



Ehrlichiosis: An Emerging Tick Borne Zoonotic Disease of Public Health Significance

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Zoonotic diseases are caused by a variety of infectious agents, such as viruses, bacteria, Rickettsia, fungi, Chlamydia, actinomycetes, prions, algae, protozoa, helminths, ectoparasites and are transmitted through different modes including by an arthropod vector [1]. Vector is defined as an arthropod or invertebrate host, which transmit the infection by inoculation into the skin or mucous membrane by biting or by depositing of infective material on the skin or on food or body sites [1]. There are different types of arthropod vectors like mosquitoes, ticks, mites, lice, sand flies, rat fleas, Tsetse flies, triatomine bugs, black flies, etc. that transmit the infections to humans and animals [1]. A number of vector borne infectious diseases, such as dengue fever, malaria, chikungunya fever, leishmaniasis, Japanese encephalitis, West Nile fever, plague, Lyme disease, Rift Valley fever, scrub typhus, rickettsial pox, yellow fever, Chagas disease, filariasis, Mayaro fever, coxiellosis, leishmaniasis, Murray Valley encephalitis, onchocerciasis, Venezuelan equine encephalitis, simian malaria, babesiosis, Ilheus fever, eastern equine encephalitis, sleeping sickness, epidemic typhus, sindbis fever, Rossa river fever, ehrlichiosis, sandfly fever, Saint Louis encephalitis, Western equine encephalitis, schistosomiasis, Zika fever etc. are significant causes of morbidity and mortality throughout the world [1-5]. It is mentioned that nearly half of the world's population is infected with at least one type of vector borne pathogen. Further, vector borne diseases account around 17% of all infectious diseases and are responsible for over 700,000 deaths each year [3].

Ticks are obligate hematophagous arthropods that parasitize on vertebrates hosts throughout the world [6]. There are approximately 850 species of ticks found in the world, however, less than 60 are identified to bite and transmit disease to human beings. They usually prefer to live in grassy and wooded areas around

the world. Though the ticks can be active throughout the year, but ticks are mainly active during warmer months. The people who are involved in outdoor activities, such as hiking, camping, hiking, or hunting in forested areas may be at risk of getting infected by ticks [7]. Ticks can transmit several diseases to humans, which include Rocky Mountain spotted fever, tularaemia, Siberian tick typhus, Queensland tick typhus, Boutonneuse fever, Ehrlichiosis, Powassan disease, *Borrelia mayonii* infection, Tickborne relapsing fever, *Rickettsia parkeri* infection, anaplasmosis, *Borrelia burgdorferi* infection, *Borrelia miyamotoi* infection, Colorado tick fever, babesiosis, heartland virus infection, *Rickettsia phillipi* infection, Bourbon virus infection, Crimean Congo haemorrhagic fever, Ganjam virus disease and Kyasanur forest disease [1,8].

Ehrlichiosis is an emerging tick-borne zoonosis that is reported from several countries of the world including USA, Venezuela and Iran [9-12]. The disease is caused by *Ehrlichia*, which is a small, gram-negative, obligate intracellular organism. The genus *Ehrlichia* was established in 1945 in the honor of Paul Ehrlich, the German microbiologist. Several species of *Ehrlichia*, namely *E. canis*, *E. chaffeensis* and *E. ewingii* are implicated in the etiology of human and animal ehrlichiosis [1,7,10,11-14]. Transmission of *E. canis* occurs by the bite of *Rhipicephalus sanguineus* whereas *E. chaffeensis* and *E. ewingii* are transmitted by *Amblyomma americanum* [7]. The organism is introduced into the dermis by the bite of an infected tick and spreads hematogenously throughout the body [7]. It is pertinent to mention that period of 4 - 24 hours of infected ticks attached to the host may be needed before successful transmission of *Ehrlichia* [7]. The natural infection due to *Ehrlichia* has been reported in humans as well as in animals, such as cattle, deer, horses, dogs, goats, sheep, mice, and rodents [7,12]. Since the first identification of *Ehrlichia chaffeensis* in 1986, over 2,300 cases had been

reported to the Center for Disease Control, Atlanta, USA [15]. The disease can be life threatening in some patients. It is mentioned that ehrlichiosis is often associated with leukopenia, thrombocytopenia, and elevated serum hepatic transaminase levels in tick-exposed patients [14]. The infection is recorded in immunocompetent as well as immunosuppressed patients [7].

The Infection due to *Ehrlichia* may range from subclinical to fatal [14]. The symptoms in the affected persons include fever, malaise, chills, loss of appetite, severe headache, nausea, vomiting, abdominal pain, diarrhea, weight loss, myalgia, eye pain, cough, pharyngitis, lymphadenopathy and maculopapular or petechial rashes on trunk and extremities [1,9,15]. Rashes are commonly observed in children. Severe complications, such as respiratory problems, renal insufficiency, and serious neurologic involvement are observed in some patients. Death can occur in immunocompromised patients [9].

The clinical symptoms are not very specific to warrant the diagnosis of ehrlichiosis, and hence, laboratory help is imperative to make an unequivocal diagnosis. Isolation of organism should be attempted in embryonated chicken egg or suckling mice. Immunological tests, such as complement fixation and indirect fluorescent antibody can be employed to demonstrate antibodies in the sera of patients. Molecular technique like PCR is also tried [1]. A study conducted in Venezuela revealed that out of 20 patients, 6 were positive for *E. canis* 16 S rRNA on gene specific PCR [11].

A number of drugs like doxycycline, tetracycline, minocycline, chloramphenicol, and enrofloxacin are used for the treatment of disease [1,15]. The duration of therapy is recommended for 5 - 14 days. Doxycycline is considered the mainstay of treatment in ehrlichiosis [7]. Prognosis is worsened if the therapy is delayed. Hence, an early diagnosis and prompt treatment is highly imperative to reduce the morbidity and mortality.

Currently, no vaccine is commercially available to immunize the susceptible population against ehrlichiosis. Therefore, preventive measures include tick control, environmental sanitation, use of protective clothing, avoid visiting wooded and brushy areas with high grass and leaf litter, checking clothes for ticks, taking bath soon after outdoor activities, washing of clothes in hot water, and application of repellent cream on the exposed parts of the body [1]. It is advised to treat the boots, clothing, and camping gear with permethrin that gives good protection against ticks.

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