Colorado Tick Fever Virus

Disease Agent:
- Colorado tick fever virus (CTFV)

Disease Agent Characteristics:
- Family: Reoviridae; Genus: Coltivirus
- Virion morphology and size: Nonenveloped, icosahedral nucleocapsid symmetry, spherical particles, 80 nm in diameter
- Nucleic acid: Segmented, double-stranded RNA with plus and minus strands that are colinear and complementary, ~27-29 kb in length
- Physicochemical properties: Stable at -70°C, 4°C, and room temperature, but loss of infectivity is accelerated at higher temperatures; resistant to treatment with ether and other lipid solvents, relatively resistant to commonly used disinfectants (e.g., formalin, Lysol, H2O2, and phenol); Wescodyne (1:200) is of only limited efficacy; may be inactivated by 95% ethanol; sodium hypochlorite (800 mg/L) is highly effective after brief exposure; sensitive to UV light.

Disease Name:
- Colorado tick fever

Priority Level:
- Scientific/Epidemiologic evidence regarding blood safety: Very low
- Public perception and/or regulatory concern regarding blood safety: Absent
- Public concern regarding disease agent: Absent but very low in endemic areas

Background:
- Recognized as a distinct entity in the US in 1930
- Etiologic agent isolated from blood in 1943
- Disease range corresponds to distribution of wood tick, Dermacentor andersoni, in the US and Canadian Rocky Mountains, Wasatch and Sierra Nevada Ranges, and Black Hills usually between March and September.

Common Human Exposure Routes:
- Tick bite

Likelihood of Secondary Transmission:
- None

At-Risk Populations:
- Predominantly persons hiking, fishing, or camping in enzootic locations

Vector and Reservoir Involved:
- Adult wood ticks of the species Dermacentor andersoni
- Other tick species may carry the virus, but their roles in transmission are uncertain.

Blood Phase:
- The virus infects erythroblasts and prolonged intraerythrocytic viremia lasts up to several months and parallels survival of RBCs.

Survival/Persistence in Blood Products:
- At least 8 days as documented in the single posttransfusion case
- 18 months in refrigerated blood clots

Transmission by Blood Transfusion:
- One documented case transmitted by transfusion

Cases/Frequency in Population:
- Endemic in mountainous regions that are congruent with the distribution of the vector
- A CTF-like agent (Eyach virus) in France, Germany, Netherlands, and former Czech Republic and CTF variants found in California in black-tailed jackrabbits have been associated with human disease.
- Disease surveillance reports from six Western states documented 441 clinical cases between 1985 and 1989. Clinical cases are thought to be greatly underreported.
- There are no good serologic survey data.

Incubation Period:
- Mean incubation period is 3-4 days following a tick bite (range: <1-14 days).

Likelihood of Clinical Disease:
- Unknown

Primary Disease Symptoms:
- Abrupt onset of fever (biphasic course in 50% of cases), chills, headache, retroorbital pain, photophobia, myalgia, malaise
- GI symptoms in ~20% of cases (abdominal pain, nausea, vomiting)
- A maculopapular or petechial rash is seen in 15% of patients.

Severity of Clinical Disease:
- Approximately 20% of patients are hospitalized.
- Protracted convalescence for several weeks or months (fatigue, asthenia) is more likely to be seen in adults (70%) than in children.
• Severe CNS and hemorrhagic forms have been described but occur at low frequency (CNS complications reported in 3%-7% of cases).

Mortality:
• Rare; three deaths reported in children

Chronic Carriage:
• There is no evidence of a persistent carrier state, but prolonged viremia occurs after clinical disease.

Treatment Available/Efficacious:
• Ribavirin may be effective.

Agent-Specific Screening Question(s):
• No specific question is in use.
• Not indicated because transfusion transmission is limited to a single reported case.
• 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 uninfected donors. This question probably also lacks sensitivity and specificity for this agent.

Laboratory Test(s) Available:
• No FDA-licensed blood donor screening test exists.
• Virus isolation from blood or stored refrigerated clots for diagnosis of acute infection.
• Direct fluorescent antibody (FA) assay to detect infected cells in clinical samples; indirect fluorescent antibody (IFA) assay to detect patient antibodies using infected cell cultures.
• IgM EIA to make presumptive diagnosis with single sample.
• IgG EIA to detect four-fold antibody titer rise in acute and convalescent samples.
• NAT can be used to detect viral RNA in whole blood.

Currently Recommended Donor Deferral Period:
• No FDA Guidance or AABB Standard exists.
• Given the prolonged viremia in some patients, a deferral of 6 months after resolution of symptoms would seem prudent.

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): Not applicable.

Leukoreduction Efficacy:
• This would not be effective given that the replication site of the virus is the RBC.

Pathogen Reduction Efficacy for Plasma Derivatives:
• Theoretically, highly susceptible to inactivation because other viruses in the same family (e.g., blue-tongue virus) are inactivated by these types of treatment.

Other Prevention Measures:
• Tick-avoidance measures (e.g., long pants, long sleeves, repellants).

Suggested Reading: