

# IN FOCUS

## Angiostrongylus vasorum – a parasite on the move

Nematodes in the superfamily Metastrongyloidea live in, or adjacent to, the lungs. The species that occur in dogs in the UK are *Angiostrongylus vasorum*, *Crenosoma vulpis*, *Oslerus osleri* and *Filaroides hirthi*. Angiostrongylosis is a serious condition associated with coughing, dyspnoea, exercise intolerance, vomiting, abdominal pain, weight loss, neurological signs, heart failure, bleeding diatheses and sudden death. This disease although still rare and sporadic, is being diagnosed more frequently and in areas outside established 'hot spots' so is of increasing concern to veterinarians and dog owners. This article considers recent evidence that *A. vasorum* infection is spreading northwards in the UK and focuses on some aspects of transmission and diagnosis.

### Life cycle

Adult *A. vasorum* worms are found in the right ventricle and pulmonary arteries of the dog. The female worms shed their eggs into the pulmonary capillaries; the eggs hatch rapidly and the first stage larvae (L1) penetrate the capillary and alveolar walls, are coughed up, swallowed and appear in the faeces. There is an obligatory phase of development within an intermediate host (a slug or snail) to the L3 stage which is infective to dogs. Paratenic hosts - i.e. a host in which some development takes place, but which is not essential to the life cycle - such as frogs may be involved but they probably have a minor role in parasite transmission. When ingested by the dog, the L3 larvae migrate through the intestinal wall, moulting and maturing in the mesenteric lymph nodes and migrating via the lymphatics, hepatic portal vein, liver and caudal vena cava to the right ventricle and pulmonary arteries, where they mature into the adult worms. The prepatent period ranges from 38 to 57 days.

### Is *Angiostrongylus vasorum* spreading north?

*A. vasorum* is a significant and frequent cause of disease in dogs in south-west France where it was first discovered in 1852 but is endemic in many countries with a mild wet, climate. The parasite was first recorded in the UK in 1975 in a greyhound imported from Ireland, but the first autochthonous infections in dogs in the UK were seen in Truro, Cornwall in 1982 where a hyper-endemic disease focus became established. The parasite was also diagnosed in a dog from the Swansea area, south-west Wales in 1987 and infection appears to have established there. *A. vasorum* was considered to be largely confined to these two regions until increasing numbers of cases were reported in the early 1990s in south-east England confirming the parasite had spread to the east. Indeed, of 20 lungworm positive faecal/BAL samples submitted to TEST-A-PET from veterinary practices in Hampshire, Surrey, Kent, Essex and Warwickshire between 1994 and 2004, 16 were *Angiostrongylus vasorum* and four were diagnosed as *Crenosoma vulpis*. Since 2005 there have been several authenticated reports of *A. vasorum* in the Midlands but the travel history of the infected dogs could not be validated.

To obtain reliable information about parasite spread, it is essential that parasitological confirmation is achieved in all cases and that the movement history of the affected dogs is known. On the 6th July 2008 a BBC news channel reported 'deadly dog parasite found in city' referring to a confirmed case of angiostrongylosis in Glasgow in a dog that had never left the city. In the same year, five cases of angiostrongylosis - all fatal - were diagnosed in northern England in untravelling dogs (Yamakawa et al. 2008; Veterinary Record, in Press). In all these cases adult *A. vasorum* were recovered from blood vessels or larvae digested from lung tissue.

The severity of this disease in dogs makes it unlikely that infections have previously been overlooked or that recent clinical awareness could be an explanation for the increase in diagnosed infections. This leads us to suggest that the parasite is spreading out of the recognised endemic areas of south west England and south west Wales.

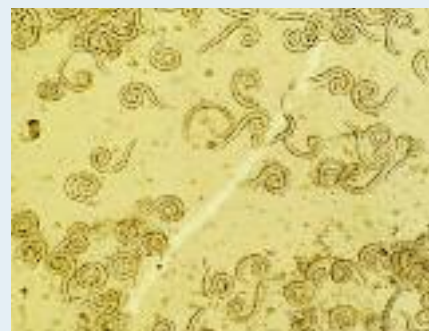
### The role of foxes in transmission

It is widely assumed that foxes are a reservoir of infection for dogs but the relative contribution of larvae shed by foxes to infections in pet dogs has yet to be determined. Infected foxes were found close to the Truro focus of canine angiostrongylosis but complete information on prevalence of infection in foxes across the UK is lacking. A study by the University of Bristol published in 2006 examined 546 rural foxes and showed that *A. vasorum* is more widespread in the UK than previously thought. Twenty three percent of animals in south-east of England were infected with *A. vasorum* but no infected foxes were found north of the midlands. This study is currently being extended to include urban foxes - high fox densities near human habitation are likely to increase *A. vasorum* transmission.

It is also suggested that movement of infected dogs into an area may result in infection in foxes. Indeed the introduction of infected dogs into non-endemic areas leading to infection to the local fox population is considered to be the underlying cause of spread of *A. vasorum* in Scandinavian countries.

### The role of molluscs: On a slimy trail

There are 115 species of terrestrial snails in the UK and 30 species of slugs. It is likely that certain types will be more efficient vectors than others but slugs, being detritivorous, are probably more important intermediate hosts. It may be that dogs do not actually have to eat the slug or snail to become infected; one laboratory study has shown that infective larvae are shed in snail secretions. Climate of course will affect the size and activity of mollusc populations and some researchers have commented that outbreaks of infection in dogs have occurred in mild, wet years when gastropods are probably abundant. Slug population dynamics in particular are strongly affected by climate. The occurrence of warmer and wetter winters which suit the slug life cycle, could cause a shift of slug populations northwards and increase the risk of transmission.



### Role of TEST-A-PET: Identification of *A. vasorum* first stage larvae

The different species of dog lungworms have different transmission characteristics and pathogenicities. Definitive diagnosis of angiostrongylosis in the living animal is achieved by the recovery and identification of first stage larvae from BAL or from Baermannised faecal samples. We have a reference collection of metastrongyle first stage larvae and are able to distinguish *A. vasorum* from other lungworms by microscopic examination of fine morphology.

### Summary

Accurate differential diagnosis of *A. vasorum* is vital both for treating clinical situations and in studies on disease epidemiology. Given the frequent long range movement of dogs within the UK and changing climate that favours expansion of the intermediate host range, it appears to be only a matter of time before *A. vasorum* becomes established in northern parts of England and in Scotland. However more basic research is required on the parasite's biological and climatic requirements in order to make predictions about precise areas at risk from range expansion.

Metastrongyloidea testing at TEST-A-PET.

- Recovery and identification of first stage larvae from BAL or from Baermannised faecal samples.
- Sample required: 3g of fresh faeces, sputum, Bronchial lavage, Baermannised faecal fluid.
- Results are available within one working day of us receiving the sample.

For more information, please see our website.

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Top: *Angiostrongylus vasorum* first stage larvae.

Above: *Angiostrongylus vasorum* adult worms.