

Ehrlichia / *Anaplasma* spp.

Ehrlichiosis

Ehrlichiosis is caused by tick-transmitted intracellular bacteria that invades monocytes and macrophages (*Ehrlichia canis*) and platelets (*Anaplasma platys*, previously *Ehrlichia platys*). The most common and important species affecting dogs is *E. canis*. Transmission by blood transfusion also occurs. It has been reported from the UK (including reports in untravelled dogs), USA, Europe, and Africa. German Shepherds are predisposed to serious chronic disease and may develop a fatal form of infection.

Transmission

Ehrlichia spp. are transmitted by the tick *Rhipicephalus sanguineus*, which is well adapted to kennels, houses, and cars. *Rhipicephalus sanguineus*, is not endemic in the UK (yet) although an increasing number of these ticks have been found on imported dogs in the UK (DOI: 10.1136/vr.104061). Transmission from the tick to the host can occur very quickly, within occurs a few hours of attachment.

What is *E. canis*?

Ehrlichia canis infects monocytes and macrophages and is the cause of monocytic ehrlichiosis. It occurs in Europe, USA, Africa, and Asia. Infections have been reported in untravelled dogs in the UK (DOI: 10.1111/jsap.12088). Australia is currently *E. canis* free.

What clinical signs are seen with *E. canis* infection?

Infection can be acute (1-3 weeks after infection), subclinical (months to years if infection is not cleared after the acute phase) or chronic (years or more) although differentiation of these stages may not be possible in infected dogs. Clinical signs include lethargy, anorexia, fever, weight loss, bleeding signs (e.g. petechial/ecchymotic haemorrhages, epistaxis due to a thrombocytopenia or thrombocytopathia), uveitis, pallor, lymphadenopathy and splenomegaly. Occasionally neurological signs occur. The chronic phase develops in some dogs and is associated with a severe pancytopenia.

What clinical pathology changes occur with *E. canis* infection?

On haematology, thrombocytopenia is very common in both acute and chronic cases. An anaemia, and sometimes a leucopenia, are also



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common. The anaemia can be non-regenerative due to bone marrow abnormalities or regenerative if as a result of bleeding.

Serum biochemistry may reveal hyperglobulinaemia, hypoalbuminaemia, and elevated ALT and ALP enzyme activities. The hyperglobulinaemia is typically polyclonal, but occasionally a monoclonal / restricted oligoclonal gammopathy is found on serum protein electrophoresis.

Renal proteinuria can also occur.

Can blood smears diagnose *E. canis* infection?

Yes, *E. canis* morulae may be visible in the monocytes, but this is a very insensitive method. A buffy coat smear or examination of splenic aspirate cytology may improve sensitivity but generally visualisation of organisms is rare. Additionally different species of *Ehrlichia* cannot be differentiated based on cytology alone.

Is PCR useful for the diagnosis of *E. canis* infection?

Yes, especially for acute infection where PCR is sensitive and specific and can be performed on blood samples (although lymph node, splenic and bone marrow aspirates are alternative samples). In chronic infections blood PCR may be negative despite infection being present (the organism may be hidden, for example in the spleen). The Acarus Laboratories of the Molecular Diagnostic Unit has a generic *Ehrlichia/Anaplasma* spp. PCR that amplifies all *Anaplasma* and *Ehrlichia* species, including *E. canis*, followed by identification of the infecting species by sequencing.

Is serology useful to diagnose *E. canis* infection?

It can be. A four-fold rise in *E. canis* antibody titre can differentiate acute from chronic infection. Antibody levels remain high for months to years following infection. Cross-reactivity occurs to other *Ehrlichia/Anaplasma* species with many of the available serological assays. The IDEXX SNAP 4Dx test detects antibodies for *E. canis* and *Ehrlichia ewingii* (which infects neutrophils and is primarily found in the USA). A positive IDEXX SNAP 4Dx test for these antibodies thus indicates previous *Ehrlichia* spp. exposure and may need to be followed up with a quantitative antibody test for *Ehrlichia* species.

How do I treat *E. canis* infection?

Doxycycline (10 mg/kg orally once daily) for four weeks is the treatment of choice. Most dogs with acute infections improve within 24-48 hours of starting treatment and these, as well as

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subclinically-infected dogs, can become PCR negative on blood following treatment. However, elimination of infection may not occur, and antibody levels can remain high. Chronically infected dogs with pancytopenia are very difficult to treat and have a very poor prognosis. Monitoring of platelet counts and globulin levels (1 and 3 months) after treatment can help monitor for relapses. Occasionally steroids may be required in addition to doxycycline if immune-mediated destruction of platelets is suspected.

How do I prevent *E. canis* infection?

Effective tick control!

Owners should be instructed to avoid tick exposure whenever possible, remove any ticks found on a dog promptly, and use a topical ectoparasiticide that is effective against ticks.

What about *Ehrlichia* spp. Infection in cats?

Ehrlichia canis and *E. canis*-like infections have been reported in cats very occasionally, with associated fever, lethargy, weight loss, joint pain, bleeding signs and pallor. Anaemia, leucocytosis and thrombocytopenia have all been reported in cases. PCR can be used for diagnosis and doxycycline (or imidocarb) have been described as effective treatments although the required duration of treatment is not known (doxycycline treatment should always be followed by food and/or water to ensure complete swallowing into the stomach otherwise oesophageal ulceration can result). NB: the IDEXX SNAP 4Dx test is optimised for dogs, not cats, so this test is not validated for use in this species. However, it is not species-specific and some researchers have successfully used it to detect cat antibodies against *Ehrlichia* spp. (DOI: 10.1089/vbz.2020.2628.).

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