

Ehrlichia chaffeensis

Disease Agent:

- *Ehrlichia chaffeensis*

Disease Agent Characteristics:

- Obligate intracellular Gram-negative bacterium
- Order: Rickettsiales; Family: Anaplasmataceae
- Size: 0.5-0.8 μm \times 1.2-3 μm
- Nucleic acid: Rickettsial genomes are among the smallest of bacteria. *Ehrlichia* is approximately 1200-1600 kb.
- Physicochemical properties: The rickettsiae are susceptible to 1% sodium hypochlorite, 70% ethanol, glutaraldehyde, formaldehyde, and quaternary ammonium disinfectants. Sensitive to moist heat (121°C) for at least 15 minutes and dry heat (160-170°C) for at least 1 hour

Disease Name:

- Human monocytic ehrlichiosis (HME)

Priority Level:

- Scientific/Epidemiologic evidence regarding blood safety: Theoretical
- Public perception and/or regulatory concern regarding blood safety: Absent, but low in selected populations (e.g., military)
- Public concern regarding disease agent: Absent, but low in selected populations (e.g., military)

Background:

- This is an emerging tick-borne zoonosis with exposure occurring in rural and suburban tick habitats during recreational, peridomestic, and military activities. Documented HME has been reported from 47 states, especially in the south central and south-east US. This corresponds to the distribution of a major vector tick, *Amblyomma americanum*, and the white-tailed deer (*Odocoileus virginianus*) that serves as the reservoir host.
- Concern over potential transfusion transmission arose in 1997 during an outbreak of febrile disease at Fort Chaffee, where a large blood drive was conducted just after military donors had extensive exposure to infected ticks.

Common Human Exposure Route:

- Bite of infected tick

Likelihood of Secondary Transmission:

- Unlikely

At-Risk Populations:

- Individuals who participate in recreational or occupational activities in rural habitats infested by ticks

Vector and Reservoir Involved:

- Lone star tick, *Amblyomma americanum*, distributed throughout southeastern and south central US.
- Cases in the western US suggest additional tick vectors that are thought to be *Dermacentor variabilis* and *Ixodes pacificus*.
- White-tailed deer are thought to be the major reservoir.

Blood Phase:

- No data for *E. chaffeensis* in humans
- Experimental infection in dogs suggests that the agent may circulate in blood for over 3 weeks.
- Asymptomatic human infection is suspected. An *Ehrlichia* species related to *E. canis* was isolated from the blood of an asymptomatic persistently infected patient in South America.

Survival/Persistence in Blood Products:

- Remains viable when infected monocytes are inoculated into RBCs stored at 4-6°C for at least 11 days, with supernatant organisms found, suggesting the potential for transfusion transmission

Transmission by Blood Transfusion:

- Theoretical
- In 1997, following deployment to Fort Chaffee, AR, a number of National Guard personnel developed febrile illnesses. Investigation of both symptomatic and asymptomatic individuals demonstrated serological evidence for infection with both *R. rickettsii*, the agent of Rocky Mountain spotted fever, and *E. chaffeensis*. Blood drives had been conducted during the deployment. Evaluation of 10 recipients of components from 377 personnel with confirmed or probable infections did not demonstrate transmission of either organism.

Cases/Frequency in Population:

- 3.6% seroprevalence is documented in selected areas.
- 487 clinical cases were reported by state health departments from 1997 through 2001.
- 2001-2002 US mean case incidence was 0.6 per million, but active surveillance during 3 years in Missouri demonstrated an annual case incidence of 11 per 100,000 population, with one practitioner reporting 100 cases per 100,000.

Incubation Period:

- 1-2 weeks (median: 9 days)

Likelihood of Clinical Disease:

- Low/Moderate, based on serosurveys
- Symptoms are often subclinical or are usually mild and flu-like.
- Immunocompromised individuals who are infected may develop more severe manifestations of disease.

Primary Disease Symptoms:

- Rash develops in up to 33% of patients.
- Fever with headache, myalgia, and malaise
- Gastrointestinal, respiratory, or central nervous system involvement also may occur.

Severity of Clinical Disease:

- Currently most infections are not diagnosed, but HME can be a life-threatening disease, with hospitalization in 41-63% of recognized cases.
- Severely affected patients can develop acute respiratory failure, renal failure, meningoencephalitis, coagulopathy, and GI bleeding.
- Untreated disease may progress to death as early as the second week of illness.

Mortality:

- 3% in published series, but this is likely an overestimate because of exclusion of unrecognized cases from the denominator

Chronic Carriage:

- Not documented

Treatment Available/Efficacious:

- Tetracyclines (e.g., doxycycline) are effective.

Agent-Specific Screening Question(s):

- No specific question is in use.
- Not indicated because transfusion transmission has not been definitively demonstrated.
- No sensitive or specific question is feasible. In endemic areas, a question on exposure to tick bites has been shown to be ineffective in distinguishing *Babesia*-infected from *Babesia*-uninfected donors. This question probably also lacks sensitivity and specificity for *E. chaffeensis*.

Laboratory Test(s) Available:

- No FDA-licensed blood donor screening test exists.
- Available diagnostic tests include IFA (some cross reactivity with other *Ehrlichia* species) and western blot, PCR, visualization of morulae (intraleukocytic clusters of bacteria) in blood smear, immunohistochemical staining, and isolation.

Currently Recommended Donor Deferral Period:

- No FDA Guidance or AABB Standard exists.
- Prudent practice would be to defer donor until signs and symptoms are gone and a course of treatment is completed.
- In focal outbreaks, a different policy may be appropriate. At the time of the recognition of the events at Fort Chaffee, AR, in 1997, a recall of components collected during the deployment was undertaken, and FDA recommended that exposed individuals not donate blood for 4 weeks after departure from the area.

Impact on Blood Availability:

- Agent-specific screening question(s): Not applicable
- Laboratory test(s) available: Not applicable

Impact on Blood Safety:

- Agent-specific screening question(s): Not applicable
- Laboratory test(s) available: Not applicable

Leukoreduction Efficacy:

- Unknown
- A related rickettsia, *Orientia tsutsugamushi*, has been shown to be removed (>4 log) by leukoreduction.
- Leukoreduction would be expected to be at least partially effective for HME because the agent is found mainly in WBCs; however, extracellular *Ehrlichia* are present.

Pathogen Reduction Efficacy for Plasma Derivatives:

- No data are available for this organism, but fractionation and inactivation techniques in use for plasma derivatives should be robust against intracellular bacteria.

Other Prevention Measures:

- Tick avoidance measures (e.g., long pants, long sleeves, repellent)
- Riboflavin/Light has been effective in inactivating *Orientia tsutsugamushi*, a related organism.

Other Comments:

- Rarely, other ehrlichiae, such as *E. ewingii*, have been implicated in human disease.

Suggested Reading:

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 6. McQuiston JH, Childs JE, Chamberland ME, Tabor E. Transmission of tick-borne agents of disease by blood transfusion: a review of known and potential risks in the United States. *Transfusion* 2000;40:274-84.
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