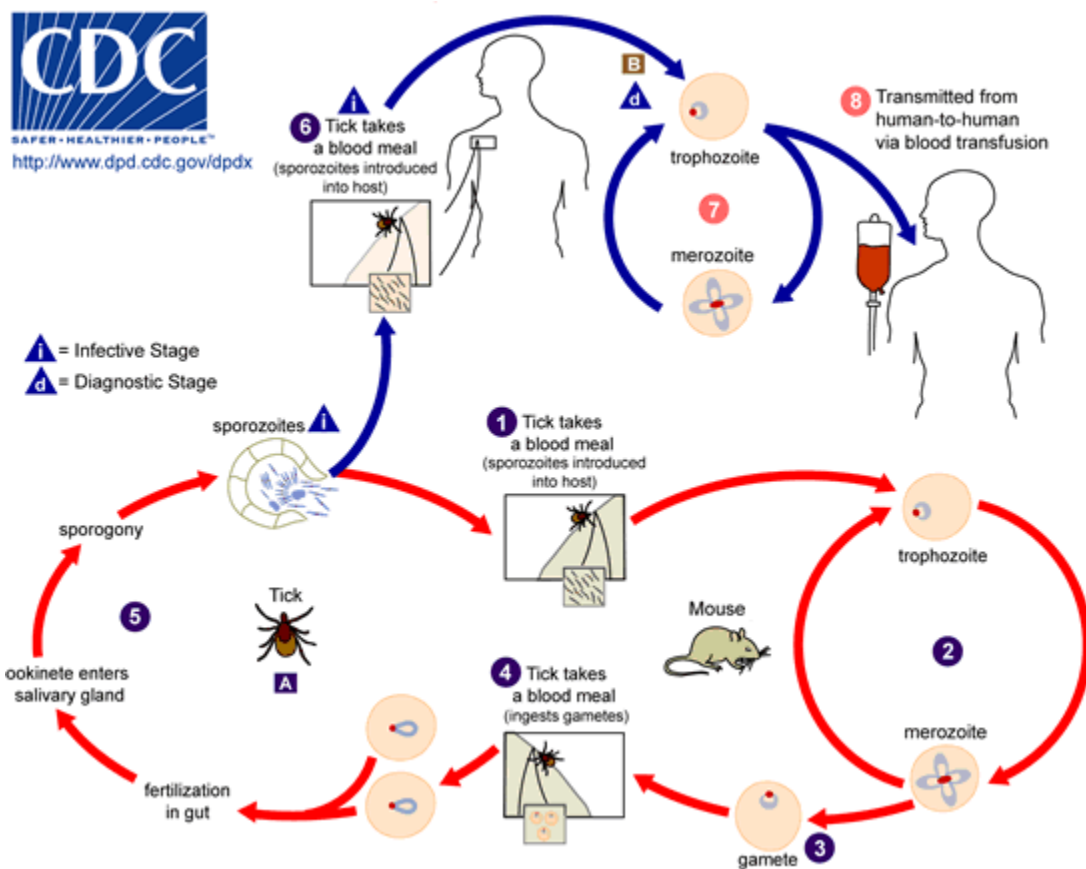


Babesiosis

Causal Agents:

Babesiosis is caused by hemoprotozoan parasites of the genus *Babesia*. While more than 100 species have been reported, only a few have been identified as causing human infections. *Babesia microti* and *Babesia divergens* have been identified in most human cases, but variants (considered different species) have been recently identified. Little is known about the occurrence of *Babesia* species in malaria-endemic areas where *Babesia* can easily be misdiagnosed as *Plasmodium*.

Life Cycle:



The *Babesia microti* life cycle involves two hosts, which includes a rodent, primarily the white-footed mouse, *Peromyscus leucopus*. During a blood meal, a *Babesia*-infected tick introduces sporozoites into the mouse host **1**. Sporozoites enter erythrocytes and undergo asexual reproduction (budding) **2**. In the blood, some parasites differentiate into male and female gametes although these cannot be distinguished at the light microscope level **3**. The definitive host is a tick, in this case the deer tick, *Ixodes dammini* (*I. scapularis*). Once ingested by an appropriate tick **4**, gametes unite and undergo a sporogonic cycle resulting in sporozoites **5**. Transovarial transmission (also known as vertical, or hereditary, transmission) has been documented for "large" *Babesia* spp. but not for the "small" babesiae, such as *B. microti* **A**.

Humans enter the cycle when bitten by infected ticks. During a blood meal, a *Babesia*-infected tick introduces sporozoites into the human host ⁶. Sporozoites enter erythrocytes ^B and undergo asexual replication (budding) ⁷. Multiplication of the blood stage parasites is responsible for the clinical manifestations of the disease. Humans are, for all practical purposes, dead-end hosts and there is probably little, if any, subsequent transmission that occurs from ticks feeding on infected persons. However, human to human transmission is well recognized to occur through blood transfusions ⁸.

Note: Deer are the hosts upon which the adult ticks feed and are indirectly part of the *Babesia* cycle as they influence the tick population. When deer populations increase, the tick population also increases, thus heightening the potential for transmission.

Geographic Distribution:

Worldwide, but little is known about the prevalence of *Babesia* in malaria-endemic countries, where misidentification as *Plasmodium* probably occurs. In Europe, most reported cases are due to *B. divergens* and occur in splenectomized patients. In the United States, *B. microti* is the agent most frequently identified (Northeast and Midwest), and can occur in non-splenectomized individuals. Two variants, arguably different species, have been reported in the U.S. states of Washington and California (WA1- type and related parasites) and Missouri (MO1).

Clinical Features:

Most infections are probably asymptomatic, as indicated by serologic surveys. Manifestations of disease include fever, chills, sweating, myalgias, fatigue, hepatosplenomegaly, and hemolytic anemia. Symptoms typically occur after an incubation period of 1 to 4 weeks, and can last several weeks. The disease is more severe in patients who are immunosuppressed, splenectomized, and/or elderly. Infections caused by *B. divergens* tend to be more severe (frequently fatal if not appropriately treated) than those due to *B. microti*, where clinical recovery usually occurs.

Laboratory Diagnosis:

Diagnosis can be made by microscopic examination of thick and thin blood smears stained with Giemsa. Repeated smears may be needed.

Diagnostic findings

- Microscopy
- Antibody detection by indirect fluorescent antibody (IFA) test is a complementary diagnostic test.
- Molecular methods

Isolation of the organisms by inoculation of patient blood into hamsters or gerbils may also assist in diagnosis. Animals inoculated with infective blood typically develop parasitemia within 1 to 4 weeks.

Treatment:

Treatment with clindamycin* plus quinine or atovaquone* plus azithromycin* are the options. The Medical Letter notes that exchange transfusion has been used in severely ill patients with high parasitemias.

* These drugs are approved by the FDA, but considered investigational for this purpose.

