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Hot Topics in Canine Medicine Mini Series

Session Two: Vector Borne Diseases

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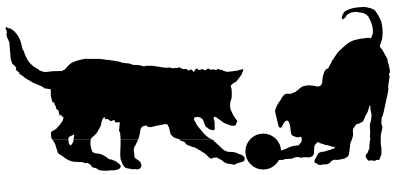

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Session 2: Vector borne Diseases

More and more animals are travelling abroad or being imported from foreign countries into the UK. This inevitably has led to an increase in a number of relatively unfamiliar infectious diseases in canine practice. In this session, we will look at a number of vector borne infectious diseases and discuss how to diagnose and manage these unusual diseases.

- Understand some of the vector borne diseases affecting dogs
- Diagnosis and management of Angiostrongylus and Dirofilaria
- Diagnosis and management of Babesiosis and Leishmaniasis
- An overview of Ehrlichiosis and Lyme disease

Vector Borne Diseases

Babesia:

Babesia is a tick-borne protozoan parasite affecting red blood cells. Multiple Babesia spp are present throughout the world. In Europe, canine Babesiosis is due to infection with *Babesia canis* (large Babesia) or less frequently *Babesia gibsoni* (small Babesia). *B.canis* has a high prevalence in France and is endemic in much of mainland Europe. A particularly pathogenic strain of *B. canis* (var *rossi*) is present in South Africa.
B. canis is transmitted by the following ticks:

- *Dermacentor reticulatus*
- *Rhipicephalus sanguineus*

Both of these tick species are present in the UK, although *Rhipicephalus* is somewhat rare. Until recently, Babesiosis had only ever been reported in the UK in dogs that had travelled abroad. A recent 'outbreak' of *B. canis* in 3 dogs in Essex, which had no history of foreign travel, has shown that Babesia may now be present in a UK population of ticks. Sporozoites in tick saliva are transmitted to the dog during feeding. Sporozoites then infect the host red blood cells and become merozoites- this leads to intra and extravascular haemolysis; thrombocytopenia may result from consumption or immune-mediated destruction.
Transmission of infection is via tick bites, blood transfusion, transplacental infection and potentially by dog bites (American Pit Bull Terriers in USA).

Clinical Signs:
Disease can be peracute, acute, chronic or subclinical and signs develop after an incubation period of around 10-21 days. Signs often include:

- Fever
- Anaemia
- Anorexia
- Icterus
- Splenomegaly
- Tachypnoea
- Collapse
- Petechial haemorrhages

Diagnosis:

- Intra-erythrocytic organisms on a blood smear (low sensitivity)
- ELISA (confirms exposure but may not be positive in peracute/acute infection)
- PCR (allows speciation)

Determining the infective species using PCR is important as this will have an impact on treatment. Co-infection with *Ehrlichia spp* or *Bartonella* may increase the pathogenicity so tests for these infections should be performed concurrently.

Treatment:
Blood transfusions and oxygen therapy may be required in acute cases. Imidocarb proprionate is effective against *B. canis*, but less so for *B. gibsoni*. Imidocarb is administered at 5 to 6.6mg/kg subcutaneously or intramuscularly twice, 14 days apart. Clinical improvement is usually seen within 24-48 hours. Side-effects of Imidocarb include diarrhoea, salivation and depression. Clindamycin may be used at 12.5mg/kg PO q12hrs for 10 days to control signs while Imidocarb is sourced.

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These drugs rarely eliminate the infection so treatment efficacy is based on resolution of clinical signs rather than follow-up ELISA or PCR assays. Prognosis is good if treatment is initiated early in the course of the disease.

Prevention:
Prevention is definitely better than cure so tick control is of vital importance. Animals should be examined for ticks daily and they should be removed promptly. A wide variety of anti-tick products are available including fipronil, flumethrin, afoxalaner and fluralaner. Potential blood donors from endemic regions should be screened for infection prior to use.

Ehrlichia:

Ehrlichiosis is caused by an intracellular rickettsia which can affect both dogs and cats. The organisms are transmitted by ticks.
E. canis causes canine monocytic ehrlichiosis (CME) and is transmitted by *Rhipicephalus sanguineous;* as this species of tick is rare in the UK, this disease is primarily seen in dogs that have travelled to endemic areas (particularly Southern Europe). The rickettsial organism infects circulating monocytes and forms morulae.

Clinical Signs:
Both acute and chronic phases of CME have been described. Acute signs occur within 1 to 3 weeks of infection. Signs are often non-specific and vague and may include:

- Pyrexia
- Lymphadenopathy
- Joint pain or lameness
- Anorexia
- Bleeding tendencies (due to thrombocytopenia)

Chronic forms of ehrlichiosis are usually associates with pancytopenia due to bone marrow hypoplasia. Signs are often more severe in animals co-infected with leishmania or babesia

Diagnosis:

- Blood smear or splenic aspirates showing morulae in leucocytes (insensitive)
- IFA or ELISA (antibodies detected between 7-28 days after infection)
- PCR (on blood, lymph node aspirate, splenic aspirate or bone marrow)

Many patients will have quite marked thrombocytopenia and hyperglobulinaemia (monoclonal gammopathy)

Treatment:
Doxycycline or oxytetracycline are the drugs of choice (10mg/kg PO q24hrs for 28 days). Rapid clinical response is usually noted. Blood transfusions may be required in patients with severe anaemia. Tetracyclines can be given prophylactically in dogs travelling to endemic regions. Tick control is essential to reduce the risk of transmission of this disease

Dirofilaria:

Dirofilaria immitus is otherwise known as 'Heartworm'. Dogs are the definitive hosts with only rare infections occurring in cats. The L3 larval stage is transmitted by the mosquito into the canine host. The larvae then migrate through tissues before reaching the heart and pulmonary artery; here they mature into adult heart worms (L5). Ambient temperatures in the UK are not high enough to allow for the parasite to multiply within the mosquito, so infection is usually identified in animals that have travelled through endemic areas (Southern Europe and USA). *Wolbachia sp* are obligate intracellular gram -ve bacteria which have a symbiotic relationship with dirofilaria and are necessary for reproduction of *D. immitus.*

Clinical Signs:
Clinical signs associated with Dirofilaria infection include:

- Coughing
- Exercise intolerance
- Dyspnoea
- Syncope
- Ascites

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- Sudden death

Signs are usually attributed to right-sided heart failure with pulmonary hypertension. Some infections can be asymptomatic.

Diagnosis:
Thoracic radiographs will reveal pulmonary artery enlargement and the pulmonary artery may become tortuous. A pulmonary interstitial pattern is often identified. Adult worms may be identified on echocardiography if worm burden is high. A blood antigen test is available and detects female adult worms; false negatives can occur with low worm burdens or all male infections. The prepatent period for Dirofilaria is 7 months so antigen tests should be performed 7 months after exposure. On occasion, microfilariae may be identified on a blood smear, but this is an insensitive diagnostic test. PCR tests are used primarily for species identification (differentiates D. immitus from other non-pathogenic species)

Treatment:
1. Symptomatic treatment of signs including diuretics, oxygen, aspirin and other therapy for congestive heart failure.
2. Adulticide therapy- Thiacetarsamide or melarsomine
3. Microfilaricide – milbemycin, ivermectin
4. Prophylaxis- milbemycin, moxidectin
5. In some cases, surgical removal of adult worms may be considered
It is generally recommended that doxycycline therapy is given concurrently to kill symbiotic *Wolbachia sp*.

It has now been shown that preventative treatment using doxycycline can lead to weakened Ag production by adult female worms leading to increased risk of false negatives using the antigen test.

Leishmania

Leishmaniasis is caused by a flagellate parasite which is transmitted by phlebotomine sandflies. Promastigotes develop in the gut of the sandfly and migrate to the proboscis where they are transmitted to the host during consumption of a blood meal. The promastigotes are then phagocytosed bt macrophages and become amastigotes. Amastigotes multiply and result in macrophage rupture and spread to other macrophages. Sandflies are most active at dawn and dusk. Leishmania is endemic in Mediterranean Europe, South America and the Middle East. The incubation period can be very prolonged (sometimes years).
Leishmaniasis is considered to be zoonotic with increased risk in immunocompromised people. Dogs act as a reservoir for human infection. Feline leishmaniosis also occurs but is less prevalent than in dogs as cats seem to be more resistant to infection.

Clinical Signs:
Subclinical infections are common. Clinical signs are a result of immune-complex mediated organ damage caused by *Leishmania infantum*. Common clinical findings include the following:

- Weight loss
- Pyrexia
- Exfoliative dermatitis
- Periocular alopecia
- Pallor
- Splenomegaly
- Lymphadenopathy
- Shifting lameness
- Foot pad hyperkeratosis
- Uveitis
- Epistaxis (due to thrombocytopenia)

Proteinuria may be present secondary to glomerulonephritis. Hyperglobulinaemia and azotaemia are often present.

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Diagnosis:

- Amastigotes may be identified in lymph node or bone marrow aspirates
- Skin biopsies may reveal parasites
- Serological tests including IFAs and ELISAs confirm exposure only and therefore are of most use in animals from non-endemic areas
- PCR testing is now preferred and can be performed on biopsies, LN aspirates, splenic aspirates or conjunctival swabs

Treatment:

Leishmania infection cannot be eliminated, but signs can be controlled using either meglumine antimonate or miltefosine. Meglumine antimonate has to be injected daily (100mg/kg s/c) for 4 weeks. Miltefosine can be given orally (2mg/kg/day) for 4 weeks. Regardless of which drug is used, concurrent use of allopurinol is advised and the latter may be necessary for 6-12 months or even life-long. Allopurinol should be administered in conjunction with a low purine diet to reduce the risk of xanthine crystal formation. Serum antibody titres should decline with treatment.

Domperidone is a D2 receptor antagonist which has been shown to have some efficacy in the reducing clinical signs and Leishmania antibody titres in dogs (0.5mg/kg q24hrs for 4 weeks); this is thought to be due to its stimulatory effect on humoral immunity. The latter drug is only recommended for dogs with very mild clinical signs.

Prevention:

The best way to reduce the risk of Leishmania infection is by avoiding travel to endemic regions. In endemic areas, animals should be kept inside at dusk and dawn to reduce exposure to sandflies and the use of insecticidal collars and repellants is recommended (eg Imidocloprid, deltamethrin and flumethrin)

A vaccine (CaniLeish) is now available and can be used in seronegative dogs older than 6 months of age (3 injections 3 weeks apart). The vaccine reduces the possibility of developing clinical signs.

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