

Artful arthropods

How much do you know about fleas, ticks, mites and other biters?

By vet Glen Cousquer

Probably the most historically significant and well known arthropod-borne disease was the “Black Death”. This scourge of the Middle Ages, also known as the Bubonic Plague, killed between 30 and 60 per cent of Europe’s human population during the 14th Century. This bacterial disease was carried by black rats (*Rattus rattus*) and transmitted from the rat to humans by the Oriental rat flea (*Xenopsylla cheopis*). The flea was able to pick up the disease when feeding on rats and then transfer the disease when feeding again on humans. At the time, the various contributing causes of this devastating disease remained obscure. Our ancestors were largely ignorant of the role played by the rat, the flea, poor hygiene and inadequate sanitation and this severely hampered their attempts to deal with outbreaks. Today, it is this understanding of how disease can be carried by reservoirs and then transmitted by vectors that allows us to mount more effective responses to such disease threats.

This feature will look at how certain arthropods play key roles in the transmission of diseases to rabbits. We will discuss the complex relationships that exist between the rabbit and a number of parasitic arthropods, before then considering the diseases that are commonly transmitted in this way. Armed with this understanding, we can then consider ways in which rabbits can be more effectively protected.

What are arthropods?

Arthropods are animals characterised by a number of common features: they are invertebrates (i.e. they do not possess a spine), have jointed limbs and an exoskeleton or cuticle usually made of chitin. The arthropods include a number of invertebrate classes including the arachnids and insects. The arachnids all have eight legs as adults and, as such, include spiders, scorpions, ticks and mites. By contrast, insects have three pairs of legs, a three-part body and will often have wings. They include flies, beetles, butterflies, bees and ants and are amongst the most diverse group of animals on the planet.

A number of arthropods parasitise rabbits and, as such, can



Cheyletiella mites result in the appearance of scurf and bald patches in the fur

transmit diseases to rabbits. Many of the most important rabbit diseases are transmitted in this way and we need a detailed understanding of the process involved if we are to protect our rabbits’ health and welfare.

So, what are the common arthropod parasites found feeding on rabbits?

In trying to answer this question you are most likely to think of the parasites that you have seen living on a rabbit. These include the *Cheyletiella* mite that provokes a characteristic build-up of dandruff in the rabbit’s coat. Other parasites only visit the rabbit to take a blood meal. Some of these are present for a number of days, as is the case with ticks, or even weeks and sometimes months, as is the case with rabbit fleas (*Spilopsyllus cuniculi*). Other parasites such as mosquitoes feed for just a few minutes, and are therefore rarely seen.

In order for such parasites to transmit diseases from one animal to another, they must first feed on an infected individual. Providing the disease can survive within or on the parasite, the pathogen (the disease-causing organism), can be transmitted to the next individual that the parasite feeds on. This can occur mechanically or, alternatively, the disease can infect and multiply within the vector (the ‘spreading’ organism) before then being transmitted to a new host. There are thus, two routes or mechanisms for disease transmission: mechanical transmission and biological transmission.

Mechanical transmission:

Myxomatosis is an infectious arthropod-borne viral disease of rabbits. It is transmitted mechanically by a number of different arthropods which pick up viral material from the skin of infected rabbits. The virus does not need to multiply inside the vector and can therefore make use of any suitable vector, including the rabbit flea, harvest mites and mosquitoes. Transmission is also possible, however, by means of thorns, thistles, needles and any other item that pierces the skin. This means that vector control and / or elimination will only reduce the incidence of disease until other means of transmission are found and exploited.

Biological transmission:

Biological transmission occurs where a disease multiplies and / or changes physiologically within an arthropod host, such as a mosquito, before being inoculated into a new host. Malaria is probably one of the most well known examples of a biologically transmitted arthropod-borne disease; others include Lyme disease, Babesiosis and Leishmaniasis.

Biological transmission is a highly developed and efficient means of transmitting diseases. As the battle against malaria has demonstrated, the fight against such diseases is very challenging and can involve vector control and / or elimination.

A complicated pathway

In seeking to understand how disease occurs, a number of complex, often inter-related, factors must be understood. These include the presence of a disease reservoir that serves to infect the arthropod vector. We must also consider the life cycle of the pathogen, the feeding habits of the vector, climactic influences and the presence of susceptible individuals. These will each now be discussed:

The disease reservoir: Clearly the arthropod needs to feed on an infected animal if it is to pick up and transmit the disease. In the case of myxomatosis, the wild rabbit population acts as a reservoir of disease. In some wild rabbit populations all adult rabbits were found to have antibodies to myxomatosis. In the case of West Nile Virus, birds act as the main reservoir host of this viral disease. Feeding mosquitoes can easily pass this disease from birds to other animals including horses, man and rabbits.

The life cycle of the pathogen: Certain pathogens cannot complete their lifecycle in or on the rabbit. Lyme disease, for example, requires an intermediate host, the tick, for its life cycle to be completed.

Feeding habits of the vector: The rabbit flea will not reproduce on the adult rabbit. Instead they wait until the female has given birth



An engorged tick on a rabbit's ear

R Todd



A rabbit with myxomatosis

and are then prompted by hormonal stimuli in ingested rabbit blood to move to the fur on the rabbit's nose and face and thence onto the newborn rabbits. The fleas then reproduce on the young rabbits, feed, and thereby transmit myxomatosis virus to the vulnerable newborn rabbits.

Climactic changes: Global warming and the accompanying changes in the distribution of ticks, mosquitoes and other biting arthropods is expected to influence the global distribution of arthropod borne diseases.

Presence of susceptible individuals: A large vulnerable population of rabbits can provide a breeding ground for disease outbreaks, allowing them to multiply and spread fast. This is one of the main reasons why vaccination is so strongly recommended. By increasing the number of vaccinated rabbits within a population, the chances of a vector picking up and transmitting a disease is correspondingly reduced. Unfortunately, it is not possible to vaccinate the wild rabbit population and we should assume that there is a constant background disease threat.

Practical Implications

Arthropods are common vectors of infectious diseases affecting rabbits, including myxomatosis, haemorrhagic viral disease (HVD), Tularemia (Rabbit fever) and Lyme disease. In the UK, myxomatosis and HVD remain the main disease threats. The mechanical transmission of these two diseases means that vector control is not the best way to protect rabbits against such diseases. Vaccination remains the recommended first line treatment against these two scourges. Where rabbits are kept in areas where myxomatosis is particularly prevalent, the use of insect repellents may be indicated in order to reduce the disease 'challenge' to your rabbit.

With the rapidly changing picture in terms of the distribution of arthropod vectors and the diseases they carry, diseases such as tularemia and West Nile Virus could potentially emerge as disease threats to the domestic rabbit population in the UK. Fortunately, current research suggests that rabbits are resistant to West Nile Virus disease.

All these external parasites can prove very irritating in their own right and vets therefore recommend preventative or therapeutic treatment of rabbits. Safe, licensed products are available to treat rabbits for fleas, ticks, mites and ward off mosquitoes and other flies.

In a future feature, we will explain Lyme disease, one of the classic examples of the biological transmission of an arthropod-borne disease. This tick-borne disease is widespread throughout the Northern hemisphere and has been reported in rabbits, amongst a number of other host species.

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