

Podcast (Video Recorded Lecture Series):  
Rickettsia Infections for the USMLE Step One Exam



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# Rickettsia

Spotted Fever (tick - rickettsia); Typhus+ (louse - prowazekii)



Body louse  
Epidemic Typhus Fever  
*R. prowazekii*

## ty·phus

Origin

GREEK

tuphein  
to smoke

GREEK

tuphos  
smoke,  
stupor

MODERN LATIN

typhus  
*mid 17th century*



Flea  
Murine (endemic)Typhus  
*R. typhi*

Greek: smoke, mist or fog

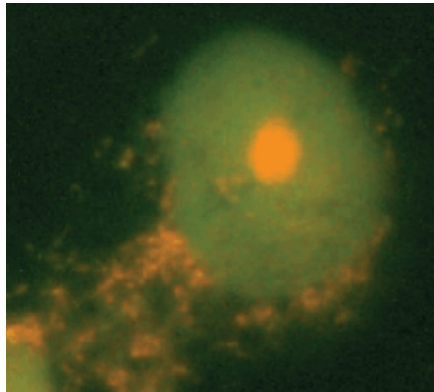
Used by Hippocrates to define a confused state of the intellect, with a tendency to stupor; applied to typhus fever (body louse) with its slow cerebration and drowsy stupor.

AKA: acute infectious fever, Pestilential fever  
Vector: body louse → Jail, Camp, Hospital fever

# Rickettsia

## Spotted Fever (tick - rickettsia)

- Background:
  - Vector: Dermacentor (American Dog Tick)
  - Obligate intracellular bacterium with a tropism for vascular endothelial cells and direct vascular injury (i.e. 'spotted fever').



Rickettsia infected  
vascular endothelial cell

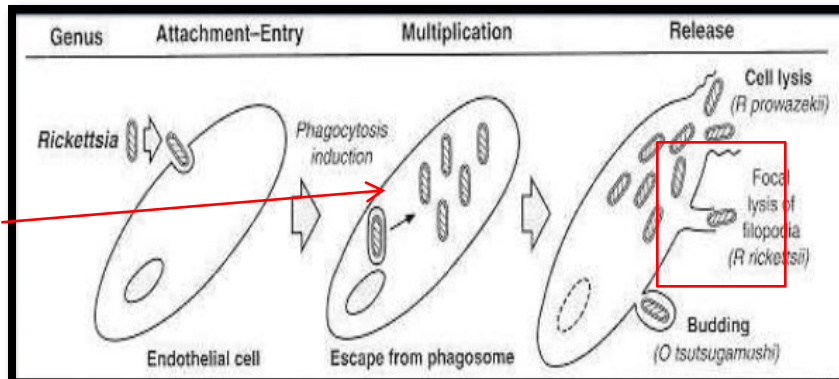


There aren't too many vascular  
endothelial cell infections, are there?

# Rickettsia

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- Background:
  - Vector: Dermacentor (American Dog Tick)
  - Obligate intracellular bacterium with a tropism for vascular endothelial cells and direct vascular injury.
- Microbiology:
  - Obligate intracellular bacteria (gram negative coccobacillus)
  - Two groups: **spotted fever (cell → cell)** and typhus (cell lysis)
  - Organism ingested via endocytosis and escape **phagosome living freely in cytoplasm.**
  - Use **cell actin filaments** to facilitate passage to neighboring cells.



Living the dream  
in cytoplasm

Actin filaments  
from cell → cell

# Rickettsia

Spotted Fever (dermacentor tick → rickettsia)

- Background:

- Vector: Dermacentor (American Dog Tick)
- Obligate intracellular organism for vascular endothelial cells and direct vasculature



- Microbiology:

What are those spots?

1. Endothelial injury
2. Lymphohistiocytic vasculitis

- Organism ingested via tick bite, phagocytosis living freely in cytoplasm.
- Use cell actin filaments to facilitate passage to neighboring cells.

- Pathology

- The organisms cause **endothelial cell injury**.
- Host response to vascular injury: immune and phagocytic cellular responses → **lymphohistiocytic vasculitis**.
- Manifest as foci of **hemorrhage** with localized **vascular thrombosis** ('spotted fever') and widespread organ dysfunction

# Rickettsia: spotted fever

- Clinical:
  - Nonspecific: risk factor for tick bite PLUS fever, HA, rash; N/GI symptoms may occur.
  - Rash, Hemorrhagic: **may not appear until 3-5 d into illness.**
    - Blanching erythematous rash with macules/petechiae
    - Ankles/wrists spread centripitally; palms/soles - late finding
- Diagnostic: **Clinical Impression** - don't wait on labs
  - Labs (nonspecific shock-like picture): ↓ Plts, Na; ↑ transaminase; azotemia
  - Serology: IFA (delay in seroconversion); Skin Bx: DFA (70-90%) sensitive.
- Differential Diagnosis (innumerable; all toxic illnesses):
  - Infectious: septic shock, meningococemia, anaplasma
  - Noninfectious: TTP, DIC

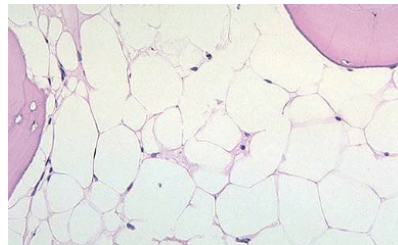
Clinically important but vignettes will likely include the rash

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- Differential Diagnosis (innumerable; all toxic illnesses):
  - Infectious: septic shock, meningococcemia, anaplasma
  - Noninfectious: TTP, DIC
- Treatment: **TTC** or chloramphenicol (50s ribosomal subunit)
  - Delay in rx is principle determinate of poor outcome
  - **Chloramphenicol**: Fatal aplastic anemia 1:25,000



Gray Baby Syndrome



Aplastic Anemia

# Rickettsia: spotted fever

Weil-Felix

**Antigen and Antibody  
Reactions**

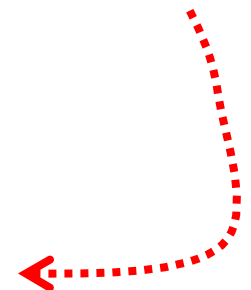
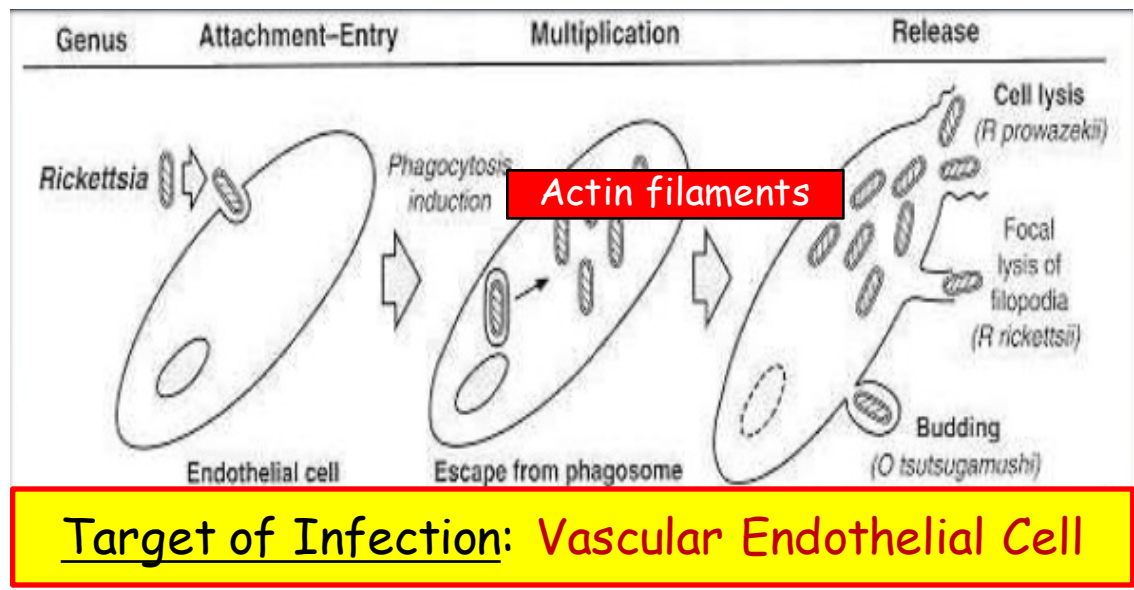
**Agglutination Tests**

Rickettsia antibody x-react with Proteus Ag

- Treatment: TTC or chloramphenicol
  - Delay in rx is principle determinate of poor outcome
  - Chloramphenicol: Fatal aplastic anemia 1:25,000
- Special Notes:
  - Weil-Felix reaction: sera from infected individuals cross react with Proteus Ag → agglutination. Historical interest ∴ a probable test question?!
  - ARDS is a common cause of death



# Dermacentor



Timing?

Location?

Palms/Soles When?

When to initiate rx?