, Arkansas, Tennessee, and Missouri) account for over 60% of RMSF
- Woods, tall grasses, **American & brown *dog* ticks, Rocky Mountain wood tick**
- In AZ—> found in feral dogs, dog ticks (RMSF isn't *always* where you expect)

**Dx:**

- Acutely by **clinical** suspicion → TREAT
- **Skin biopsy of rash** (+PCR or immunoflourescence) – fast, 70% sensitive
- Definitive - **paired IGM/IGG** 2-4 weeks apart
    - **Treat empirically with doxycycline (if untreated within 8 days, mortality 25%**--> asplenics, HIV, immunosuppressed higher)

Bx: lymphocytic vasculitis, hemorrhage, dermal purpura and edema; CDC: Intracellular R. rickettsiae multiply in endothelium of small-medium-sized arteries of skin/organs. Cell death causes hemorrhage & the rash that is traditionally associated with Rocky Mountain spotted fever.





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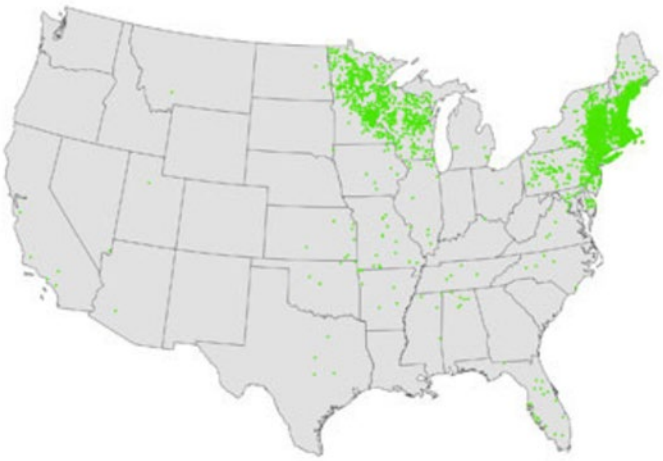
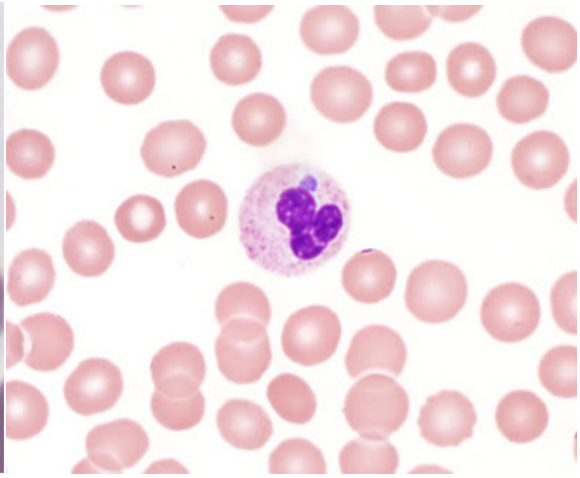



- Anaplasma phagocytophilum, Gram neg round/elliptical bacterium in granulocytes
- **"Human *granulocytic* anaplasmosis or HGA"**
- F, C, HA, myalgias/arthralgias, ?rash
- **NE/NCentral U.S.** — 90% in New York, Connecticut, New Jersey, Rhode Island, Minnesota, and Wisconsin
- Summer, woods, tall grasses, middle aged men
- **Ixodes deer ticks** —> also transmit Babesia & Lyme in these areas, think of coinfection

**Dx:**

- Acutely by **clinical** suspicion
- Look for purple **morulae** inside **PMNs** on Wright stained peripheral smear - increased yield if you spin blood down & examine a Wright stained smear of the "buffy coat" layer (concentrated WBC)
- Definitively - **PCR or paired IGM/IGG** 2-4 weeks apart
- **Treat empirically with doxycycline pending diagnostics** (rifampin if no doxy)



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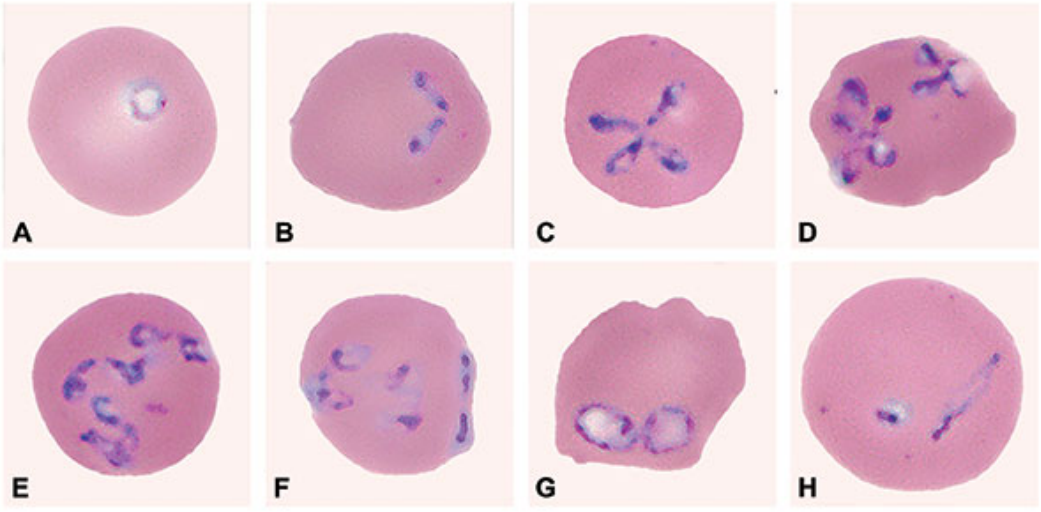
**BABESIOSIS**

- Babesia microti – protozoan like malaria
- May be misdiagnosed in malarious parts of the world
- **NE/Upper MidWest U.S.**, same as Lyme, HGA
- Summer, **Ixodes deer ticks**, woods/tall grasses, hooved livestock (Cattle Fever)
- F, C, myalgias/arthralgias
- Hemolytic anemia, hemoglobinuria, thrombocytopenia
- SIRS/ARDS/increased mortality in immunocompromised, **asplenics (85% parasitemia vs. 10% in immunocompetent patients),** HIV, & Lyme coinfection

**Dx**:

- Light-microscopic examination of blood smears for "maltese crosses" in RBCs (pair & tetrads of merozoites in RBCs)
- Tx 7-10 days with **atovaquone + azithromycin OR clindamycin + quinine** if severe illness or immunosuppressed




(Representative peripheral smear, Wright stained, of a Babesia species infection, demonstrating "tetrads" or "maltese cross" forms. Herwaldt BL, de Bruyn G, Pieniazek NJ, Homer M, Lofy KH, Slemenda SB, et al. Babesia divergens–like infection, Washington State. Emerg Infect Dis [serial online] 2004 Apr [23 Jan 2016]. Available from: http://wwwnc.cdc.gov/eid/article/10/4/03-0377

Note bene: Images from CDC, public domain images, or as noted.