Small Animal

Responsible parasiticide use in dogs and cats in the UK

Frequently asked questions

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The Environment and Parasiticides

Background

Parasiticides used to treat fleas, ticks and worms are important for protecting cats and dogs from diseases caused by harmful parasites, however their impact extends beyond pet health and welfare, influencing environmental sustainability, biodiversity and public health. The responsible use of parasiticides, which considers both the benefits and risks of parasiticide use, is a core component of modern small animal veterinary practice. This document aims to address frequently asked questions on the responsible use of pet parasiticides that may arise in UK veterinary practice.

Why is there concern around the environmental risk of pet parasiticides?

In the past, pet parasiticides were thought to pose minimal environmental risk, as the quantities used on individual pets were considered too small to have a significant impact. However, evidence of widespread waterway pollution with fipronil and imidacloprid has resulted in growing concerns about the environmental risks associated with pet parasiticides, as topical products have been identified as a major source of this pollution (EMA, 2023a; Budd *et al.*, 2023; Perkins *et al.*, 2024; de Marchi *et al*., 2025). Furthermore, ecological risk rankings of organic chemicals have identified these compounds as priority chemicals of concern amongst emerging aquatic contaminants (Spurgeon *et al.*, 2022; Egli *et al.*, 2023). A recent paper from researchers at Sussex University also found a high prevalence of these parasiticides in hair within bird nest lining and a suspected association between various parasiticides and increased chick mortality (Tassin de Montaigu *et al.*, 2025). While the amount of parasiticide applied to a single pet may seem negligible, the cumulative effect - considering the millions of pets treated frequently throughout their lifetime - may be substantial. Pet parasiticides are, by design, toxic to a wide range of invertebrate species, and their widespread use raises concerns about unintended harm to ecosystems.

How are fipronil and imidacloprid used in spot-on products passing into waterways?

Wastewater effluent is the primary source of fipronil and imidacloprid waterway pollution in the UK (UKWIR, 2023). Down-the-drain household wash-off from bathing of spot-on treated dogs, washing of dog bedding and owner handwashing are all important contributors to this pollution, with wash-off occurring via these routes for at least 28 days after spot-on application (Perkins *et al.*, 2024). Swimming is also a source of pollution from spot-on treated dogs (Yoder *et al.*, 2024). This appears to be less significant than wastewater as a source of pollution, however local impacts may be significant, particularly in standing water bodies regularly entered by multiple dogs.

What are other potential sources of fipronil and imidacloprid pollution?

Both pesticides were used in agriculture until recent years. Following evidence of their negative impacts, on pollinators in particular, restrictions were placed on their agricultural use in the EU and the UK, with outdoor agricultural use of imidacloprid banned in 2018 (European Commission, 2018) and all agricultural use of fipronil banned in 2017 (European Commission, 2019). At present, no plant protection products containing fipronil or imidacloprid are registered for use in the UK (Health and Safety Executive, 2022) with no recorded usage since 2016 (FERA, 2023). Given that the highest concentrations of these agents are being reported downstream from wastewater treatment facilities, rather than in areas where surface runoff from agricultural areas would be expected, residual presence of agricultural products is unlikely to be a significant contributor to current pollution.

Other than veterinary parasiticides, non-veterinary biocides (including ant, cockroach and fly bait products) are the only remaining licensed usage of fipronil and imidacloprid. No evidence exists to suggest a significant pathway for these products into the environment, so they are not currently considered an important source of the reported contamination (EMA, 2023a). Wash-off from imported textiles has also been suggested as a potential source of contamination, however there is no evidence to support this as a significant pollution pathway and research from the United States suggests it is unlikely to represent a major source (Budd et al., 2023).

Off-license use of fipronil sprays on other veterinary species has been suggested as a source of pollution. However as sprays make up less than 2% of fipronil sales in veterinary medicines (VMD, 2022), this is unlikely to represent a substantial emissions pathway.

Does this mean systemic ectoparasiticides (e.g. isoxazolines) are more environmentally friendly than topical products (e.g. fipronil/imidacloprid)?

Little is known about the environmental emissions and risks associated with alternative ectoparasiticides such as isoxazolines. However, existing evidence indicates potential concerns and care should be taken to avoid 'regrettable substitution' where widespread use of one chemical of concern is replaced by another which is no less harmful (Zimmerman and Anastas, 2015). For this reason, any transition to alternative products should be accompanied by judicious, risk-based use and education of pet owners to support responsible use.

Systemically absorbed isoxazolines such as fluralaner are primarily excreted in faeces (EMA, 2023b), potentially contaminating soil, so it is important to advise pet owners to dispose of faeces from treated pets, wherever possible. However, emissions pathways are likely to be affected by the administration route. For example, after administering tablet or spot-on fluralaner to a dog, around 25% of the fluralaner dose is absorbed into the circulation (Kilp et al 2014, 2016; EMA 2016, 2023b). Of the tablet dose, around 90% is excreted unchanged in the faeces, representing both the unabsorbed portion and the absorbed amount subsequently eliminated (Kilp et al., 2014). The environmental fate of the 75% of spot-on fluralaner that is not absorbed is unknown (Kilp *et al.*, 2016), raising concerns around the potential for environmental and human exposure via this pathway.

Systemically absorbed Isoxazolines are also found in the skin and hair of treated animals (EMA, 2013), suggesting potential environmental dissemination through shedding. This is supported by a recent study, which found fluralaner at concerning levels in swimming water following entry of an orally treated dog (Diepens *et al.*, 2023).

Isoxazolines are highly potent and stable, with prolonged degradation rates (e.g. fluralaner's half-life in soil ranges from 404 to 989 days, compared to 142 days for fipronil and 191 for imidacloprid (EMA, 2017; PPDB, 2020), posing a risk of soil accumulation. As per- and polyfluoroalkyl substances (PFAS), also known as 'forever chemicals' they belong to a group of agents of growing concern due to their resistance to degradation and potential to contaminate ecosystems and drinking water (Wang *et al.*, 2017; Brunn *et al.*, 2023).

There are currently no studies assessing pathways for isoxazolines to the environment, their prevalence in soil or water or their effects on ecosystems, leaving critical knowledge gaps regarding their environmental risks.

What about the environmental risks associated with other parasiticides, such as wormers?

Anthelmintics are primarily excreted unchanged or as metabolites in faeces, and sometimes urine, posing a risk of soil contamination (Jacobs and Scholtz, 2015) and to aquatic environments (Wagil *et al.*, 2015). Little is known about the environmental prevalence or impact of anthelmintics used in pets, however research on their use in large animals indicates a potential risk to coprophilous and soil invertebrates. Earthworms are particularly sensitive to praziquantel and pyrantel (Goodenough et al, 2019), whilst macrocyclic lactones, such as moxidectin, pose a risk to coprophagous insects such as dung beetles (Jacobs and Scholtz, 2015). Risk assessing and/or faecal testing instead of routine anthelmintic administration would help to reduce the potential for environmental exposure, alongside removal of faeces.

What environmental risk assessment is required for pet parasiticides prior to regulatory approval?

Under the Veterinary International Conference on Harmonization (VICH) framework, environmental risk assessments for veterinary medicines used in companion animals typically do not require data on their environmental fate or toxicity, based on the assumption that medicines used as individual treatments in non-food animals will not enter the environment in significant quantities (EMA, 2000). However, growing evidence of environmental contamination from pet parasiticides has prompted a reassessment of this framework (EMA, 2023a; VMD, 2024). Nevertheless, although it is being reviewed it is still in effect, meaning that little information is currently available on the environmental exposure and ecotoxicity of most parasiticides used in pets.

Risk based Prescribing

What is the current advice on pet parasite control?

The British Veterinary Association (BVA), British Small Animal Veterinary Association (BSAVA), and British Veterinary Zoological Society (BVZS) recommend that veterinary professionals should avoid blanket treatment and instead risk-assess use of parasiticides for individual animals. This should take into account animal, human and environmental health risks . Veterinary associations have also issued a 5 point plan which outlines the principles of responsible parasite control in pets (BVA, 2021).

The Royal College of Veterinary Surgeons Practice Standards Scheme assessment criteria for the most basic level of accreditation (core standards) states that: *'A practice must be able to demonstrate that when using endoparasiticides/ectoparasiticides, it does so responsibly, and is accountable for the choices made in such use. A responsible approach includes considering the specific needs of each animal (taking into account lifestyle factors, owner/household vulnerabilities and so on) before prescribing POM-V and POM-VPS products. A blanket approach should not be taken.'* (RCVS 2024a). Further to this, practices applying for the RCVS PSS Environmental Sustainability Award must demonstrate that steps are taken to reduce over-prescribing. One example cited is the use of faecal worm egg counts to minimise unnecessary use of parasiticides (RCVS 2024b).

Similarly, veterinary medicines regulators advise that "*The decision to use the veterinary medicinal product should be based on confirmation of the parasitic species and burden, or of the risk of infestation based on its epidemiological features, for each individual animal.*" - as detailed in the SPC/datasheet for newer pet parasiticide products (VMD, 2024).

The pharmaceutical industry-funded advisory body ESCCAP (European Scientific Counsel for Companion Animal Parasites) also provides guidelines for parasiticide use. These guidelines include the recommendation for "sustained integrated flea control" in cases of high, ongoing re-infestation risk, while moderate risk situations may require "regular prevention at appropriate intervals." (ESCCAP, 2022).

What is a risk-based approach to parasite control?

This strategic approach targets the preventative use of parasiticides to higher-risk individuals, rather than routinely treating populations prophylactically, thereby balancing animal welfare, public health and environmental objectives using a One Health approach (BVA, 2019). This enables more judicious use of parasiticides, reducing the likelihood of resistance, unnecessary treatments and environmental harm. In small animal patients, risk-based parasite control represents a compromise between routine, year-round preventative treatment for all animals, and treatment based solely on diagnosis of infestation.

Indiscriminate treatment for any parasite - without consideration of patient or client factors is not consistent with a risk-based approach, even if the risk of exposure to certain parasites, such as fleas, can never be completely excluded.. Risk-based parasite control aims to balance the tolerance of some parasite exposure risk with the need to reduce harm from excessive parasiticide use. Similarly, a risk-based approach can also be applied to zoonoses: there is limited data on the prevalence of zoonotic disease associated with pet parasites as no formal reporting or surveillance systems are in place for most of the parasites in question. More research is needed to support evidence-based decision-making in this area. Information that is currently available suggests clinical disease is uncommon to rare in the UK (Chaloner *et al.*, 2011; Patterson, 2023; British Liver Trust, 2023). Preventing transmission of disease to humans is an important objective of treatment regimes, however in the absence of robust epidemiological evidence to support this approach, indiscriminate treatment in all animals on the basis of zoonotic disease prevention is difficult to justify - particularly given the growing evidence of risks associated with parasiticide overuse.

Currently, it is commonplace for practices to offer subscription health care plans that incorporate routine inclusion of year round parasite treatment for patients. For many practices this leaves little room for individual prescribing within these plans to account for the differing risk profiles of individual animals, and may place pressure on clinicians to over-prescribe parasiticides. In order to provide an individualised risk based treatment plan, practices may have to restructure healthcare plans to allow tailored care for each pet and may consider providing services as an alternative to basing the scheme's value on parasiticide prescribing. These services could provide contextualised preventative healthcare assessment consults covering e.g. dental disease, nutrition advice and weight management. It may be necessary to change the pricing structure and to communicate the value of these schemes differently to owners as a result of these changes.

What is the difference between hazard and risk, and why is this important?

Hazard is the inherent potential of something to cause harm (e.g. a toxic chemical or infectious disease). Risk is the possibility that harm will occur, and is determined by both the potential impact of the hazard and likelihood of exposure to that hazard. Exposure is the degree to which people, animals or the environment may come into contact with the hazard (frequency, duration and intensity of contact). A hazard may be present for all individuals, but the *risk* of that hazard is likely to vary substantially from animal to animal, depending on individual and circumstantial factors that affect the potential *impact* of the hazard on the animal and the *likelihood* of its exposure.

For example, fleas exist in the external environment as a hazard, and there is a risk that they may be transmitted to a feline patient and cause feline allergic dermatitis. However an indoor cat is less likely to encounter this hazard, therefore the risk of it causing harm is lower. In this scenario, reconsidering the need for routine prophylactic flea treatments and their frequency would be appropriate.

There will be variation in opinion between owners and even clinicians as to what constitutes an acceptable risk. This underscores the importance of shared decision-making and the provision of balanced, evidence-based guidance on the risks and benefits of both parasites and parasiticides to support informed choices regarding their use.

What other risks are associated with pet parasiticide use?

Extensive use of parasiticides may foster drug resistance. This has been seen in farmed animal and equine settings, prompting a change in approach to worming strategies.

Parasiticide resistance is less common in pets than in large animals and has received comparatively little attention. However, evidence indicates that this may be an emerging problem. Widespread hookworm (*Ancylostoma caninum*) resistance to pyrantel and benzimidazoles has been reported in Australia (Dale *et al.*, 2024, Abdullah *et al.*, 2025). Similarly, the spread of *A.caninum* anthelmintic resistance is now considered a critical issue in the United States (US) (Marsh and Lakritz, 2023). Heartworm (*Dirofilaria immitis*) resistance to macrocyclic lactones is present in regions of the US (Bourguinat *et al.*, 2015), and the first cases of heartworm and suspected tapeworm (*Dipylidium caninum*) anthelmintic resistance have been reported recently in Europe (Oehm *et al.*, 2024; Traversa *et al.*, 2024). Resistance to anthelmintics has not yet been reported in UK pets, however, routine surveillance for helminths is uncommon, so it is feasible that resistance could be present but undetected.

The threat of ectoparasiticide resistance is a concern. Any exposure to parasiticides favours the survival of resistant parasites and imposes a selection pressure that encourages resistance genes to spread within the population. Mechanisms by which resistance to pet parasiticides may develop and propagate are poorly understood. Environmental contamination may contribute to the development of parasiticide resistance, as exposure to sublethal doses may contribute to the selection for resistant parasite strains (Bossard, Hinkle and Rust, 1998). Resistance to acaricides, including fipronil, has been reported for ticks affecting dogs in a number of countries in recent years, including the US and Brazil (Becker *et al.*, 2019; Tian *et al.*, 2023). Practitioners have long reported anecdotal cases of fipronil resistance in fleas, citing frequent treatment failures. Research has confirmed this high rate of treatment failure, with Cooper *et al.* (2020) finding that 61.9% of cats and 44.9% of dogs treated with fipronil-based products still had fleas. Despite this, no research has been conducted to definitively confirm or rule out fipronil resistance in UK flea populations, and user error has been suggested as a cause of treatment failure. Notably, failure rates in the aforementioned study were substantially higher for fipronil than any other treatments, including other similarly applied products, and a metabolic resistance mechanism to fipronil through increased detoxification in a resistant laboratory flea strain has now been described (Ramon-Portugal *et al.*, 2023). Further research on the occurrence, prevalence and mechanisms of resistance to pet parasiticides, particularly flea resistance to fipronil, is needed.

Another emerging concern with extensive parasiticide use is the potential health risk to pet owners and veterinary professionals from chronic exposure, particularly through contact with animals treated with topical parasiticides (Jennings *et al.*, 2002; Craig *et al.*, 2005). Persistent low-grade exposure to pesticides has been linked to various diseases, including cancer, asthma and diabetes, and even low-level exposure may negatively affect early childhood development (Peng *et al.*, 2024; Kim, Kabir and Jahan, 2017; Kim *et al.*, 2019). Residues of topically applied parasiticides have been found in the households of treated pets and on the skin of in-contact people for at least 4 weeks after application (Dyk *et al.*, 2012; Perkins *et al.*, 2024). However, no research has examined the health effects of this exposure or that of other parasiticides, such as fluralaner or moxidectin, which are also available in topical formulations. More research is needed to determine the extent of exposure to pet parasiticides amongst veterinary professionals and pet owners, and the potential health implications of this exposure.

Parasites and Pets

How common are parasites in pets within the UK?

Fleas

Varying figures have been reported for the prevalence of fleas in cats and dogs in the UK. Two studies have surveyed flea infestations via examination of pets in practice. The first showed fleas in 21% of cats examined and 6.8% of dogs (Bond *et al.*, 2007), the second found fleas on 28.1% of cats and 14.4% of dogs examined (Abdullah *et al.*, 2019). It is possible that cases were over-reported in these studies due to the sampling method as randomisation protocols are not described.

In a more recent SAVSNET survey of 4.8 million dog and 1.9 million veterinary consultations in the UK, fleas were recorded in 1 in 400 dog consults (0.25%) and 1 in 85 cat (1.17%) consults (Farrell *et al.*, 2023). It should be noted that some cases of flea infestation may not have been detected or recorded in clinical notes in the latter studies, potentially resulting in underestimation of flea prevalence. Other studies also looking at electronic health records via VETCOMPASS have reported the diagnosis of flea infestation in 2% of canine consults (O'Neill *et al.*, 2014) and 5-8% of feline consults (O'Neill *et al.*, 2014; O'Neill *et al.*, 2023). Anecdotal observations also suggest prevalence to be higher within particular settings than these studies report, such as charity and shelter sectors.

'Real time' data on yearly, seasonal and species flea prevalence in the UK, as described in the above studies using electronic health records, can be found via the SAVSNET Flea Index (SAVSNET, 2025).

Ticks

Similar to fleas, the reported prevalence of ticks varies. Data collected from patients in practice in studies with a similar design to the previously noted flea studies estimated tick attachment prevalences of 14.9% overall (Smith *et al.*, 2011), 30% in dogs (Abdullah *et al.*, 2016) and 6.6% in cats (Davies *et al.*, 2017). However these studies likely overestimate prevalence due to sampling methods (Davies *et al.*, 2017). It is also worth noting that 19% of practices within one of these studies reported no patients with ticks throughout the data collection period (Smith *et al.*, 2011).

In a more recent study, with data collected from electronic health records of first opinion practices via VETCOMPASS, the estimated 5-year (2014 to 2018) period prevalence of ticks was 2.03% (O'Neill *et al.*, 2024). Similar to the other studies based on electronic health data, the methodology could result in underestimations.

'Real time' data of tick activity per year and season can be found via the [SAVSNET Tick Activity Index] (SAVSNET, 2025).

Canine Lungworm (Angiostrongylus Vasorum)

Studies of fox post-mortems indicate that lungworm is becoming more widespread in the UK (Taylor *et al.*, 2015), however there are no similar studies of *A. vasorum* prevalence in canine patients, and peer-reviewed data on the prevalence of symptomatic lungworm disease in dogs is lacking.

A study testing serum samples of 4000 dogs from the UK submitted to an external lab (for any reason, not specifically lungworm diagnosis), found 1.32% were antigen-positive indicating presence of lungworm infection, 3·2% were positive for specific antibodies to lungworm indicating exposure to the parasite and 0.97% positive for both. The samples were predominantly from the South East, an area noted as endemic for lungworm. As these samples were 'excess' serum from any submission it cannot be said if they related to animals with clinical signs of lungworm (Schnyder *et al.*, 2013). There are no current studies assessing how common clinical cases of lungworm are. A 2014 study survey found that nearly 80% of UK veterinary practices that responded had not diagnosed any lungworm cases within the preceding year, however the distribution of lungworm preventative treatments used across these practices was not described and may have influenced this (Kirk *et al.*, 2014).

Toxocara spp.

Toxocara is the main 'roundworm' of concern when considering treatment regimes in companion animals due to its zoonotic potential.

Studies on dogs in the UK have found a prevalence of patent *Toxocara spp.* infection of 0-5.3% (Guest, Stephen and Price, 2007; Batchelor *et al.*, 2008; Wright, Stafford and Coles, 2016; Drake *et al.* 2022). Animals with varied lifestyles and previous worming regimes are included in the study populations. Notably, the study populations are often skewed towards younger animals, who are more likely to have patent *Toxocara* infections due to immature immune responses and lower levels of age-related immunity (Nijsse et al., 2015a; Morgan, Azam, and Pegler, 2013). One study in Ireland found a much higher overall prevalence of 17.6%, however, this was a population of stray animals entering a shelter rather than owned pets (de Waal *et al.*, 2022).

Studies on cats in the UK are few but have reported the prevalence of *Toxocara spp*. as 3.6- 26%, the latter being in untreated cats with outdoor access and the former amongst cats with a varied lifestyle but from a small geographic area (Gianelli et al. 2017; Wright, Stafford and Coles, 2016).

Tapeworm

A number of tapeworm species affect companion animals including *Dipylidium caninum, Taenia* and *Echinococcus granulosus. Echinococcus Multilocularis* is not present within the UK but may be a consideration if travelling.

Very limited information is available on the prevalence of *D.caninum* and *Taenia* species in UK pets. A 1981 study of cats in the London area found that 1.2% were infected with *Di.caninum* and 1.2% with Taenia *taeniaeformis* (Nichol, Ball and Snow, 1981). The prevalence of tapeworm in dogs is likely to be lower than in cats due to their lower rates of flea infestation (Farrell *et al.*, 2023) and lower propensity to hunt.
E. granulosus has historically been thought to be restricted to mid-Wales, the surrounding English border regions and the Hebridean Scottish Islands, although distribution may be changing in the UK or additional endemic foci present that are yet to be identified (Collins, 2019). As exposure is through ingestion of raw, untreated ungulate (predominantly sheep) carcasses, cases have typically been restricted to hunting hounds and farm dogs. Studies have reported 9.4% of hunts and 10.6% of farm dogs in Powys, Wales as testing positive for *Echinococcus* spp. coproantigen (Mastin *et al.*, 2011; Collins, 2019). To date, no studies have looked at domestic ‘pet’ dogs in similar geographical areas so the potential of exposure and shedding in this population is unknown.

What are the risk factors for parasites in companion animals?

Fleas

While the risk of fleas can never be entirely eliminated, several factors influence the likelihood that an animal will develop a flea infestation. Two of the strongest predictors are species and season. Fleas are significantly more likely to infest cats than dogs, and a clear seasonal pattern has been observed, with flea activity peaking between June and October (Farrell *et al.*, 2023).

Electronic health data from thousands of UK veterinary practices can be used to assess the relative risk of different population groups at various times of year, for example data indicates that a cat during peak flea season is more than ten times more likely to develop a flea infestation than a dog in mid-winter or spring (Fig 1; SAVSNET, 2025).

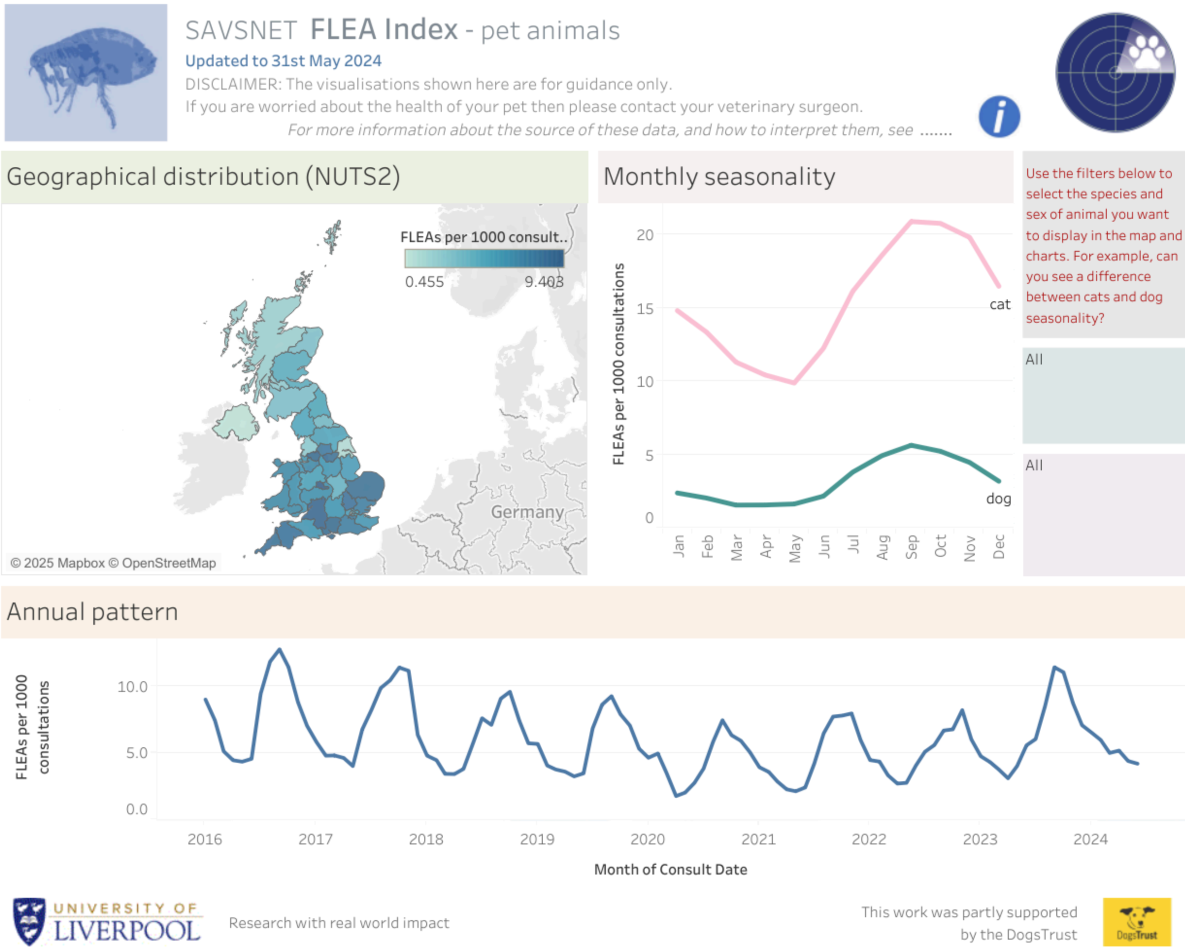

Fig 1. SAVSNET Flea Activity Dashboard showing geographic, seasonal and species patterns for flea infestations in the UK. Available at https://public.tableau.com/app/profile/savsnet.at.liverpool/viz/Fleaactivitydashboard/fleadashboard

Additional risk factors include geographic location, age, socio-economic background, and lifestyle. Flea infestations are more likely to occur in the southern regions of the UK (Fig 1). Animals under one year old are more prone to flea infestations, as are those from areas with higher levels of socio-economic deprivation in the UK (Farrell *et al.*, 2023). Indoor cats are less likely to develop flea infestation than outdoor cats (Farkas *et al.*, 2009).

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Frequently asked questions

Ticks

Ticks are more likely to be seen in dogs in rural and suburban environments compared to urban areas. Gundogs, terriers and pastoral dogs and dogs with medium length hair are more likely to present with ticks.

Tick attachment has shown a seasonal pattern, with higher cases in the spring-autumn months, and June being the peak month for cases in dogs (Fig 2; Smith *et al.*, 2011; O'Neill *et al.*, 2024). Younger animals and male entire cats have also been shown to have higher risk (Arsevska *et al.*, 2024), but in general, cats are less likely than dogs to present with ticks (Davies *et al.*, 2017).

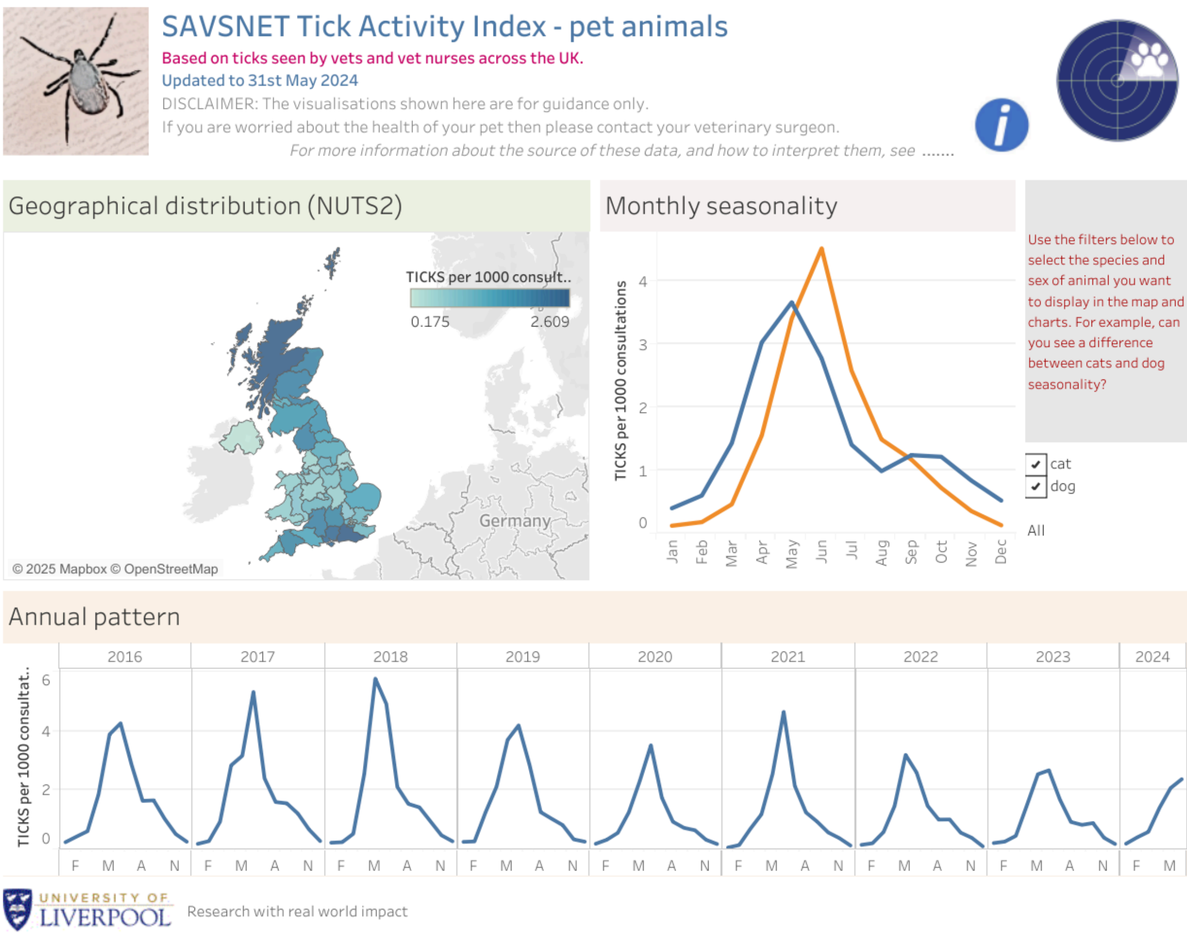

Fig 2. SAVSNET Tick Activity Dashboard showing geographic, seasonal and species patterns for tick infestations in the UK. Available at https://public.tableau.com/app/profile/savsnet.at.liverpool/viz/Tickdashboard/Tickdashboard

Canine Lungworm (*Angiostrongylus Vasorum*)

Geographical region is likely to significantly influence lungworm risk; however, data on case distribution is limited and may not reflect current patterns. Local case records or screening data may be a more reliable indicator of risk. This could be assessed via in-practice records of clinical cases or positive screening tests, but it would also be useful to share such information across networks of practices within localities.

Given the life cycle of lungworm, behaviour that would increase ingestion of the slug and snail intermediate hosts, such as scavenging, would increase risk. There is evidence that small numbers of *A. varosum* L3 larvae may be shed through the faeces of infected slugs (Conboy, Guselle and Schaper, 2017), and L3 larvae shedding has been induced experimentally in submerged slugs (Robbins et al., 2021), however the significance of this transmission route in the spread of *A.vasorum* to dogs is unclear.

In one study, dogs under 1 year old were more likely to be positive for lungworm, and cocker spaniels are overrepresented. Significant associations were found between *A. vasorum* infection and dogs presenting with cough, coagulopathy, vomiting/diarrhoea and/or lethargy (Holmes *et al.*, 2020).

Toxocara

Juvenile animals (under 12 months old) are much more likely to test positive for *Toxocara spp*. than adults, and represent the majority of positive samples (Batchelor *et al.*, 2008; Beugnet *et al.*, 2014; Nijsse *et al.*, 2016; de Waal *et al.*, 2022). Studies on stray animals report higher prevalence rates (de Waal *et al.*, 2022).

Studies in European countries have shown that other risk factors in owned dogs include recent kennelling, coprophagia and increasing time off lead/free roaming (Nijsse *et al.*, 2015a; Nijsse *et al.*, 2016).

In cats, increased outdoor access, number of cats in household and decreased worming frequencies were associated with toxocara-positive faecal samples. It should be noted that this study included cats < 6 months of age, which is likely to have affected outcomes, particularly for toxocara(Beugnet *et al.*, 2014).

Tapeworm

D. caninum is spread by ingestion of fleas and may therefore occur where flea infestation is present. Only ~3% of the flea infestations tested in one study contained flea(s) that were positive for *D. caninum* DNA (Abdullah *et al*, 2019).

Dogs and cats are infected by *Taenia spp* after eating raw offal and carcasses of intermediate hosts, therefore scavenging carcasses or the feeding of raw unprocessed diets that have not been adequately pre frozen or cooked are the main risk factors to consider (Franssen *et al.*, 2019; Hoberg, 2002).

E. granulosus transmission is highly lifestyle dependent and geographically focused. As geographical foci may exist beyond those historically identified, exposure through ingestion of raw, untreated ungulate (predominantly sheep) carcasses is the most important risk factor to consider. This could be via scavenging or the feeding of inadequately pre-frozen raw diets. Dogs living in or visiting known endemic areas may be at risk if they could gain access to carcasses. Free roaming activity in these areas may create opportunity for this and increase risk (Mastin *et al.*, 2011).

What are the health impacts on pets of the common parasites and do they warrant prophylactic treatments?

Fleas

Fleas are irritating to pets, with the most common clinical consequence being an episode of flea allergic dermatitis. This was reported in electronic consult health records obtained through VETCOMPASS in 0.48% and 1.9% of canine and feline consults respectively (O'Neill *et al.*, 2021, 2023).

Fleas can occasionally cause significant anaemia when very young kittens and puppies are exposed to severe flea infestations (Dryden and Gaafar, 1991).

Some fleas may be host to other infections that may subsequently cause disease and can spread from one animal to another. This may include the tapeworm *D. caninum* and the bacterium *Bartonella spp*. In one study, 11.3% of flea infestations in cats and dogs contained flea(s) positive for *Bartonella spp*.

The incidence of clinical disease from flea-borne pathogens is unknown, but thought to be uncommon in UK pets. None of the animals within this study from which the fleas were collected had clinical signs reported (Abdullah *et al.*, 2019).

In the past, prophylactic treatment was also advised due to the difficulties of clearing a flea infestation once established, with multiple treatment rounds and household treatment with insecticides being required. Newer treatments such as isoxazolines appear to be more efficacious in eliminating infestations than older products (especially if detected early, for example through regular flea combing), which may make a reactive approach more effective. This is supported by studies indicating rapid resolution of household flea infestations following isoxazoline administration, without the need for environmental treatment (Dryden *et al.*, 2018; Williams *et al.*, 2014). This difference in efficacy is further illustrated in recent research from the UK , in which treatment failure was less commonly reported for newer often systemic compounds (Cooper et al, 2020). However, other factors could be at play, such as mode of application.

Ticks

Tick-borne diseases are uncommon to rare in UK pets, with most cases occurring in animals with a history of travel (De Marco *et al.*, 2017; Silvestrini *et al.*, 2023). There is evidence that tick-borne disease transmission is increasing across Europe and this trend may be occurring in the UK, although contemporary evidence for changes in disease transmission in the UK is lacking. Babesiosis, Ehrlichiosis, Lyme Borreliosis and Anaplasmosis have been reported in the UK, however at present only Anaplasmosis and Lyme Borreliosis are considered to be endemic (Silvestrini *et* *al.*, 2023). Cases of encephalitis secondary to the tick transmitted Flavivirus that causes Louping ill have also been reported in dogs within the UK (Elgueta *et al.*, 2024; Gonzalo-Nadal *et al.*, 2021). It should be noted that some cases were reported to be on routine tick/acaricide prophylaxis, suggesting a potential lack of efficacy against this condition.

Canine Lungworm *(Angiostrongylus Vasorum)*

Lungworm can cause significant clinical signs including respiratory distress and coagulopathies which can lead to death in severe cases. Whilst the prevalence of symptomatic lungworm is unclear, the potential severity remains a clinical concern and this may pose a barrier to reducing parasiticide use. However, risk assessment can still be applied using geography, patient age and scavenging behaviours.

In known endemic regions, prophylactic treatment could be targeted at younger patients or those that scavenge intensely. Additionally, a patient's risk of lungworm may differ from their risk of other parasites. To provide more targeted protection, prophylaxis could be tailored using narrower-spectrum products rather than broad-spectrum combination treatments, allowing for lungworm prevention on its own. In areas with low or unknown geographical risk of lungworm, alternatives to prophylaxis could be considered, such as regular antigen testing of patients and adjustment of practice policy based on findings.

Toxocara

The majority (>90%) of adult household dogs and cats do not have patent toxocara infections due to the development of age resistance and, where present, this very rarely causes disease (Nijsse *et al.*, 2015b). One study found that less than 1% of faecal samples from dogs over 1 year old with diarrhoea were positive for toxocara (Batchelor *et al.*, 2008). Therefore, prophylactic treatment in adult patients is unlikely to be warranted on the basis of animal health but may still be considered in some patients to prevent egg shedding and reduce zoonotic risk in certain circumstances, as is discussed in later sections.

Patent infections occur more commonly in puppies and kittens and heavy burdens can cause disease. Prophylactic treatment regimes are therefore justified in juvenile animals to prevent illness and egg shedding.

Tapeworm

Tapeworm infestations are largely non-pathogenic in dogs and cats (Rana, 2024). Tapeworm segments may be seen, particularly in cats who hunt frequently. As these are typically of little clinical significance, prophylactic treatment may not be warranted on the basis of animal health.

There is risk of transmission of *Taenia hydatigena*, *Taenia ovis*, *Taenia multiceps* and *Echinococcus granulosus* tapeworm between dogs and sheep where dogs walk or work on farmland. As the intermediate hosts for these four species of tapeworm, clinical signs such as neurological signs and poor growth rates can be seen in sheep, costing in excess of £6 million to the sheep farming industry (EBLEX 2013). This may be an additional indirect animal health risk and socio-economic consideration for some dogs.

Parasites and People

What is the risk of zoonotic disease from pet parasites and does this warrant prophylactic treatment?

Fleas

The prevalence of *Bartonella* species — the bacteria responsible for bartonellosis in humans, but typically causing asymptomatic infections in pets — has been cited as a rationale for recommending year-round flea treatment of all cats and dogs in the UK (Wright, 2020). One study found that 11.3% of flea infestations on pets involved fleas carrying Bartonella spp. However, only 17 of the 53 Bartonella-positive flea pools were identified as *Bartonella henselae*, equating to just 3.6% of the original 470 flea samples tested (Abdullah, 2019). *B. henselae*, the causative agent of cat scratch disease, is the species most commonly linked to zoonotic infection. Notably, the study did not determine whether the *B. henselae* strains detected were of genotypes associated with human disease.

Despite the presence of *B. henselae* in cats, the reported incidence of human infection in the UK remains low. This is likely because most cats harbour *B. henselae* strains that are rarely associated with zoonotic disease (Chaloner et al., 2011), and because most cases of cat scratch disease in humans are mild and self-limiting. *B.henselae* infections are not included in the UK Animal and Plant Health Agency's annual Zoonosis Report (APHA, 2024), suggesting that flea-associated Bartonellosis is not considered a significant public health concern. Whilst limited detail is available on the prevalence of human *B.henselae* as there is no formal reporting or surveillance, NHS England recorded only 10 and 11 cases of cat scratch disease in hospitalized patients in 2021-2022 and 2022–2023, respectively (NHS England, 2023).

Toxocara

The zoonotic risk of toxocariasis is commonly cited as a rationale for routine worming of cats and dogs in the UK. Humans can become infected by ingesting embryonated *Toxocara canis* or *T. cati* eggs, which are shed in the faeces of infected dogs, cats, and foxes. However, *Toxocara* spp. eggs are not infectious when first excreted; they must embryonate in the environment before posing a risk (Morgan, Azam, and Pegler, 2013). As a result, infection is most likely acquired through ingestion of contaminated soil, although consumption of raw or undercooked meat can also be a source (Wu and Bowman, 2020; Healy et al., 2024).*Toxocara spp*. eggs are very resilient in the environment and can retain their infectivity for years, therefore effective measures to reduce human exposure should focus on reducing environmental contamination with eggs (Nijsse *et al.*, 2015b).

The epidemiology of human toxocariasis is not well understood. Human exposure to Toxocara is not uncommon, with recent reviews estimating a global seroprevalence of 19% (Ma *et al.*, 2020), and an estimated seropositivity of 10.5% in European regions (Rostami et al. 2019). Most infections in humans are asymptomatic or mild, however clinical toxocariasis can cause serious disease including blindness, asthma, cognitive dysfunction and epileptic seizures (Chen *et al.*, 2018; Ma *et al.*, 2018). Limited data is available on the prevalence of toxocariasis in the UK, however clinical cases appear to be extremely rare. In a review of toxocariasis reports in the literature in the 46 years between 1972 and 2017, a total of 106 cases were reported in the UK, equating to 2.6 cases per year (Chen *et al.*, 2018; Patterson, 2023).

Reported risk factors for seropositivity include male gender, rural living, young age, consumption of raw meat, and drinking untreated water, with infection rates highest in developing countries (Giannelli *et al.*, 2017; Rostami et al., 2019). Foxes also play a significant role in the transmission of *Toxocara* spp. and the contamination of the environment with parasite eggs. Evidence suggests that in areas with effective dog faeces removal, foxes may become the primary source of environmental contamination (Morgan, Azam, and Pegler, 2013). Young children and immunocompromised individuals are considered at higher risk of infection (Lupia *et al.*, 2024; Winders and Menkin-Smith, 2025).

The current widely accepted guidance is to deworm dogs and cats with outdoor access at least four times a year to reduce the shedding of *Toxocara* eggs into the environment (ESCCAP, 2020). However, this advice is not well supported by evidence (Nijsse *et al.*, 2015b). Multiple studies have found that routine worming has no significant effect on the shedding of *Toxocara* from adult household dog and cat populations in Western countries (Sager *et al.*, 2006; Nijsse *et al.*, 2015a; Nijsse *et al.*, 2016; Lempereur *et al*, 2020; Stafford *et al.*, 2020; Drake *et al.*, 2022). One study found that household dogs with a higher number of treatments per year were *more* frequently infected with *T. canis* (Claerebout *et al.*, 2009). Another study concluded that higher worming frequency was associated with a lower occurrence of *T. canis* shedding in adult dogs (Wright and Wolfe, 2007), however assessment through the GRADE quality of evidence rating system (Guyett et al, 2008) indicates that the results of the latter study may be of low reliability.

Modelling of intervention scenarios suggests that, even assuming full efficacy, routine worming of adult dogs every three months has minimal impact on overall *Toxocara* egg shedding. In contrast, the removal of canine faeces is highly effective at reducing environmental contamination. For example, within the model, with 90% compliance and fully effective treatment, worming every 3 months would reduce dogs' contribution to environmental contamination by only 11% (from 39% to 28%), with the remaining contamination arising from stray cats, household cats, and foxes. In comparison, 90% compliance with removal of dog faeces would reduce the canine contribution to just 4%, and even 50% compliance would achieve a reduction to 20% (Nijsse et al., 2015b).

Given that such high compliance with worming is unlikely in the general dog-owning population, routine prophylactic worming—particularly in adult dogs—is unlikely to significantly reduce environmental *Toxocara* contamination. Greater impact is likely to be achieved through owner education focusing on good hand hygiene and proper faeces disposal (Patterson, 2023; Nijsse et al., 2015b). Prophylactic treatment should instead be prioritised for juvenile dogs, as they are the most frequent shedders and thus major contributors to *Toxocara* egg output in the environment (Morgan, Azam and Pegler, 2013).

Tapeworm

Echinococcus granulosus is of most concern in terms of zoonotic tapeworm in the UK, and is transmitted by ingesting parasite eggs present in contaminated food, water and soil. Cases of *E. granulosus* or hydatid disease result in cysts within organs such as the liver, spleen and lungs and can require extensive treatments. Fortunately this is considered very rare by the British Liver Trust (British Liver Trust, 2023). A systematic review of cases within the literature between 2000-2021 in Europe identified 4 cases in the UK (Casulli *et al.*, 2022). However, due to the slow progression of clinical disease over months to years, a lag may be seen between increases in infection rates and increases in clinical cases so this may not reflect current infections.

Given that canine infections are heavily lifestyle dependent, many pets will not be at significant risk of carrying this parasite so therefore would not pose a risk of transmission to their owners or others. The patient's diet and domestic travel history should be considered and treatment targeted at those with a significant risk profile.

Dipylidium caninum, or flea tapeworm, is potentially zoonotic however infection in humans is rare and typically mild (Rousseau *et al.*, 2022).

In conclusion, a risk-based approach to parasiticide use on the basis of zoonotic disease prevention can be adopted, and in many circumstances, routine prophylactic use may not be justifiable.

Parasite Testing and Practical Considerations

What tests could be useful for screening (in asymptomatic patients)?

A number of diagnostic tools are available in practice that can screen for the parasites discussed. It is important to also recognise the limitations of these tests when using them as adjunctive tools within a risk based prescribing protocol.

Clinical examination:

Providing opportunities for regular physical examinations to assess the presence of ectoparasites, may be a useful tool to monitor the need for treatments.

Faecal egg counts:

Faecal flotation techniques can be performed to identify the presence of the eggs of roundworm (*Toxocara spp.*), hookworm and whipworm. Quantitative techniques such as the Mcmaster method will give a worm egg count with the threshold of detection of most laboratories being 50-100 eggs per gram of faeces.

Sensitivity of this test may be affected by intermittent shedding of ova or testing during the prepatent period therefore pooled samples are often recommended. Shedding may also be below the level of detection providing a false negative. It is also possible to have false positives due to coprophagia. Given the public health considerations for *Toxocara spp.*, there is no accepted threshold for egg counts before treatment is recommended as is often applied in large animal practice.

This is a non-invasive test without the need for bringing the patient to the clinic which may be attractive to clients. However, having to remember to supply a faecal sample at regular intervals and collecting a 3 day pooled sample may affect client compliance. Faecal flotation can easily be performed in house provided staff members are trained and familiar with identifying parasite eggs. AI based technologies are also now available that will perform faecal microscopy in house (Imagyst, Zoetis). A positive sample would mean the animal is shedding eggs into the environment - if faeces is not being disposed of - so it also may need to be considered whether this would pose a higher risk to the public (in the case of *Toxocara spp* eggs) if used as an alternative to routine treatment.

Faecal antigen testing:

Faecal antigen testing is now easily available for the detection of roundworm (*Toxocara spp*.), hookworm, whipworm and *D. caninum* (Faecal Dx, IDEXX). Studies have shown good agreement between faecal antigen results and flotation techniques. Percentage positive agreements reported for each parasite are as follows; roundworm 88-98%, hookworm 89-97%, whipworm 71-99%, *D. caninum* 99% (Little *et al.*, 2019; Burton, Michael and Drake, 2025).

As the test identifies presence of parasite antigen rather than ova in faeces, it has the potential to detect infections within the prepatent period or at times of egg shedding below the level of detection which may be the case where positive findings have been made with a negative flotation test.

Baermann faecal test:

This is often used as a reference standard test for the diagnosis of *A. Vasorum* by which newer serological methods of testing have been compared. As the Baermanns method identifies L1 larvae within the faeces, it will only detect patent infections once larval shedding has begun. Therefore a negative result will be found within the prepatent period (approximately 38-60 days).

Larval output can vary and be intermittent throughout infected periods thus possibly affecting the sensitivity of a single test (Oliveira-Junior *et al.*, 2016). This is why standard lab recommendations are to provide a pooled sample. However, the sensitivity of the test can also be affected by sample storage and delay in sample processing which may be more likely if waiting to collect pooled samples (Oehm and Schnyder, 2022). Operator skill is also important in correctly identifying larvae.

As with other faecal tests this is a non-invasive test for the patient however, client compliance in providing samples may affect ease of use for regular screening. Given the time and equipment required and that larvae identification is best performed by an experienced technician it may be preferable that this would be performed by a reference laboratory rather than in house for most practices.

Direct Faecal Smear:

Direct detection of L1 larvae via microscopy of a direct faecal smear has been described as a useful rapid test to identify clinical cases of *A. Vasorum*. A sensitivity of 54-61% and a specificity of 95-100% was reported depending on the experience of the assessor when examining known Baermann positive samples (Humm and Adamantos, 2010).

As with the baermann test it will only detect cases within the patent phase of infection and will also be affected by larval concentration within the faeces.

Whilst this test is unlikely to be sensitive enough as a reliable sole screening modality, given that it is non-invasive, cheap and easy to perform, it may be of use as an adjunctive method in between more invasive methods such as blood testing to increase frequency of monitoring, particularly if local prevalence is unknown.

Patient side blood antigen testing:

A patient side blood test for circulating *A.Vasorum* antigen is commercially available (Angio Detect, IDEXX) which uses ELISA methods within a lateral flow test. A recent knowledge review (Weir and Ireland, 2021) concluded that the test is highly specific, with reported specificity between 98-100% , and moderately sensitive with reported sensitivity between 84-97% (Liu *et al*., 2017; Schnyder *et al*., 2014) . These reports assess the test in comparison to known Baermann positive cases.

Positive cases can be identified approximately 9 weeks post inoculation (Schnyder *et al*., 2014) therefore infections may be negative if early in the pre-patent period. Cross reactivity has been reported with other parasites eg. *C. Vulpis* (Lempereur *et al.*, 2016).

Testing for circulating antigen rather than direct presence of larvae in faeces will avoid the issue of intermittent shedding of larvae and the logistics of faecal collection and analysis that are associated with using the baermann test.

Other considerations for using this test as a screening tool is the patients temperament as blood sampling is a more invasive sampling method than faecal collection and may cause distress in some patients.

It is worth noting that other serological diagnostic tools are available for *A. Vasorum* such as antigen ELISA, antibody ELISA, PCR (eg. on bronchoalveolar lavage samples) and have been reported to have higher diagnostic accuracies than faecal and patient side tests. However these would be more likely to be used in the case of a symptomatic patient so have not been discussed further in this document.

How can veterinarians promote responsible pet parasiticide use?

Considerations to discuss and promote in practice may include:

Risk assessment

With a growing emphasis on contextualised care, it is important for veterinary professionals to perform individualised parasite risk-assessments prior to the prescription of parasiticides.

Owner education

Owners should be provided with balanced, evidence-based guidance and information regarding the risks and benefits of parasiticides to support informed decision-making. They could be given choices regarding parasiticide use, including the option to monitor and treat in response to confirmed infestation.

Swimming and bathing

If topical parasiticides are used, swimming should be discouraged and the risk of transfer down-the-drain discussed. Product datasheet guidelines on waiting intervals before swimming after the application of spot-ons may help to reduce emissions; however, these are typically default values and not based on product-specific scientific data (EMA, 2011). Research confirms that dog swimming is a source of parasiticide emissions to waterways (Yoder *et al.*, 2024), and recent research has found that swimming emissions pose a risk to the environment throughout the duration of action of spot-on parasiticides containing fipronil and imidacloprid (28 days), therefore swimming should be avoided throughout this period (Perkins *et al.*, 2025).

Appropriate disposal of faeces

If faecally excreted parasiticides are administered, bagging and binning patient faeces will reduce the risk of environmental contamination. This is also likely to be the most effective way of reducing the risk of environmental contamination with toxocara eggs, and thereby the risk of transmission to humans.

Appropriate disposal of medication

Clients could be encouraged to return packaging contaminated with parasiticides or unused products for appropriate disposal in pharmaceutical waste.

Parasite screening

Routine faecal testing can help to target treatments more effectively in adult animals. Even if routine treatments are used, faecal testing can be discussed with clients to monitor efficacy of products and treatment regimes.

Flea and tick checks

Owners can be taught to check their pet for fleas and ticks, whether receiving treatment or not, and they can also be advised on how to remove any ticks using tick removal devices.

Report treatment failures

Identifying emerging concerns regarding the efficacy of parasiticide products relies on practitioners identifying and reporting this to the manufacturers and the VMD. Vets should aim to report any noted treatment failures of parasiticides.

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