Babesiosis

Description/Etiology

Babesiosis is a tickborne infection caused by protozoa of the genus *Babesia* (e.g., *Babesia microti*, *Babesia bovis*, *Babesia divergens*). The infection is often mild and self-limiting, but in rare cases it may be severe and life-threatening, mostly in immunocompromised persons (e.g., patients with human immunodeficiency virus [HIV] infection) and those that are asplenic.

Although more than 100 *Babesia* species may infect wild and domestic animals, two species, *B. microtia* and *B. divergens*, produce most infections in humans. Babesiosis is primarily transmitted when a tick feeds on an infected host, usually a rodent or cow, and then later feeds on a human, injecting the parasite along with its saliva into the wound. In rare cases, babesiosis has been transmitted through blood transfusion or transplacentally (i.e., crossing the placenta from mother to fetus). Onset of the illness typically occurs 1–4 weeks after transmission, although if transmitted through blood products symptoms may occur 4–9 weeks after transmission. The parasite enters and replicates within the human red blood cells (RBCs) until the cell wall is weakened and disintegrates, and releases the parasites, which leads to destruction of RBCs and hemolytic anemia. As the immune system tries to respond to the infection, cytokines are released, which is thought to cause inflammatory symptoms, including myalgias (i.e., muscle pain), arthralgias (i.e., joint pain), fever, and in more severe cases pulmonary inflammation (see below for a list of signs and symptoms). Infections caused by the *B. divergens* strain, more common in Europe, tend to be more severe, leading to complications including acute respiratory, liver, or renal failure; congestive heart failure; disseminated intravascular coagulation (DIC); rupture of the spleen; and death.

Babesiosis is suspected in patients with prolonged and recurrent fever of unexplained origin, accompanied with symptoms and signs similar to that of malaria (e.g., sweats, fatigue, myalgia, hemoglobinuria and hemolytic anemia) and history of exposure to ticks in an endemic area. Diagnosis is confirmed by finding the parasite inside the erythrocytes in peripheral blood smears or by serology testing.

Most asymptomatic individuals are able to clear the infection without treatment. Treatment depends on disease severity and is not recommended for asymptomatic babesiosis unless parasitemia in blood smears persists for more than 3 months. Combined pharmacotherapy with a 7- to 10-day course of oral atovaquone and azithromycin is the recommended treatment for mild and moderate infection. Treatment with quinine and clindamycin is another alternative, but quinine has been reported to cause side effects that include hearing loss, tinnitus (i.e., a ringing sensation in the ears), nausea, diarrhea, and dizziness. Parasites may persist in the blood up to 2 years after symptoms have resolved. If babesiosis is severe, hospitalization for management of complications and treatment of babesiosis with intravenous clindamycin, oral quinine, and exchange transfusions (i.e., slow removal of the patient’s blood and replacement with healthy donor blood) may be required to eliminate the parasite and stabilize the patient.

Facts and Figures

- The incidence of babesiosis is highest in May through October, when humans are most likely to come in contact with ticks.
B. divergens, the cattle species, is endemic in Europe, while B. microti, the rodent species, is endemic in the Northeast, upper Midwest, and northern Pacific Coast of the United States. The Centers for Disease Control reported 429 cases of babesiosis caused by B. microti in 18 states in the U.S. during 2011; 10 of them were related to transfusions. Up to 12% of persons with Lyme disease are coinfectected with babesiosis.

Risk Factors
Risk factors for babesiosis include living in or traveling to an endemic area (e.g., Northeastern, Midwestern, and northern Pacific Coast of the U.S.). Babesiosis is more frequent in males in endemic regions possibly due to occupational exposure, and during spring and summer when recreational activities rise, increasing the risk of exposure to infected ticks. The risk of more severe disease is increased in patients who have had a splenectomy, are older than 65 years, or are immunocompromised. Coinfection with Lyme disease or human granulocytic anaplasmosis, which are also tickborne infections, is not uncommon.

Signs and Symptoms/Clinical Presentation
Most healthy individuals with babesiosis are asymptomatic and may never know they are infected. If an infected individual does experience symptoms after the incubation period (up to 9 weeks) onset is usually gradual and symptoms may last for months. Common symptoms include headache, fatigue, malaise, decreased appetite, fever, myalgia, arthralgia, cough, and sweats, which may be misdiagnosed as viral illness. Signs may include petechiae (i.e., small purple hemorrhagic spots on the skin), jaundice, or hepatosplenomegaly (i.e., enlarged liver and spleen).

Assessment

Laboratory Tests That May Be Ordered
- Microscopic examination of a blood smear with Wright or Giemsa staining is required for diagnosis. Blood smears may need to be repeated over several days to find a blood sample that contains the parasite. A blood smear with more than 10% of the RBCs infected is considered severe parasitemia. Babesiosis may be misdiagnosed as malaria, another intraerythrocytic protozoan infection.
- Serology is a nonspecific indicator of recent or past infection.
- Polymerase chain reaction (PCR) test for babesial DNA can confirm diagnosis.
- CBC may indicate anemia with decreased RBCs and increased reticulocytes; the platelet count may also be decreased.
- Renal and liver function test values (e.g., creatinine, AST, ALT, total bilirubin) are often elevated.
- Urinalysis may indicate proteinuria and hemoglobinuria.
- If blood smears, serology, and PCR tests are negative, but babesiosis is still suspected, a hamster test may be performed. A blood sample is shipped to a laboratory that injects the patient’s blood into hamsters. If the patient is infected, the hamsters should have high levels of parasitemia within 2–4 weeks.

Treatment Goals
Promote Recovery and Symptom Relief
- Assess patient’s vital signs and pain level; report any changes to the treating clinician.
- Review laboratory results; report any changes to the treating clinician.
- Administer prescribed medications (e.g., antiparasitics [e.g., atovaquone, azithromycin, clindamycin, quinine], analgesia); monitor for efficacy and adverse effects.
- Perform exchange transfusion, if applicable.
  - Follow facility transfusion protocols; reinforce transfusion education and verify completion of facility informed consent documents.
  - Verify patient identity using at least two identifiers (e.g., name, medical record number, date of birth); verify patient blood type, donor blood types, and that the blood product is the product ordered and has not expired.
  - Administer blood product within 4 hours of the time the blood product left the blood bank using a blood administration set.
  - Assess for signs of transfusion reaction.
    - If no sign of reaction is observed, the rate may be increased and vital signs monitored per facility protocol.
    - If a reaction develops, immediately stop the transfusion.
Provide Emotional Support and Education
- Educate and encourage discussion about babesiosis, potential complications, and treatment plan; provide written materials, if available, to support verbal education
- Assess anxiety level, coping ability, and need for support services
- Request clinician referral to a social worker for identification of local resources or support groups, if appropriate

Food for Thought
- Several diseases that cannot be detected with conventional pre-transfusion testing of blood products, including Creutzfeldt-Jakob disease, dengue, and babesiosis, have emerged as a risk for patients who require multiple transfusions
- Failure to respond to treatment for Lyme disease should raise the suspicion for babesiosis
- Babesiosis has been made a nationally notifiable disease in the U.S. in an effort to detect, monitor, and prevent tickborne and transfusion disease

Red Flags
- Babesiosis may be transmitted through transfusion of contaminated blood products from infected blood donors
- Transfusion reactions due to blood group incompatibility are life-threatening and require immediate attention
- Older adults, especially those coinfected with Lyme disease, experience increased risk for complications and death related to babesiosis

What Do I Need to Tell the Patient/Patient’s Family?
- Educate patients living in or traveling to endemic areas to wear light-colored clothing (to better visualize ticks), long pants tucked into socks, and insect repellent when hiking in wooded areas. After spending time in wooded areas, they should inspect themselves for ticks, particularly in hair and skin folds. Pets should be inspected daily. If a tick is found, it should be removed carefully with tweezers by pulling at a 90º angle (perpendicular to the skin). Folk methods of tick removal (e.g., application of petroleum jelly or a lit match) should be avoided because they may stimulate the tick to release saliva into the wound
- Encourage patients living in areas in which tick-borne diseases are endemic to fill holes in stonework to reduce the mouse population on their property, to avoid planting vegetation that is appealing to deer, and to consider fencing to keep deer off the property
- Encourage patients with a history of tick exposure and any of the signs and symptoms listed above to seek medical attention

References