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Threats of vector-borne zoonotic disease in Europe: dogs, drosophilids, and Oriental eye worm

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Mosquito and tick ecology has changed in parts of Europe over the past 20 years and threats to the UK from diseases such as dengue, West Nile virus, tick-borne encephalitis, and Crimean-Congo haemorrhagic fever have to be considered.[1] But health professionals must also be aware of increasing risks from less well known vector-borne zoonoses that have emerged in Europe during the same timeframe. These zoonotic conditions include certain parasitic disorders of dogs that are well known to veterinarians, such as visceral leishmaniasis and dirofilariasis. However, it is the spread of an apparently new disease that affects the eyes, thelaziosis, which we wish to highlight.

During the past 20 years, cases of human and canine visceral leishmaniasis (caused by the protozoan *Leishmania infantum*, which is transmitted by sandflies) have increased throughout historical endemic foci in coastal Mediterranean regions. Furthermore, the disease has spread beyond these regions into new areas at more northerly latitudes, including northern Italy[2] and Madrid, Spain.[3] Like visceral leishmaniasis, canine dirofilariasis, which is caused by mosquito-transmitted filarial worms, is also often diagnosed in southern Mediterranean regions. Until 1999, most cases in human beings originated from Italy, France, Greece, and Spain, but the pattern of this disease has also changed, with autochthonous cases now regularly being reported from northern, central, and eastern Europe.[4]

Of special note, however, is thelaziosis caused by the spiruroid nematode *Thelazia callipaeda*. Unknown in Europe until only 25 years ago, thelaziosis is highly unusual in parasitology in that male fruit flies (*Phortica* spp, family Drosophilidae) are the vectors,[5] and transmission occurs when larvae are deposited as the fly feeds on lacrimal secretions. Adult worms develop within the conjunctival sacs and lacrimal glands, and clinical outcomes range from asymptomatic carriage to conjunctivitis, corneal ulceration and, if left untreated, blindness.[6] From its first description in Beijing 100 years ago,[7] *T callipaeda* has been known as Oriental eye-worm because of its distribution across Asia and the Indian subcontinent, where it is recognised as an emerging problem; more than 1000 confirmed cases in human beings have been recorded in the past 20 years.[8] In central China, this neglected disease is prevalent wherever dogs are found, and predictably affects mainly elderly people, children, and other vulnerable individuals in poorer rural areas. In Europe, *T callipaeda* was first diagnosed in domestic dogs in Italy in 1989[9] and since then has been reported in dogs, cats, and wildlife in many countries in Europe. Eight human cases have been described so far, from Italy, France, Spain, and, only last year, the Balkan states, in addition to increasing reports of infections in domestic dogs in previously unaffected countries. In fact, the worm seems to be moving from west to east, possibly via the ranging

behaviour of foxes, and it appears to be the same haplotype of the parasite, which is distinct from the Asian varieties, that is presently circulating, most recently recorded in Greece.[10]

This emerging pattern of thelaziosis is not explained simply by increased awareness and surveillance. Changes in patterns of all zoonotic vector-borne diseases are multifactoral,[1] with both animal and human movement playing a part. In the UK and other non-endemic countries in Europe, diseases such as dirofilariasis and visceral leishmaniasis are well documented in dogs that have travelled, and in this way, dogs provide a potential source of parasites to existing and competent vectors in waiting. In the case of the UK, ticks, mosquitoes, and *Phortica* spp await the annual return of some 200 000 pets that have been taken abroad, and the increasing numbers of animals being imported illegally from eastern Europe. Earlier this year, we described the first cases of thelaziosis in the UK in dogs that had travelled,[11] one from Romania, the others from France and Italy, and also investigated an unrelated case of thelaziosis in a human being. This case involved a Chinese national from Beijing who arrived in October, 2016, to study at a UK University, and was probably infected during stays in rural areas of Mongolia in June of that year. Symptoms started soon after arrival in the form of severe discomfort with a foreign body sensation, and the patient reported seeing worms in one eye. However, although they remained undetected on two visits to an eye hospital in January, which lead to suspicion of delusional parasitosis, worms were finally recovered on the third consultation several weeks later (figure).

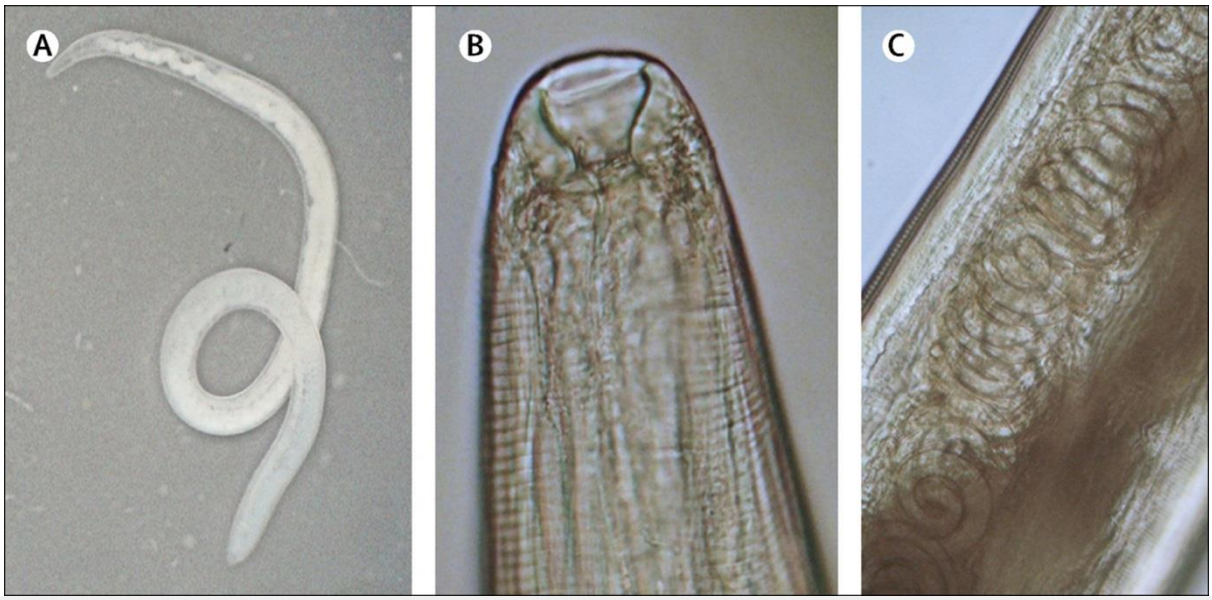

Figure: Features of *Thelazia callipaeda.* (A) An adult female *Thelazia callipaeda,* measuring 1·1 cm, that was removed from the eye of a Chinese student in the UK. (B) Typical six-sided mouth or buccal cavity and the striated cuticle of the worm. (C) Larvae within the worm uterus.

While certain notorious and invasive mosquito vectors of major diseases quite rightly occupy the public health centre stage, it is important to appreciate the problems presented by other lower profile but still serious vector-borne disorders. Thelaziosis offers a differential diagnostic challenge to distinguish it from allergic factors and other pathogens, including include various aberrant helminths.[6] The way forward to address these challenges is through a multidisciplinary one-health effort as we here demonstrate through collaborative liaison, an approach essential to combat all vector-borne diseases.

We declare that we know no conflicts of interests.

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