

Rickettsia, Ehrlichia, and Borrelia

Risk Factors for infection: exposure to vector (tick/louse/mite)

Rickettsia

fastidious, gram negative bacteria, which are obligate intracellular pathogens

Pathogenesis:

- vector bites and feeds
- regurgitates bacteria into skin bite site
- Bacteria carried via lymphatics to small blood vessels to general circulation where they invade endothelial cells (primary target)
- spreads to contiguous endothelial cells, smooth muscle cells, and phagocytes
- eventually spread via the microcirculation and invade all organs systems

ENDEMIC DISEASES

Rocky mountain spotted fever (*R. rickettsii*) vector=tick

Murine typhus (*R typhi*) vector=flea

EPIDEMIC DISEASES

Rickettsialpox (*R. akari*) vector=mite

Epidemic typhus (*R. prowazekii*) vector=louse

Rashes

Rickettsial species cause a petechial rash in early disease that starts on trunk and spreads outward (centrifugal).

Two notable exceptions:

R. akari has a characteristic papulo-vesicular rash (looks like chicken pox).

R. rickettsii starts on the wrists, ankles, soles, and palms and then spreads proximally (centripetal)

Rocky Mountain Spotted Fever

Causative agent: *Rickettsia rickettsii*

Vector: tick

-May-Sept (peak months when people are outside with potential tick exposure)

-Endemic regions are South Atlantic and South Pacific states

-After 7-14 d asymptomatic incubation period, sudden onset of fever, headache, malaise, myalgia.

-GI disturbances, hepatomegaly and jaundice can occur in the later stages

-rash with three stages:

1. erythematous macule - blanches on pressure
2. macular papular - a result of fluid leakage from infected blood vessels
3. hemorrhage - into center with frank petechiae

Endothelial invasion leads to angiitis with local thrombus formation and subsequent end organ damage

Diagnosis

R. rickettsii:

-fastidious organism (hard to culture and stain)

-skin biopsy

-PCR

-Serologies

Treatment

doxycycline

Rickettsialpox

Causative agent: *Rickettsia akari*

Vector: mite

An eschar forms right at the bite site

A papular-vesicular rash with fever, headache, lymphadenopathy chills, myalgia

Diagnosis

Treatment

Self-limited

Doxycycline or tetracycline

Epidemic Typhus

Causative agent: *R. prowazekii*

Vector: louse

Crowding and poor sanitation

Incubation approximately one week with the abrupt onset intense headache, chills, fever, and myalgia.

No eschar

Rash starts fifth day of illness in the axillary folds and upper trunk, spread centrifugally, spares face, palms, and soles.

Diagnosis

Treatment

Doxycycline

Ehrlichia

Small, obligate intracellular gram negative bacteria that cause a flu-like illness (fever, HA, chills, myalgia, malaise)

Symptoms of ehrlichiosis are the same as those of rickettsial diseases

Lab results: thrombocytopenia, leukopenia, elevated LFT

Pathogenesis: enters via tick bite and spreads via lymphatics to the blood.

“Spotless” Fever (but 20-30% with HME can have rash)

Clustered inclusion-like appearance in the host cell vacuoles: morula (Latin for “mulberry”).

transmitted by ticks

Multiple species that infect either granulocytes or monocytes

Human Granulocytic Ehrlichiosis (HGE)

Causative agent: *Anaplasma phagocytophilum*

Vectors: Ixodes ticks

Reservoirs: white-footed mouse, chipmunks, and voles.

Year round disease with one peak incidence in July and then another in November

Northeast distribution

Can be severe: ARDS, septic shock like picture, rhabdomyolysis, neurologic sequelae including demyelination polyneuropathy or a brachial plexopathy.

Human Monocytic Ehrlichiosis (HME)

Vector: Lone star tick (*Amblyomma americanum*)

Reservoir: dog

Seasonal: May-July

Southeastern and Southern central U.S.

Diagnosis:

Treatment

Doxycycline or tetracycline.

Borrelia

Lyme Disease

-Causative agent *B. burgdorferi* a treponeme

-Vector: Ixodes ticks (nymphs)

reservoirs: the white-footed mouse, white tailed deer, cattle, horses, dogs

Clinical stages of infection:

1) local: erythema migrans

2) early disseminated -

- Cardiac - heart block, myocarditis, myopericarditis
- Musculoskeletal - generalized joint pain, joint effusion - the knee is the most common.
- Neurological - meningitis, Bell’s palsy, peripheral neuropathy, encephalitis (extremely rare)
- erythema migrans may persist

3) chronic disseminated (months to years after bite)

- chronic destructive arthritis of the large joints,
- end stage cardiomyopathy
- stroke, meningoencephalitis, dementia, peripheral neuropathy which is irreversible
- acrodermatitis chronica atrophicans

Diagnosis: Use of antibodies

Treatment: oral versus IV

Other *Borrelia*:

Borrelia hermsii

Borrelia recurrentis``

Prevention of vector borne diseases