



LYME DISEASE (I)

A: eggs laid in spring, appear as larva during the spring and summer

B: larva use mice and birds as their first host, fall off, become nymphs and go dormant for six months

C: the dormant nymph wakes in spring and finds a secondary host in deer, humans and other mammals

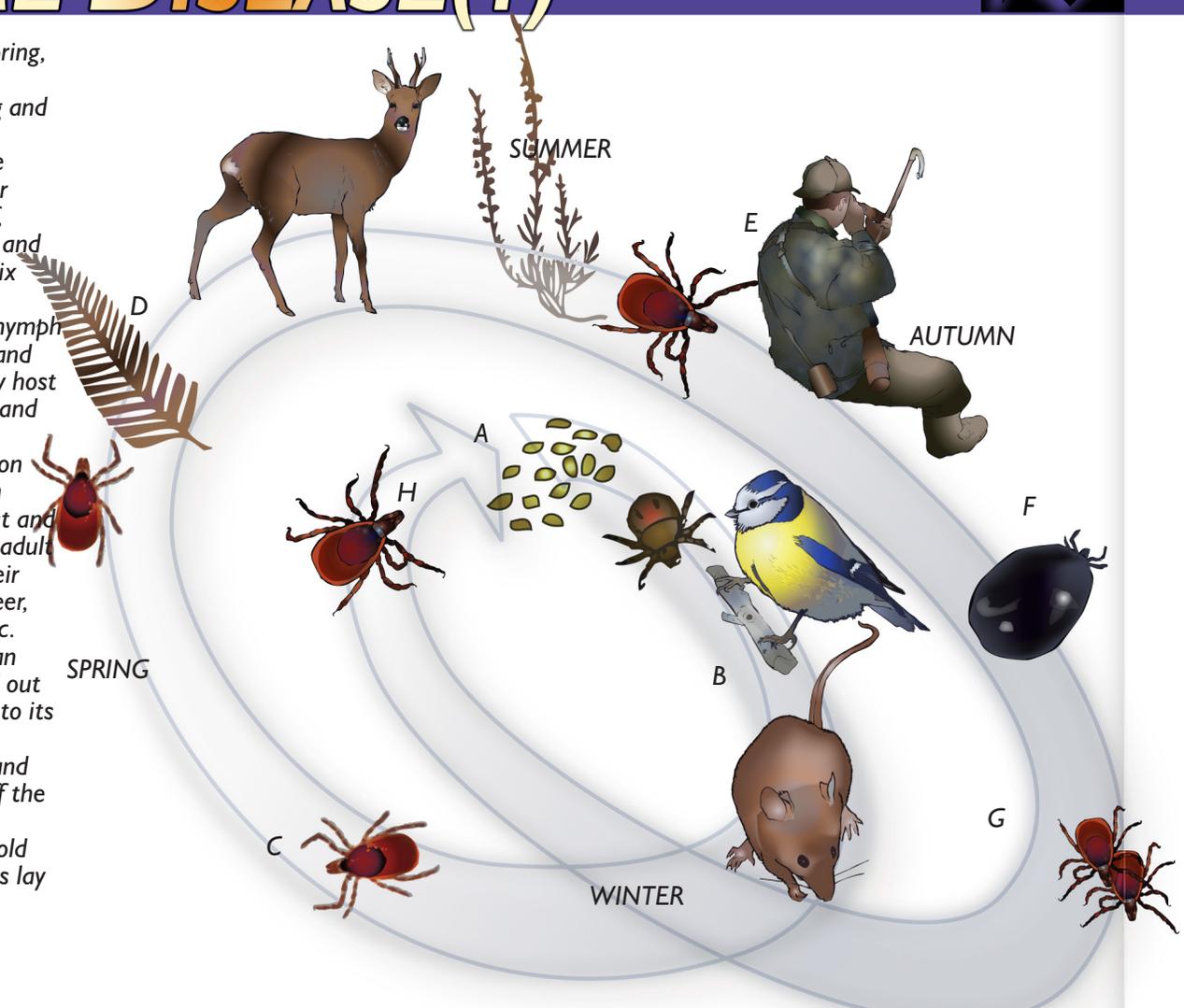
D: after feeding on blood the nymph drops off the host and matures into an adult

E: adults find their tertiary hosts: deer, humans, dogs etc.

F: after feeding an adult is enlarged out of all proportion to its original size

G: adults mate and eventually fall off the host.

H: at two years old the adult females lay eggs



Aim

The aim of this guide is to raise awareness of Lyme disease and methods of prevention.

Cause of disease

Lyme disease is caused by a spiral-shaped, spirochaetal bacterium of the *Borrelia* genus. There are hundreds of strains of *Borrelia* bacteria, many of which remain unstudied. Lyme disease (also termed Lyme borreliosis or Borreliosis) is spread to humans (and other mammals and birds) through the bite of infected ticks.

In the UK, there are two families of ticks, hard ticks and soft ticks. It is usually hard ticks that spread Lyme disease. The most common ticks to transmit Lyme disease to people and companion animals in the UK are *Ixodes ricinus* (also known as the sheep tick, deer tick, wood tick, and castor bean tick) and *Ixodes hexagonus* (the hedgehog tick).

Both these hard ticks have several life-stages (see illustration). From hatching, the larval ticks seek a host (this is termed 'questing'), which involves

waiting on low vegetation, forelegs outstretched. The tick can sense chemicals, heat and movement from a passing host. As the host brushes by, the tick latches on with special hooks on its legs. It then proceeds to search for a suitable feeding site.

The mouthparts of the tick comprise 2 chelicerae (cutting tools), 2 palps (limbs with sensory organs) and a hypostome, which is a barbed tube that anchors into the flesh of the host (see illustration overleaf). Blood is then drawn up the tube into the body of the tick. The mouth parts can vary in size and shape depending on the species of tick.

The tick's saliva contains a number of biochemicals which have anaesthetic, anticoagulant, anti-inflammatory and, in some species, adhesive properties. These help to allow the tick to feed without discovery and to keep the blood flowing. It is during the feeding process that the tick ingests *Borrelia* bacteria and other pathogens from an infected host. Once fed, the tick leaves the host, and either moults to the next life-stage, or, in the case of

an adult female, lays a batch of many thousands of eggs before dying. Each time the tick feeds on a new host, it is able to transmit the *Borrelia* bacteria and other pathogens into the bloodstream of that host. Only a percentage of ticks carry *Borrelia* bacteria, however, this percentage can vary from area to area. Prompt removal of ticks is important, as the risk of infection increases the longer the tick remains attached. Checking for attached ticks regularly will help to reduce the risk, and will increase the chances of discovering them before they have had time to attach.

Larval and nymph ticks are tiny (even when engorged) measuring between 0.5mm and 1.5mm (as small as a poppy seed) and so can be difficult to see; therefore disease transmission is more likely to occur if they remain undiscovered.

Apart from through tick bites, it is also possible for Lyme disease to be passed from a mother to her unborn baby. *Borrelia* bacteria have been isolated from various body fluids and tissues, and from other arthropods. However, to date there has been no scientific study to investigate these as potential means of transmission.

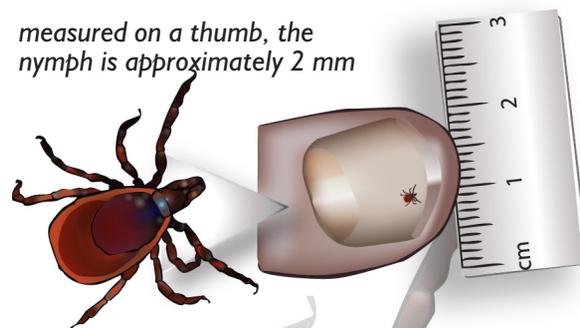
Other pathogens can be carried concurrently by ticks. Some of these pathogens can be transmitted in other ways, such as through blood transfusions. As ticks can carry a cocktail of organisms, it is useful for a doctor to check for these co-infections.

Correct tick-removal techniques are vitally important in avoiding transmission of infective organisms. Freezing, burning or smothering ticks with substances such as petroleum jelly, alcohol, butter/oils, aftershave etc., can cause ticks to regurgitate their stomach contents back into the host. Scratching off, squashing or crushing an attached tick can also spill the stomach contents and leave mouthparts embedded in the skin. Refer to the 'Removing embedded ticks' section for instructions on safe removal.

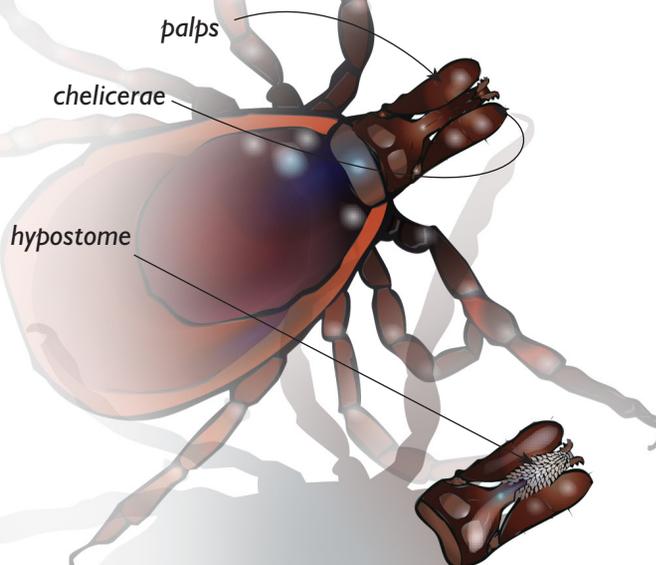
Signs and symptoms

The bite from a tick tends to cause a lump on the skin with a small scab. They are not usually itchy or painful, and so may easily be missed. The earliest, most common, and in some cases only manifestation of Lyme disease is 'erythema migrans' (a pink or red rash spreading from the site of a tick bite), which appears approximately 3-30 days after a tick bite. However, atypical rashes also occur and may be dismissed as an allergic reaction, fungal infection or other skin complaint. It should also be noted that some studies have demonstrated that less than 50%

measured on a thumb, the nymph is approximately 2 mm



mouthparts of a tick



of Lyme disease patients present with a rash at all. Other common symptoms with early infection may include 'flu like' symptoms such as joint and muscle aches, stiff neck, fever, headaches, swollen glands and tiredness or fatigue. Apart from the distinctive erythema migrans, none of the early symptoms are unique to Lyme disease, which may make diagnosis difficult. If left untreated, early symptoms may persist for weeks or longer and dissemination of the disease may lead to more serious complications, such as a viral-like meningitis, facial palsy, other nerve damage or arthritis. All stages of the infection usually respond to treatment with antibiotics, but it is easiest to treat at an early stage, especially when the rash is present. More rarely, persistent and recurrent symptoms can occur, in some cases months or years later. However, especially in the case of people whose occupation or hobby places them at high risk of tick-bite occurrence, re-infection should also be considered.

Neuroborreliosis (infection of the nervous system) is the commonest complication of Lyme borreliosis in the UK. Lyme arthritis is rare in patients with UK-acquired infection, but more common when the disease is acquired in North America or some parts of Europe.

continued in Lyme Disease(2)