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A SHORT REVIEW OF BABESIOSIS

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ABSTRACT Babesiosis is a tick-borne disease caused by many protozoa of the genus Babesia, transmitted by Ixodes scapularis (deer tick). Most humans are infected in the nymph stage. Symptoms include mild to moderate illness such as fever, malaise, chills, myalgia, and fatigue. nausea, vomiting, night sweats, headache, dry cough, weight loss, anemia and hematuria. Each year, more than 2000 cases are reported in the United States. Microscopic detection remains the best and most suitable tool for in situ diagnosis of acute diseases. PCR time consuming and is more expensive than microscopy but it is more sensitive and specific for the detection of B. microti. cobas® 6800 and cobas® 8800 systems, have been approved by the FDA for in vitro diagnostic (IVD) testing. Babesiosis is usually treated with a combination of atovaquone and azithromycin, or clindamycin and quinine. In severe cases of babesiosis, whole blood exchange should be considered a life-saving intervention. Accurate detection and species identification are critical for selecting the best treatment and determining the best chance of recovery. Control and prevention of ticks are necessary to prevent disease.

KEYWORDS :

INTRODUCTION

Babesiosis or Piroplasmosis is a tick-borne infectious disease caused by various species of the protozoan genus Babesia. Babesiosis is named after the Romanian physician, Dr. Victor Babes who observed microorganisms (later named Babesia bovis and Babesia ovis) in the erythrocytes of cattle and sheep with haemoglobinuria, which can infect both animals as well as humans [1]. More than 100 species of genus Babesia were discovered that infect various vertebrate host's erythrocytes [2]. Babesia microti, Babesia divergens, Babesia duncani, and Babesia venatorum are the four known babesia species that infect people [3]. The B. microti species, which is spread by Ixodes scapularis, commonly known as deer tick or black-legged tick, is the most common species to infect people in the United States [4].

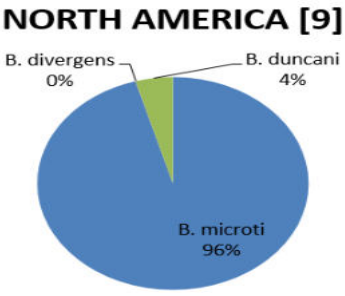
Babesia – Taxonomic Classification	
Kingdom	Chromista
Phylum	Apicomplexa
Class	Aconoidasida
Order	Piroplasmida
Family	Babesiidae
Genus	Babesia

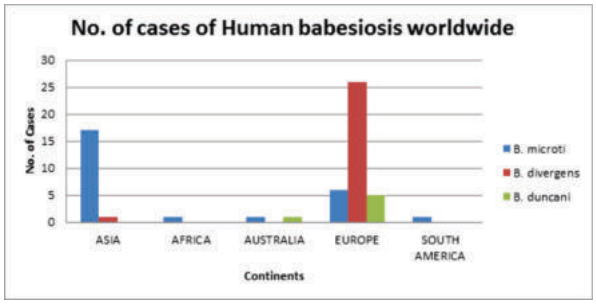
In 1957, the first human case of babesiosis was found near Zagreb in Croatia [5]. A young farmer, grazing cattle on a tick-infested pasture who was asplenic and developed symptoms after 15-21 days after being bitten by a tick, was admitted with fever, anemia, and hemoglobinuria and died of renal failure in the second week of his illness. The pathogen was found to be Babesia divergence [6,7].

In 1967, A 48-year-old fisherman was brought to the renal unit and had jaundice symptoms the next day. Within a week, the patient died, and necropsy indicated extensive bile staining of all organs. Babesia divergence was later identified as the pathogen.[8] Babesiosis is a rapidly spreading infection, with an increasing number of cases recorded worldwide.

More than 25,000 cases of human babesiosis have been reported in North America, accounting for 95% of all known cases worldwide. Each year, more than 2000 cases are reported in the United States [9,10].

Babesiosis is mostly caused by Babesia microti in North America and Asia. Babesiosis is a far rarer but more fatal disease in Europe, caused by the pathogen Babesia divergens.





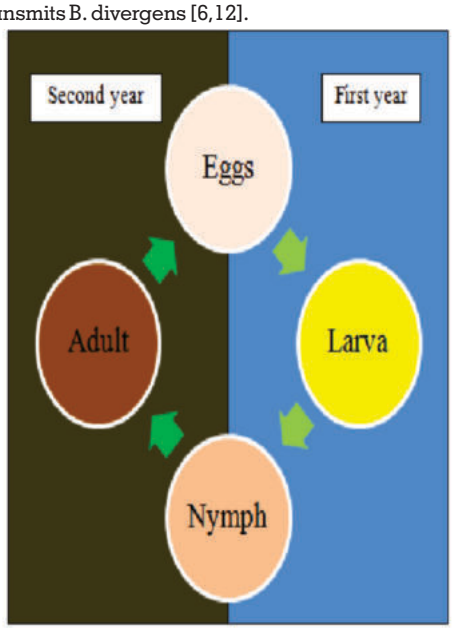
In India, the first case of human babesiosis was reported in 2005 near Gwalior in Madhya Pradesh. He was admitted to the hospital with high grade fever, anorexia, vomiting, profuse sweating, chills, slight headache, and arthralgia. The patient was diagnosed with Plasmodium falciparum and was given antimalarial medication. After a thorough examination of the smears, the parasites were identified as Babesia species [11].

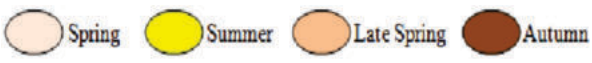
Lifecycle and Transmission

Members of the Ixodidae family are the only confirmed vectors of Babesia parasites. Each of Ixodes scapularis's three active stages, namely larva, nymph, and adult, requires a blood meal from a vertebrate host in order to progress to the next stage. The tick transmission cycle begins in the spring when adult females lay eggs that hatch into larvae. In late summer, newly hatched larvae ingest the parasite when they feed on blood meal from infected rodents. Fed larvae develop into nymphs after moulting.

Nymphs transmit Babesia to rodents in late spring and summer of the following year. Although larvae, nymphs, and adults can feed on people, nymphs are the most common vector. Adult Ixodes scapularis feeds largely on white-tailed deer (Odocoileus virginianus), which are not repositories for B.

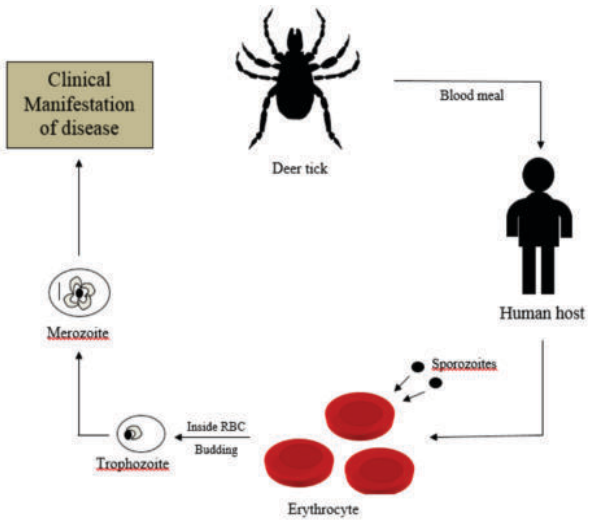
microti but may be a direct contributor to ixodes tick proliferation. The I. ricinus tick, which has a three-year life cycle, transmits B. divergens [6,12].





Pathogenesis

The only cells infected by Babesia sp are erythrocytes. Most humans become infected during the nymph stage. The parasite reproduces by binary fission, generating merozoites. Hemolytic anemia occurs as the infection progresses, and it may be accompanied by tissue hypoxia. Babesia causes anemia and hemoglobinuria by activating antibody-mediated cytotoxic destruction of erythrocytes. Babesiosis can, in severe cases, result in multiple organ dysfunction syndrome, which can be fatal [6,13,14].



Signs and Symptoms

The incubation period varies depending on the route of transmission, although it typically lasts 1-4 weeks after a tick bite and up to 6 weeks after transfusion of contaminated blood products. Even though the majority of cases remain asymptomatic [15], Symptoms include mild-to-moderate illnesses such as fever, malaise, chills, myalgia, and fatigue. nausea, emesis, night sweats, headache, dry cough, weight loss, anemia, and hematuria [16]. Severe complications may include liver and kidney failure [17], acute respiratory failure, congestive heart failure, coma, and even death. Acute Respiratory Distress Syndrome (ARDS) is also a complication of treatment for babesiosis [18]. Babesiosis can be a severe and sometimes fatal infection in elderly people and immune compromised patients [16].

Diagnosis

Babesia species are found in greater numbers in capillary blood than in venous blood. Microscopic detection remains the best and most sustainable tool for on-site diagnosis of acute illness. Giemsa or Wright stains of thick and thin blood smears were used to detect Babesia species under the microscope. It is more sensitive and takes less time to complete [19-21].

Indirect Fluorescent Antibody Test (IFAT) has also a good level of specificity and sensitivity. Enzyme-Linked Immunosorbent Assay (ELISA) shows more specificity than IFAT. ELISA is used to detect anti-babesia antibodies by utilizing an anti-IgG conjugated with an enzyme, typically peroxidase [22].

Even though PCR is more time-consuming and expensive than microscopic detection, it is more sensitive and specific for detecting B. microti [12,19,21,23]. Under clinical microscopy, the ring forms of P. falciparum and Babesia spp. are difficult to differentiate. Human babesiosis may be differentiated from malaria using PCR-based diagnostics [24]. The rapid polymerase chain reaction (PCR) test's application as a conventional diagnostic test is limited by its extremely high sensitivity. For patients, sample contamination in diagnostic PCR can have far-reaching effects. There are numerous sources of contaminants (including water, reagents, disposables, sample carryover, amplicons, and even a lack of communication between researchers using the same laboratory space).

Strict quarantine protocols should be undertaken, and safety measures are necessary to prevent product contamination [6,19,25]. cobas® Babesia (Roche Molecular Systems, Inc.) is a qualitative PCR test that detects Babesia DNA and RNA on the cobas® 6800 and cobas® 8800 systems, which received In Vitro Diagnostic (IVD) test approval from the FDA. It is a qualitative in vitro nucleic acid screening test for the direct detection of Babesia (B. microti, B. duncani, B. divergens, and B. venatorum) DNA and RNA in whole blood samples [26, 27 , 28].

The immune-fluorescent assay (IFA) and immunoblot assay (IgM and IgG Western blot) can also be used for detecting antibodies against B. microti. The immunoblot assay is more sensitive and specific than IFA [29].

Treatment

Most asymptomatic individuals do not require treatment. Babesiosis is usually treated for at least 7-10 days in sick patients with a combination of atovaquone and azithromycin, or clindamycin and quinine. A patient who had not improved with clindamycin and quinine was treated successfully with azithromycin and quinine. This condition can be seen in immunosuppressed patients. In severe cases of Babesiosis, whole blood exchange transfusion should be considered as a life-saving intervention. [21,30,31].

Prevention

Ixodes scapularis ticks can be found in wooded, brushy, or grassy habitats. There is no vaccination available to protect against babesiosis. People who live, work, or travel in tick-infested areas should take necessary precautions to avoid tick bites and tick-borne diseases, especially for those at high risk, such as immune compromised people and those who have undergone splenectomy. Use tick repellents containing N,N-diethylmetatoluamide (DEET), dimethyl phthalate, or permethrin (Permanone). Tick control and prevention should

be required to prevent the disease. Necessary measure should be taken to create awareness among people who live [16,21,32,33]

CONCLUSION

Babesiosis in humans is a widespread issue that poses a serious health burden in regions where it is endemic. Each year, more than 2000 cases are reported in the United States. Awareness programs should be undertaken to prevent the spread of babesiosis. Accurate detection and species recognition are critical for selecting the best treatment and determining the best chance of recovery. There is no vaccination for babesiosis. Studies are needed for the discovery of vaccination against human babesiosis, as in some countries it is declared as an endemic disease.

Abbreviations

ARDS	Acute Respiratory Distress Syndrome
DNA	Deoxyribonucleic acid
DEET	N,N-diethylmetatoluamide
ELISA	Enzyme-Linked Immunosorbent Assay
FDA	Food and Drug Administration
IFA	Immunofluorescent assay
IFAT	Indirect Fluorescent Antibody Test
IgG	Immunoglobulin G
IgM	Immunoglobulin M
IVD	In Vitro Diagnostic
PCR	Polymerase Chain Reaction
RBC	Red Blood Cell
RNA	ribonucleic acid

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