

Babesia

Epidemiology:

Babesia is a protozoan parasite of the blood that causes a hemolytic disease known as Babesiosis. There are over 100 species of *Babesia* identified however only a handful of species have been documented as pathogenic in humans [8]. For centuries, Babesiosis was known to be a serious illness for wild and domestic animals especially cattle. Victor Babes, a Romanian scientist who first documented the disease in 1888, Long believed to be a disease that only affected non-human mammals, it wasn't until 1957 that the first case of Babesiosis was seen in humans In the United States, *Babesia microti* is the most common strain associated with humans with other species infecting cattle, livestock and occasionally domestic animals .People who contract Babesiosis suffer from **malaria-like symptoms**. As a result malaria is a common misdiagnosis for the disease.

Agent (Classification and Taxonomy)

Babesia is a protozoan parasite with a taxonomic classification as seen in Table 1. *Babesia microti* (*B. microti*) and *Babesia divergens* (*B. divergens*) are the two species to most frequently infect humans. Infections from other species of *Babesia* have been documented in humans but are not habitually seen.

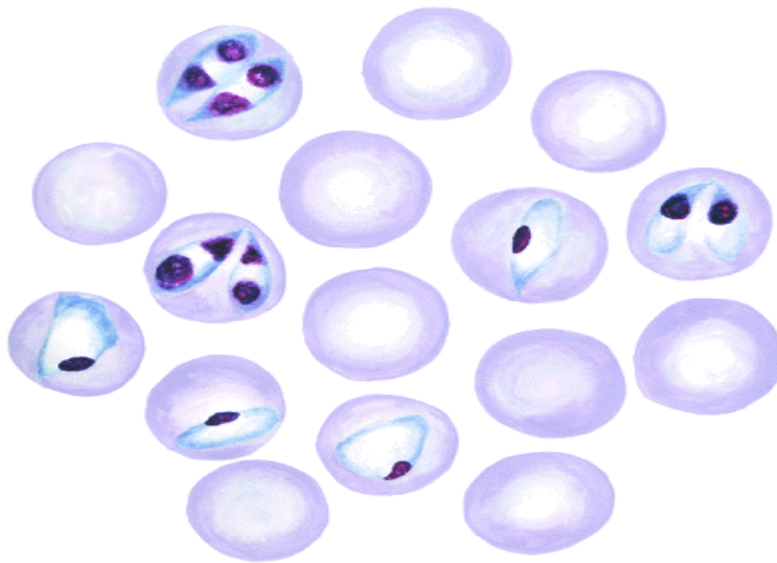
Babesiosis can also be known as Prioplasmosis. Common names of the disease include **Texas Cattle Fever, Redwater Fever, Tick Fever, and Nantucket Fever**

Table 1

Kingdom	Eukaryota
Phylum	Alveolata
Class	Apicomplexa
Order	Aconoidasida
Family	Piroplasmida
Genus	Babesiidae
Species	Over 100 species <i>Babesia Microti</i> <i>Babesia divergens</i>

Morphology

Babesia enters erythrocytes at the sporozoite stage. Within the red blood cell, the protozoa become cyclical and develop into a trophozoite ring seen in the second cell of Image 3.



(Image 3. Morphology of *Babesia* in an erythrocyte [14]).

-The trophozoites morph into merozoites, which have a tetrad structure coined a Maltese-cross form,

Trophozoite and merozoite growth ruptures the host erythrocyte leading to the release of vermicles, the infectious parasitic bodies, which rapidly spread the protozoa throughout the blood

Transmission

Babesia is spread through 1- the saliva of a **tick** when it bites *B. microti*, the most common variety of *Babesia* in humans however, has not been shown to transmit transovarially

. However, as of 2003 the (CDC) acknowledged more than 40 cases of Babesiosis contracted from 2- packed red blood cell (PRBC) transfusions and 2 infections documented from 3-organ transplantation .

. **The reservoirs** are theorized to be the white-footed mouse and the white-tailed deer These woodland species are hypothesized reservoirs because although they are known to harbor the disease,

The life cycle

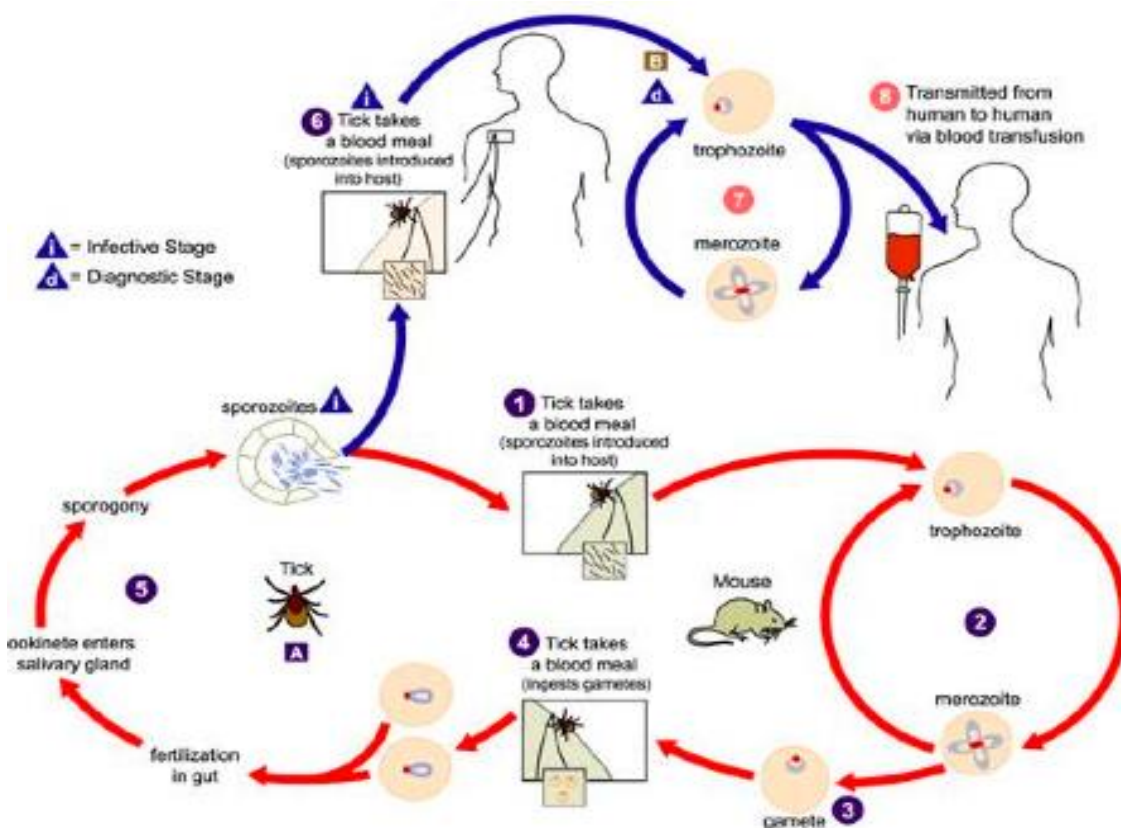
The life cycle of *B. microti* requires a biological stage in a rodent or deer host.

Beginning from the point labeled (1) in Figure 1 below,

1-the tick (*Ixodidae*) introduces the sporozoites into the rodent when taking a blood meal. Sporozoites enter erythrocytes in the blood and begin the cyclical development between trophozoites and merozoites

2- some merozoites produce gametocytes

- 3- The definitive tick host, Ixodidae, takes up the gametes when attached for a blood meal
- 4- The gametes are fertilized in the gut of the tick and develop into sporozoites in the salivary glands. The sporozoites are introduced into a **human** upon inoculation at the bite of an infected tick.
- 5-. Babesia can be diagnosed at the trophozoite stage and can be transmitted from human to human either through the tick vector or through blood transfusions [8].



Clinical Presentation in Humans

- Signs of infection usually arise 1 to 8 weeks after a bite from an infectious tick
- The severity of *B. microti* infections varies. For 25% of cases in adults and half of cases in children,
 - the disease is **asymptomatic** or mild with flu-like symptoms.
 - In cases of **symptomatic infection**, symptoms are characterized by irregular fevers, chills, headaches, general lethargy, pain and malaise –
 - In severe cases, hemolytic anemia, jaundice, shortness of breath, and hemoglobinuria are documented due to the lytic effects of parasitic multiplication

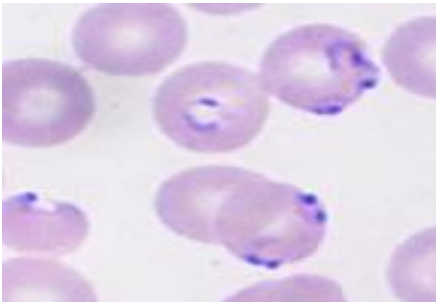
-**Complications** that arise from *B. microti* infections include acute respiratory failure, congestive heart failure, and renal failure. Infections can be fatal in 5-10% of hospitalized patients with increased risk of death in the immunosuppressed, the elderly, and those co-infected with Lyme disease

-*B. divergens* infections have a much higher fatality rate (42%) and present with the most severe symptoms.

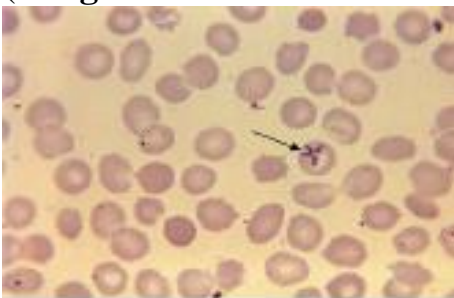
Diagnostic Tests

1-As a protozoan parasite, the most effective way to identify *Babesia* infection through blood sample testing.

2-diagnoses should be made with an indirect fluorescent antibody (IFA) test



(Image 4. Geimsa-stained thin blood smear of *Plasmodium falciparum*)



Source: Larrison et al. Review of Medical Microbiology and Immunology, 10th Edition, Mosby/Elsevier (2004) 100-101
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(Image 5. *Babesia* tetrad seen in a blood smear)

Management and Therapy

- patients spontaneously recover having only experienced mild symptoms undiagnosed as the disease.

-. For *B. divergens* and more severe *B. microti* infections, the standard treatment was oral or intravenous Clindamycin with oral quinine

-, treatment regimens have been increasingly leaning towards oral Atovaquone with oral azithromycin.

- controlling or complete eradication of the tick vector can break the transmission cycle.

