




# ***Babesia microtti***

Assist prof

Dr. Muntaha M. Hassan

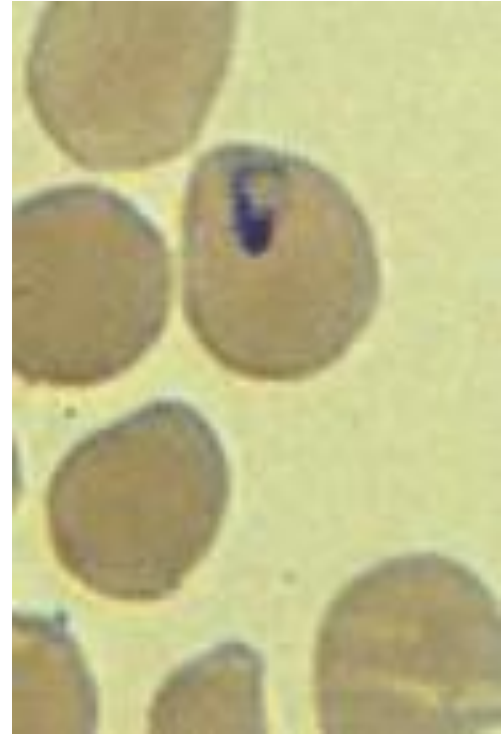
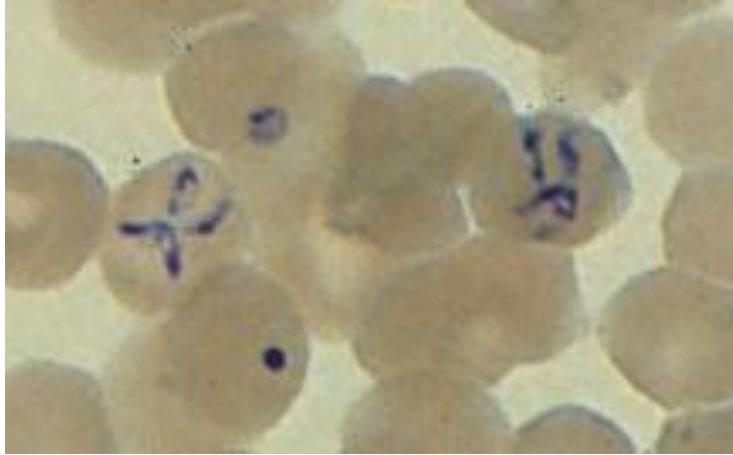
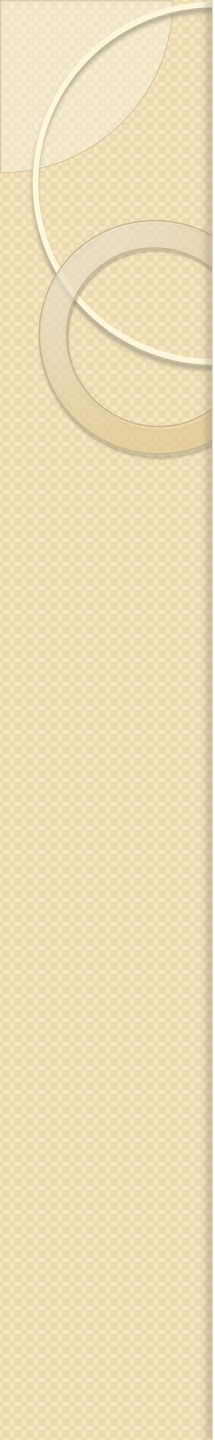
Department of Microbiology

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- Babesiosis is an infection caused by a malaria-like parasite, also called a “piroplasm,” that infects red blood cells.
  - *Babesia microti* is believed to be the most common piroplasm infecting humans, but scientists have identified over twenty piroplasms carried by ticks.
  - Ticks may carry only Babesia or they may be infected with both Babesia and Lyme spirochetes. People can also get babesiosis from a contaminated blood transfusion.
  - The first case of babesiosis was reported from Nantucket Island, Massachusetts, in 1969. Since the late 1980’s, the disease has spread from the islands off the New England coast to the mainland. Cases have also been reported all across the United States, Europe, and Asia.

# Transmission

- *Babesia* species are spread through the saliva of a tick when it bites. At its nymphal stage, a tick bites into the skin for a blood meal.
- The tick, if not removed, stays attached for three to four days, with longer periods of feeding associated with a higher probability of acquiring the parasite.
- The parasite can survive in the tick as it molts through its various developmental stages, resulting in all stages being potentially infectious.
- Some species of *Babesia* can be transmitted from a female tick to its offspring before migrating to salivary glands for feeding transmit transovarially.

- *Babesia* species enter erythrocytes at the sporozoite stage. Within the red blood cell, the protozoa become cyclical and develop into a trophozoite ring.
- The trophozoites molt into merozoites, which have a tetrad structure coined a (Maltese-cross) form. The tetrad morphology, which can be seen with Giemsa staining of a thin blood smear, is unique to *Babesia*, and serves as a distinguishing feature from *Plasmodium falciparum*, a protozoan of similar morphology that causes malaria.
- 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.

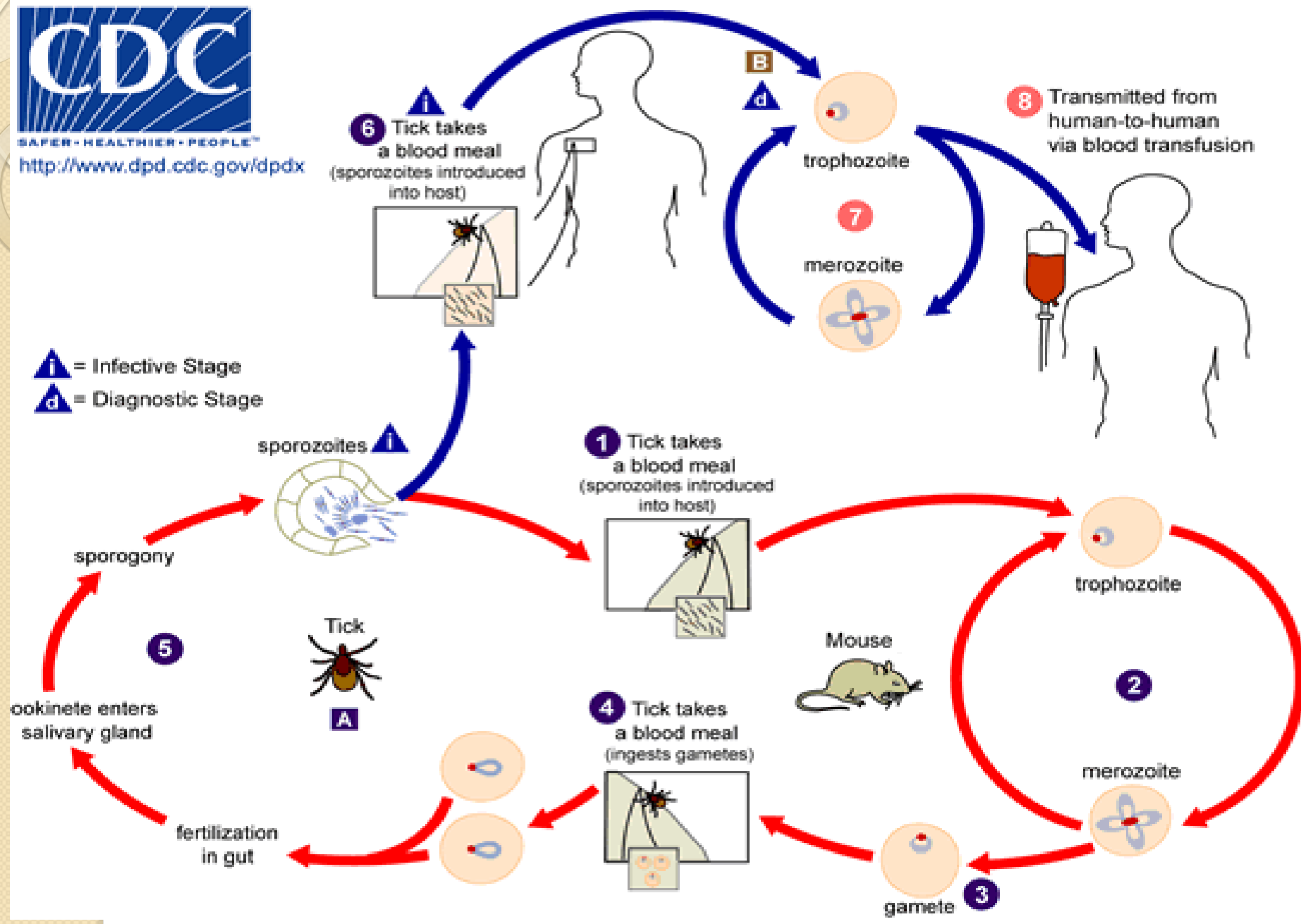


# Lifecycle

- The lifecycle of *B. microti*, which is typical of parasites in that genus, requires a biological stage in a rodent or deer host, and is transmitted by ticks of the family Ixodidae between these hosts.
- To begin, the ticks introduce the sporozoites into the host when taking a blood meal. Sporozoites enter erythrocytes in the blood and begin the cyclical development between trophozoites and merozoites. Rather than producing more trophozoites, some merozoites produce gametocytes.
- The tick definitive host takes up the gametocytes when attached for a blood meal. 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.



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# Pathogenesis

- The protozoans *Babesia* spp. are generally transmitted by ticks and reach the blood stream while the ticks are feeding.
- Once inside the host, the parasite attaches to an erythrocyte, is engulfed via endocytosis, matures, and then starts asexual reproduction, producing merozoites.
- Infected erythrocytes eventually rupture and released merozoites invade other erythrocytes. The main pathogenesis associated with babesiosis is hemolytic anemia. Hemolytic anemia is the result of direct erythrocyte injury caused by the parasites and also by immune-mediated mechanisms.
- Low blood oxygen (hypoxaemia) as a result of the anaemia contributes to morbidity and the most pathogenic strains cause kidney and liver injury, and systemic inflammatory disease.



# Lab diagnosis

- Even with much study of babesiosis and malaria, misdiagnosis with blood smear can be frequent and problematic.
- To supplement a blood smear, diagnoses should be made with an indirect fluorescent antibody (IFA) test. IFA testing has a much higher specificity than stained blood smears with antibody detection in 88-96% of infected patients. Diagnostic measures through antibody testing are also particularly useful for identifying serum prevalence in asymptomatic individuals. Due to the transmissibility of *Babesia* through blood transfusions, IFA testing would be an effective means of screening for the disease in blood donations.

# Epidemiology

- Endemic areas are regions of tick habitat, including the forest regions of the northeastern United States and temperate regions of Europe.
- Ixodidae, the tick vectors of *B. microti*, also transmit the better-known *Borrelia burgdorferi*, causative agent of Lyme disease.
- Prevalence of babesiosis in malaria-endemic regions remains unknown due to the likelihood of misdiagnosis as malaria.
- Prevalence of babesiosis is mostly documented during the months of May to September when tick activity in endemic regions is high.

# Prevention

- 1-The most effective public health measure for *Babesia* is avoidance of tick exposure. This can be performed through personal prevention strategies such as avoiding tick-infested areas (especially during high tick season between May and September).
- 2- Remaining covered with light clothing, searching for ticks after being outdoors, and removing discovered ticks from the skin.
- 3- Other preventive measures include applying diethyltoluamide (DEET), a common repellent that is effective against ticks and insects.