UK canine tick-borne disease in 2016 – an update

Tick-borne disease represents an increasing risk to UK dogs and their owners. This threat comes not just from Lyme disease which is endemic in the UK, but also from other tick-borne diseases originating abroad. As both the incidence of Lyme disease in the UK and the frequency of pet imports and travel increases, so will the risks of tick-borne disease. This article considers the ticks that pose the most significant threat to UK dogs and their owners, their treatment and prevention. It also considers control measures in individual dogs and people, as well as discussing how to minimize the risk of further introduction of tick-borne disease into the UK.

Key words: ticks, Lyme disease, zoonosis, tick-borne disease, pet travel

Introduction

Tick-borne disease represents an ongoing and growing risk to UK dogs and their owners. This comes from both increasing numbers of endemic ticks, and those encountered in mainland Europe where pet travel is now increasing. Dogs encountering ticks abroad may be exposed to pathogens not present in the UK. This in turn may lead, not only to significant disease in the travelling pet, but also exotic ticks and tick-borne diseases being brought back to the UK. The most common ticks found on UK dogs continue to be *Ixodes* spp ticks, the vectors of Lyme disease (Smith et al. 2011, Abdullah et al. 2016). *Dermacentor reticulatus* is also present in endemic foci across the UK, including South West England and Wales, as well as a newly discovered population in Essex. These foci present an opportunity for *Babesia canis* to establish in these areas and this was recently demonstrated with an outbreak of canine babesiosis in Harlow. *Rhipicephalus sanguineus* is a tick capable of transmitting a variety of tick-borne pathogens, including rickettsial diseases, some with zoonotic potential. It is currently not endemic in the UK, but increased pet travel makes the establishment of endemic foci of *Rhipicephalus*, infestation in homes and novel tick-borne diseases in the UK, more likely.

This article provides a review of these threats, as well as discussing the prevention of tick-borne disease.

Endemic tick-borne disease in UK

Lyme disease

Lyme disease is now recognised as a disease complex which is widespread in humans and dogs living in temperate regions of the Northern hemisphere (Bennett 1995) caused by spirochete bacteria of the *Borrelia burgdorferi* complex. It is transmitted by *Ixodes* spp ticks and although it has been reported in a wide variety of mammals, dogs and humans seem relatively more susceptible to disease. The sheep tick *Ixodes ricinus* (Figure 1) is the most important vector throughout Europe and although in the UK *I. hexagonus* and *I. canisuga* are also implicated in Lyme disease transmission, they are not thought to be as significant vectors as *I. ricinus*. Various other *Ixodes* spp. ticks may also be involved in maintaining transmission cycles of *Borrelia* spp in small mammals, but because

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**Figure 1:** *Ixodes ricinus* female tick (courtesy John McGarry, University of Liverpool)
most of these species do not commonly bite humans or dogs, they are not thought to be significant vectors of disease.

Where Lyme disease is endemic it is maintained by reservoir hosts that act as sub clinical carriers of infection, and reproductive hosts that do not carry infection but maintain populations of infected ticks. Small rodents and birds are the most significant reservoir hosts of Lyme disease, but in the UK, deer, especially roe deer, act as epidemiologically important reproductive hosts, carrying Lyme disease to new parts of the country.

Ticks mostly become infected as larvae and then remain infected as nymphs and adults. When these life-cycle stages of the tick feed, *Borrelia* spp multiply in the gut and, over a period of several days, penetrate the gut epithelium and migrate to the salivary glands where they may then be potentially delivered to a new mammalian host. As a result, a tick has to feed for several hours, and often 24-48 hours, before transmission occurs. Faster transmission has been demonstrated under experimental conditions (Piesman 1993, Shih and Spielman 1993), but only in mice models using *Ixodes scapularis* which is not present in the UK. Even under heavy challenge in mouse models, the majority of transmission still took at least 24 hours to occur. Nymphs are thought to be more significant in terms of overall transmission than adults, as they are more abundant and due to their size, less likely to be groomed off pets and missed when looking for attached ticks.

Although transovarian transmission of *Borrelia* spp in ticks can occur, it is currently not thought to be epidemiologically significant.

**Distribution of human Lyme disease in the UK**

The reported incidence of Lyme disease in people is increasing. There were 0.5 cases per 100,000 people in England and Wales in 2001. This rose to 1.73 cases per 100,000 in 2011. Public Health England (PHE) have published figures showing that 421 laboratory confirmed cases of Lyme disease were diagnosed in the UK during the 3rd quarter of 2015. In comparison, 300 were reported during the same time period in 2014. The growing number of reported cases is likely to be a combination of a genuine increase in disease transmission, heightened awareness among the general public and increased surveillance. A number of high profile cases reported in the British press are likely to have led to increased public concern and awareness of relevant clinical signs. The likely genuine increase in transmission may be due to an increased uptake of outdoor pursuits and an increase in wild host reservoir or tick numbers. It has been suggested that dog owners might be at greater risk of infection than people without dogs, but studies have found no correlation between dog ownership and risk of infection, and infected dogs pose little or no direct risk to humans (Goosens *et al.* 2001).

**Clinical presentation in dogs**

Most infections with *B. burgdorferi* are sub clinical with only 5-10% of infected dogs developing clinical signs. When Lyme disease does develop, this is often due to re-exposure to infection, with an incubation period of 2-5 months. (Wlodarek *et al.* 2013). Dogs present primarily with acute or sub-acute arthritis in one or more joints with associated lameness, joint swelling and heat. Other acute signs may then follow including fever, anorexia, lethargy and lymphadenopathy. The acute form is often transient but relapsing. The common primary human clinical presentation of a circular skin rash known as erythema migrans (Figure 2) is not recognised in dogs. Chronic disease is often described in human infection but is less commonly seen in canines, occurring in untreated acute cases and presenting as non-erosive polyarthritis. Protein losing nephropathy (PLE) can be a sign of renal disease in chronic Lyme disease patients. This should not be confused with the syndrome Lyme nephritis. This occurs in 1-2% of dogs diagnosed with Lyme disease in the US with an average onset at 5-6 years. Labrador and Golden Retrievers are over represented, and prior or concurrent lameness is described in 9-28% cases. Typically, these dogs present with an acute progressive PLE with membranoproliferative glomerulonephritis, tubular necrosis and interstitial nephritis, but possibly milder forms exist (Litman 2013). Fortunately, this syndrome is rare in the UK for reasons that are not understood. Heart disease, seizures and behavioural changes may also occur in chronic cases but are uncommon.

**Diagnosis and treatment**

None of the clinical signs associated with Lyme disease in dogs are pathognomic. It should be considered as a differential