Canine Ehrlichiosis

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Canine Ehrlichiosis is a tick borne, febrile, debilitating disease of dogs and wild canidae caused by Ehrlichia canis transmitted by the brown dog tick, Rhipicephalus sanguineus. The infections are known to occur world wide. The disease is also known as canine typhus, canine haemorrhagic fever, tracker dog disease, idiopathic haemorrhagic syndrome and tropical canine pancytopenia. In Kenya the disease is known locally as Nairobi bleeding disease. The disease was first discovered by Donatien and Lestoquard in 1935 at the Pasteur Institute in Algeria. They noted that experimental dogs infected with brown dog ticks developed severe febrile illness characterised by anaemia. Blood smears of infected dogs stained by Giemsa stain showed small reckettsia like organism inside canine monocytes. They called the newly discovered organism Rickettsia canis. In 1945 Moshkovski renamed the organism as Ehrlichia canis in honour of Paul Ehrlich the famous German bacteriologist.

Ehrlichia are obligate intracellular bacteria which differ from rickettsiae because they replicate in the phagosome of host cell whereas all rickettsia, with one exception (C. burnetti) grow free within the cytoplasm. Other distinguishing characters include their ultrastructure, tropism for circulating leukocytes and antigenic composition. All ehrlichia are presumed to be tick borne and only one species, Ehrlichia sennetsu is thought to be pathogenic to humans.

Since its discovery, reports indicate that the disease has been increasing in frequency and importance. In India, canine ehrlichiosis was first reported in 1944 in Madras (Mudaliar, 1944). In Untied States the disease was first described in 1962 in Oklahoma. The potential impact of the organism was greatly appreciated only in 1968, during a serious epizootic of highly fatal haemorrhagic disease called Tropical Canine Pancytopenia (TCP) among sentry dogs used by US troops stationed in Vietnam. The disease was characterised by generalized debilitation, epistaxis, anaemia and leukopenia. For more than a year the disease remained unknown. Later, Huxsoll in 1970 detected ehrlichial inclusions in the blood and tissue of dogs with TCP and realised that TCP was severe form of canine ehrlichiosis

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Morphology

E.canis and other members of the genus ehrlichia are minute gram negative cocci that stain dark blue to purple with Romanovsky stain and with Machiavello method they stain light red and brown -black with silver stain. Like chlamidia, ehrlichia go through three developmental stages.

Elementary bodies- Individual ehrlichia organisms

Initial bodies- Immature organismal inclusions

Morula - mature organismal inclusions.

Elementary bodies are small gram negative organisms about 0.2- 0.5 µm in diameter and difficult to detect by light microscopy. Elementary bodies are usually coccoid or ellipsoidal. Elementary bodies enter canine monocytes by phagocytosis. Phagolysosomal fusion does not occur in infected cells and elementary bodies begin to grow and divide within the confines of the phagosome. Replication of organism occurs by binary fission. At 3- 5 days after infection, small numbers of tightly packed elementary bodies 1.0- 2.5 µm in diameter are observable as pleomorphic inclusions called as initial bodies. During the next 7-12 days, additional growth and replication occurs and initial bodies develop to meture inclusions called mulberry or morula (4-6 µm in Diameter). Infected monocytes usually contain several morula each containing several dozen elementary bodies. Morula break up into elementary bodies when infected cell ruptures and infectious cycle is repeated. All the three growth stages occur within a membrane- lined vacuole of host origin that separates individual organisms or a group of these from the host cell cytoplasm.

Epidemiology

As early as 1935 the brown dog tick

Rhipicephalus sanguineus was considered to be the vector of E.canis . Studies conclusively proved trans-stadial transmission where in larvae, nymphs and adults are able to transmit the disease. In infected ticks, E.canis multiplies within hemocytes and cells of the salivary gland. Then organism enters digestive tract and infects midgut epithelium. Ticks could transmit E.canis for 155 days. Attraction of mononuclear cells to the inflamed site of tick bite may facilitate the infection of blood monocytes. Amblyomma americanum and Octobius magnini were more recently described as potential vectors.

Wild and domestic canids are currently considered as naturally susceptible to infection. Usually the infection is sporadic and is of worldwide occurrence. Eventhough disease occurs in all breeds of dogs, German shepherds are more susceptible. Epistaxis is a pathognomonic feature in these breeds. All ages are affected, but males are found to be more affected. The disease incidence is more noted during the dry season wherein in the tick activity reached the peak.

Pathogenesis

Pathogenesis depends on the strain of organism, breed of dog affected, concomitant disease and the host defence mechanism. The most common finding in an acute E.canis infection is the extensive invasion of paranchymal organs and perivascular cuffing by plasma cells particularly lungs, meninges, kidneys and spleen suggesting an immunopathologic etiology. Lymphocytes of infected dogs exert a cytotoxic effect upon autologous monocytes. Leukopenia along with a highly prominent thrombocytopenia is a pathognomonic haematologic manifestation for canine ehrlichiosis.

Clinical disease

After an incubation period of 10-15 days canine ehrlichiosis begins as an acute febrile disease. The first stage is characterised by fever 40-41.4°C, depression, anorexia, weight loss, occulonasal discharge, conjuctivitis, occasional vomiting and lymphadenopathy. Edema of limbs and ataxia may also be present. The acute phase typically lasts for 2 or 3 weeks. Most dogs survive acute phase followed by a subclinical phase lasting several months. Animals remain infected but are generally asymptomatic and blood values remain subnormal. Characteristic features of TCP are occasional fever, corneal opacity regenerative or nonregenerative anaemia with severe leukopenia and thrombocytopenia. Initially there may be bone marrow hyperplasia followed by hypoplasia due to the exhaustion of cellular elements in the marrow. The outcome of the third and the terminal phase depends on the breed of dog. Beagles, for example, may become chronic carriers. German shepherds usually succumb. Clinical manifestations include fever, anorexia, severe weight loss, marked pancytopenia, anemia and peripheral edema. Echymosis and petichiae commonly occur at multiple sites. Unilateral or bilateral epistax is common. Death occurs due to extensive mucosal or serosal haemorrhage or due to secondary bacterial infection prompted by the dog's debilitated condition. Increased ESR and prolonged bleeding time is very characteristic. Dogs are also susceptible to infections with E.equi and E. risticii which is mild and inapparent.

Diagnosis

Diagnosis of acute ehrlichiosis is by microscopic detection of organism in Giemsa stained blood smears or buffy coat preparations. The morular rossettes take a light blue or lilac tint within the cytoplasm of the monocytes. The first drop of blood from a prick incision on the ear of dog is considered ideal. Percentage of infected monocytes within the peripheral blood is extremely low and hence best results are obtained by searching the feather edge of the stained whole blood smear. An indirect flourescent antibody test is currently the only available specific means for detection and titration of antibodies to E.canis. The organism generated by the in vitro culture techniques serves as the antigen for the test.

This test can also be used for assessing the efficacy of treatment.

Treatment and control

Among all therapeutics tested, tetracyclines are the most effective for the treatment of E.canis and other ehrilichial infections of dogs.

First line antibiotics

Tetracycline 22 mg/kg i/v for 14 days (usually practised)

Oxytetracycline 25 mg/kg oral three times daily for 21 days

Doxycycline 5 mg/kg oral two times daily for 14 days.

Minocycline 20 mg/kg oral two times daily for 14 days.

Second line antibiotics.

Chloramphenicol 50 mg/ kg oral three times daily for 21 days

Imidocarb dipropionate 5 mg/ kg i/ m or s/ c single injection and repeated in 2-3 weeks.

Following treatment with tetracycline, dogs in early stages of disease show spontaneous clinical and haematological improvement. Chronically infected dogs may respond more slowly to treatment. Some dogs may require prolonged treatment. Efficacy of treatment can be judged from the IFA titres. Various supportive therapies like blood transfusion using fresh whole blood or platelet rich plasma and polyionic fluids are recommended. Short term administration of anti-inflammatory and immunosup pressive compounds may be useful for secondary immune mediated complications.

The only preventive therapeutic measure for canine ehrlichiosis is administration on a continuous basis tetracycline at a low dosage of 6.6 mg/ kg/ day. This can be tried in dogs travelling in enzootic areas. Routine use of acaricides and control of tick infestation is recommended. All new dogs should be free of tick infestation and serological status screened before introducing them to E.canis free groups.

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number of animals so that animals not performing well in the organization's farm can be culled and removed. While selecting males from farmer's herd the dams of the males can be monitored for her milk yield for the lactation and even in the next lactation through a FPR program.

A planned program for animal procurement from the farmer's herds can be designed through a FPR programme. For this an area is identified for the production of breeding stock, all the animals in the area are identified and registered and put to FPR. The top animals are selected as mothers of the breeding stock and nominated mating is arranged for the production of the required type of animals. The progeny born out of the nominated mating of the top (elite) cows/she buffaloes are to be procured by the organization. In the normal course male calves are purchased from the contract herd of the farmers on a regular basis. It would be advantageous to procure the calf at the earliest age as possible because a scientific management can be arranged in the breeding farm of the AI organization. It is to be pointed out in this context that providing a good management in the organizations' farms is also a difficult proposition and at most care is required to achieve the desired results.

Bull production can also be attempted in the organizations on bull mother farms. A well-maintained herd of cows are necessary in this case. The number of cows to be reared is related to the number of male calves to be produced, selection intensity and the reproductive performance of the female stock. While having own herd has the advantage of security, measurement of the economic traits in a uniform management, accuracy of the data, etc, it provides for lesser selection intensity.

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