BVA British Veterinary Association | Policy statement

BSAVA BRITISH SMALL ANIMAL VETERINARY ASSOCIATION

BVZS

BVA, BSAVA and BVZS policy position on responsible use of parasiticides for cats and dogs

Executive summary

Background

Parasiticide products are commonly used in small animal medicine to prevent and treat for various parasites, including fleas, ticks and worms. As well as preventing animal health and welfare problems, human health risks from associated zoonotic threats have to be considered. Given the many health and welfare concerns associated with parasites, routine use of parasiticide treatments is now widespread in the UK.

However, there is increasing evidence from multiple sources that some parasiticides are contaminating the environment, including through wastewater from homes, animals entering waterways outdoors, excretion in faeces and urine, and residues in pet fur. As parasiticides can be harmful to a range of non-target species, this could be detrimental to wildlife and ecosystems, and could in turn impact on public health.

Given the importance of being able to use these products, it is advisable to take note of these concerns now and to take proactive steps to use them more responsibly, to make sure they continue to remain available and effective in the future, whilst being used in a way that minimises harm to the environment

This is a true One-Health problem of immense complexity, and our understanding and position will be kept under review as the evidence base grows. This policy was originally published in 2021, and updated in 2025 to reflect the latest evidence.

Our position

Given the potential adverse environmental impacts, BVA, BSAVA and BVZS are calling for a more considered approach to the use of small animal parasiticides. Everyone must take concerns about the possible environmental impacts of small animal parasiticide products seriously, proactively promoting discussion and highlighting these challenges.

There are many knowledge gaps in relation to parasites and the use of parasiticide products which make risk analysis difficult. This policy position highlights those gaps, and the need to balance animal health and welfare, human health and the health of the wider ecosystem. It is also designed to promote greater discussion of the concerns associated with the current use of these products and encourage responsible evidence-based approaches to prescribing them.

Priorities for action

The position includes a total of 36 recommendations which apply to a range of stakeholders. In our 2025 review, we identified the following as priorities for action:

Research is urgently needed on:

- the extent of the impact of certain risk factors on the prevalence and severity of parasitic infections in pets, including factors such as seasonality, multi-pet households, geography, lifestyle and type of pet, and optimal use of parasiticides to control those risks, including frequency of administration.
- risks to animal and human health from common parasites, and prevalence in human and animal populations.
- prevalence and impacts of veterinary parasiticide products in the natural environment, including impacts on non-target species. This should include all commonly used parasiticides, in addition to fipronil and imidacloprid, and consider the impacts of long acting and combination products.

Veterinary professionals, SQPs and businesses should:

- ensure they understand the risks associated with parasiticide treatments and are able to advise clients appropriately, and always take a proportionate and targeted approach to prevention and treatment.
- avoid blanket treatment, instead risk assessing use of parasiticides for individual animals, and where possible and reasonable, avoid prescribing topical products for pets which are likely to swim or be bathed. Businesses should empower individual vets to discuss tailored treatment plans with their clients, and allow for risk assessment within practice health plans so vets can base prescribing decisions accordingly.

VMD should:

- review the requirements for environmental impact assessment of companion animal parasiticide products.
- reconsider the classification of parasiticides which are currently AVM-GSL.

Pharmaceutical companies should:

- further improve information provided with veterinary medicines to ensure that key points on safe usage are clearly and simply presented, with support from regulatory bodies.
- prioritise development of a narrow spectrum product for lungworm, as opposed to combination products, to reduce the need for overtreatment.

Stakeholders should collaborate to:

- address the potential for resistance, taking lessons from previous work on antimicrobial resistance (AMR), including by encouraging reporting of suspected resistance to the VMD to support monitoring and further research.
- educate pet owners on the correct use of parasiticide products, how to prevent animals getting parasites, and how to check for them.

Introduction

Parasiticide products are commonly used in small animal medicine to prevent and treat various parasites, including fleas, ticks and worms. As well as preventing animal health and welfare problems, human health risks from associated zoonotic threats have to be considered.

There is increasing evidence from multiple sources that some parasiticides are contaminating the environment. There is evidence to suggest they are reaching rivers through wastewater from homes or other premises where animals are kept[1,2], or from animals entering waterways outdoors[3]. Parasiticides may also be excreted in urine[4] and faeces[5], and therefore deposited in gardens and open spaces, and absorbed into soil. Residues may also be found in pet fur and come into contact with wildlife[6], for example treated fur may be used by birds to line nests. As parasiticides can be harmful to a wide range of non-target species[7], and with even small doses potentially impacting large numbers of invertebrates[8], this could be highly detrimental to wildlife and ecosystems and in turn could impact on public health.

In the farm animal and equine sectors, there are concerns over high levels of resistance to parasiticide products. Whilst there is limited evidence for this threat in small animal medicine, maintaining the efficacy of these products in the future is important.

Companion animal parasiticide products come in various forms, including spot-on, oral, collar, spray-on, or injection treatments, and are used to treat a wide range of small animals, including wildlife. The way in which the medicines are used, and the relevant risk factors, differ with each host species, and most of the available data referenced in this position relates to cats and dogs. However, many of the recommendations will also be relevant for the treatment of rabbits and other small mammals. Whilst comparisons are made with the farm animal and equine sector, the risk of zoonoses for the small animal sector carries a distinct difference given the nature of companionship and the close proximity resulting from owners sharing living spaces with their pets, along with shared public spaces and parks. In addition, the zoonotic impact will be different for ectoparasites and endoparasites.

Veterinary professionals should always take a risk-based approach to prescribing medicines, including parasiticides, aiming to use parasiticides as little as possible but as much as necessary, depending on individual animal and owner circumstances. However, there are many knowledge gaps in relation to parasites and the use of parasiticide products, making that risk analysis difficult. Our position highlights these gaps and calls for more research to be undertaken. It is also designed to promote greater discussion of the concerns associated with the current use of these products and encourage responsible evidence-based approaches to prescribing them.

This statement will explore the background to the potential conflict that exists between the needs of animal health, human health and the health of the wider ecosystem. It is a true One-Health problem of immense complexity, and our understanding and position will develop as the evidence base grows. Given the unknown but potentially severe environmental impacts, there should be a more considered approach to the use of small animal parasiticides.

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[1] Perkins, R., et al. 2020. “Potential Role of Veterinary Flea Products in Widespread Pesticide Contamination of English Rivers.” *Science of the Total Environment* 755: 143560. https://doi.org/10.1016/j.scitotenv.2020.143560

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[3] Yoder, L. E., M. Egli, A. K. Richardson, A. Brooker, R. Perkins, C. T. Collins, and J. Waage. 2024. “Dog Swimming and Ectoparasiticide Water Contamination in Urban Conservation Areas: A Case Study on Hampstead Heath, London.” *Science of the Total Environment* 955: 176686. https://doi.org/10.1016/j.scitotenv.2024.176686.

[4] Veterinary Medicines Directorate (VMD) 2023. Summary of Product Characteristics: Bravecto 1,000 mg Chewable Tablets for Large Dogs (>20–40 kg). London: Department for Environment, Food & Rural Affairs. https://www.vmd.defra.gov.uk/productinformationdatabase/files/SPC_Documents/SPC_2158782.PDF

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[6] de Montaigu, C. T., G. Glauser, S. Guinchard, and D. Goulson. 2025. “High Prevalence of Veterinary Drugs in Bird’s Nests.” *Science of the Total Environment* 178439. https://doi.org/10.1016/j.scitotenv.2025.178439

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Parasite threats

Parasites are common in cats, dogs and other small companion animals, and are frequently categorised as:

- external or ectoparasites, including fleas, ticks, and mites
- internal or endoparasites, including tapeworms, roundworms, and protozoa

These parasites can cause direct animal health and welfare issues, including clinical disease, as well as acting as disease vectors. They can also spread to humans – a zoonotic risk.

Animal and human health risks

Some parasites can pose a potential threat to human health in terms of their zoonotic potential, particularly for very young, elderly, and immunosuppressed individuals. Zoonotic risks are increased by the fact that owners are often in very close contact with companion animals and share the same living areas. Fortunately, whilst some parasites such as ticks and fleas and their resulting diseases are relatively common in animals, prevalence of zoonoses appears to be rare in the UK. However, as most of these diseases and zoonoses are not notifiable and the symptoms in humans are sometimes vague, they are often not tested for, so the true prevalence is difficult to ascertain. It is also important to remember humans can be directly infected by parasites from environmental sources, so prophylactic treatment of pets may not greatly reduce the incidence of some diseases in humans. Current estimates, global surveillance, and further research are needed to develop our understanding of the risks to human health and better quantify the impacts.

Ectoparasites

Ectoparasites can:

- cause skin lesions, which may lead to secondary infections
- induce immune responses, which may lead to potentially severe or debilitating allergic reactions
- act as a vector for the transmission of pathogens, which may cause disease
- cause a nuisance to the animal, such as itching and scratching, directly affecting their welfare
- cause anaemia due to blood-feeding from intense burdens, especially in young or debilitated animals
- in the absence of effective treatment, on rare occasions lead to death of the animal, a particular risk in young animals.

Fleas

Fleas (*Ctenocephalides spp.*) are common throughout Europe and are significant vectors of various infections[9]. Their bites cause physical irritation, and can lead to flea allergic dermatitis, which is a serious concern for animal health and welfare[10].

Fleas produce minor skin irritation in humans and also act as vectors for zoonotic diseases, including *Bartonella henselae* and *Rickettsia felis* Some species of *Bartonella* can lead to serious human health conditions such as fever, skin lesions, haemolytic anaemia, immunosuppression, lymph node enlargement, and encephalopathy[11,12], particularly for those who are immunocompromised. *R. felis* is also known to have negative impacts on human health[13], inducing fever, rash and neurological signs,

[9] ESCCAP. n.d. "Ectoparasites: Insects." European Scientific Counsel Companion Animal Parasites. Accessed August 15, 2025. https://www.esccap.org/parasites/Ectoparasites+Insects/2/
[10] Elsheikha, Hany M. 2012. "Flea Allergy Dermatitis: The Continued Challenge." The Veterinary Nurse 3 (6): 350–56. https://doi.org/10.12968/vetn.2012.3.6.350
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[12] Tsuneoka, Hidehiro, Masashi Yanagihara, Shigeki Otani, Yoshihiro Katayama, Hiroshi Fujinami, et al. 2010. "A First Japanese Case of *Bartonella henselae*-Induced Endocarditis Diagnosed by Prolonged Culture of a Specimen from the Excised Valve." *Diagnostic Microbiology and Infectious Disease* 68: 174–76. https://doi.org/10.1016/j.diagmicrobio.2010.05.009
[13] Zavala-Velázquez, Jorge E., José A. Ruiz-Sosa, Ricardo A. Sánchez-Elias, Gustavo Becerra-Carmona, and David H. Walker. 2000. "*Rickettsia felis* Rickettsiosis in Yucatan." *The Lancet* 356 (9235): 1079–80. https://doi.org/10.1016/S0140-6736(00)02735-5

though its full impacts are not well understood. The tapeworm *Dipylidium caninum*, which is involved in the life cycle of the flea, is also zoonotic[14]. Non-zoonotic diseases spread by fleas, such as *Mycoplasma haemofelis,* are also of relevance for pets. Although cases of diseases caused by *Bartonella* and *Rickettsia* appear to be rare, neither are notifiable nor routinely tested for, so it is possible that the prevalence is higher than currently thought. Further studies should be undertaken to understand the true prevalence of these diseases in both the animal and human population.

Once established, flea populations can be difficult to eradicate from a household, with some evidence suggesting it can take up to three months to do so[15], although newer generations of parasiticides, such as isoxazolines, may provide swifter resolutions[16]. The exact prevalence of fleas on cats and dogs in the UK is unclear but significant, with populations varying considerably from year to year[17]. There are consistent seasonal differences, with a tendency to increase from spring to autumn[18,19,20] but fleas are present and continue to pose a risk even in colder months.

Data suggest there may be an increased risk for flea infestation in the south of the UK compared to the north as a result of climatic factors[21], and for pets coming from areas of higher social deprivation[22], however there is currently a lack of clear research into other factors which increase or decrease the risk of an animal having fleas, such as lifestyle. This makes it difficult to completely prevent fleas without control measures, including those directed at the environment.

Ticks

A variety of tick species exist within the British Isles, primarily *Ixodes ricinus* but also *I. hexagonus* (hedgehog tick) with *Dermacentor reticularis* present in some areas. Other tick species may also pose a threat if imported on dogs travelling into the country, even if climatic conditions are not currently favourable for them to establish in the UK eg *Rhipicephalus sanguineus (*brown dog tick)[23]. Ticks rarely cause significant problems through their physical attachment but are an important vector for a number of diseases of animals and humans. Previous cases of canine babesiosis have highlighted the risk of vector-borne disease in travelling animals and the risk of establishment in the UK tick population[24]. Human cases of Lyme disease (*Borrelia burgdorferi* and rarely, *Borrelia mayonii* infection)[25], *Babesia canis* and *Ehrlichia spp.* infections have risen in recent years although are only occasionally seen in cats and dogs. Incidence of flavivirus related illness in dogs is also increasing and is an area of concern[26,27]. Probable UK-acquired cases of tick-borne encephalitis (TBE) in

[14] Centers for Disease Control and Prevention (CDC). n.d. "Dipylidium." CDC DPDx. Accessed August 15, 2025. https://www.cdc.gov/dpdx/dipylidium/index.html
[15] Dryden, M. W. 2009. "How You and Your Clients Can Win the Flea Control Battle." *Veterinary Medicine Supplement*, March, 17–26.
[16] Perkins, R. 2025. "A One Health Perspective on Pet Parasiticides." *BSAVA Companion*, February, 22–26. https://doi.org/10.22233/20412495.0225.22.
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[18] Ibid.
[19] Cooper, A. R., E. Nixon, H. Rose Vineer, S. Abdullah, H. Newbury, and R. Wall. 2020. "Fleas Infesting Cats and Dogs in Great Britain: Spatial Distribution of Infestation Risk and Its Relation to Treatment." *Medical and Veterinary Entomology* 34 (4): 452–58. https://doi.org/10.1111/mve.12462
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[21] McGarry, "Update on Fleas."
[22] Cooper et al., "Fleas Infesting Cats and Dogs," 452–58.
[23] Hansford, K. M., L. P. Phipps, B. Cull, M. E. Pietzsch, and J. M. Medlock. 2017. "Rhipicephalus sanguineus Importation into the UK: Surveillance, Risk, Public Health Awareness and One Health Response." *Veterinary Record* 180 (5): 119. https://doi.org/10.1136/vr.104061
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[26] Dagleish, M., M. Cartney, B. Watson, B. Wells, and M. Rocchi. 2024. "Increased Incidence of Dogs with Fatal Louping Ill Virus Infection." *Veterinary Record* 194: 155–56. https://doi.org/10.1002/vetr.3979
[27] Gonzalo-Nadal, V., A. Kohl, M. Rocchi, B. Brennan, J. Hughes, J. Nichols, et al. 2023. "Suspected Tick-Borne Flavivirus Meningoencephalomyelitis in Dogs from the UK: Six Cases (2021)." *Journal of Small Animal Practice* 65: 132–43. https://doi.org/10.1111/jsap.13682

humans and dogs have been rarely detected in the UK[28,29], though the risk is still considered to be very low for the general human population[30].

Various lifestyle factors and geography are known to influence the risk of tick exposure, including passing through long grasses[31],[32]. This knowledge helps enable a more risk-based approach to be taken to prevention and treatment, although the seasonal pattern of emergence is changing with associated climate changes, and risk of exposure will increase with more favourable climates[33].

Mites

Mites also commonly cause animal health and welfare concerns, including mange. Most are host specific, though *Sarcoptes scabiei* mites cause sarcoptic mange in dogs and scabies in humans, which is extremely uncomfortable. Other mites include *Demodex* mites, which are host-species specific, and ear mites (eg *Otodectes cynotis*), which can cross-infect other species. *Cheyletiella* mites are common in small rodents and rabbits, can infest dogs and cats, and can bite humans, and Harvest mites (*Trombicula autumnalis*) are parasitic in the larvae stage in certain geographical locations[34,35].

Lice

Various species of lice can occur on all animals. These are host specific and rarely cause or carry disease for small companion animals.

Recommendation 1: Existing information regarding risks factors which contribute to common ectoparasite infestations should be collated, and further research undertaken to fill knowledge gaps. Academic institutions and Government have a role to play in this.

Recommendation 2: Research should be carried out with a one health approach in mind and collaboration encouraged between the medical public health experts and the veterinary professions. Research should include identifying the impacts of parasite-borne disease such as Bartonellosis, Rickettsioses, and Lyme disease on human health, and quantifying the true prevalence of these in both the animal and human population.

Endoparasites

There are various types of helminths (worms) which affect cat and dog species in the UK. Some are not of clinical significance most of the time, but others can result in clinical disease and possibly lead to death. Some are also potentially zoonotic.

The most common types of worms are detailed below.

Roundworms

Intestinal roundworms (*Toxocara* and *Toxoscaris* spp.) can infect cats, dogs, humans and other species. In animals, roundworm infections can lead to clinical signs such as diarrhoea, vomiting and

[28] UK Government. n.d. "Rare Tick-Borne Infections Diagnosed in England." Accessed August 15, 2025. https://www.gov.uk/government/news/rare-tick-borne-infections-diagnosed-in-england.
[29] Gonzalo-Nadal, V., A. Kohl, M. Rocchi, B. Brennan, J. Hughes, J. Nichols, A. Da Silva Filipe, J. I. Dunlop, M. Fares, J. J. Clark, R. Tandavanitj, A. H. Patel, A. Cloquell-Miro, J. Bongers, J. Deacon, A. Kaczmarska, C. Stalin, T. Liatis, J. Irving, and R. Gutierrez-Quintana. 2024. "Suspected Tick-Borne Flavivirus Meningoencephalomyelitis in Dogs from the UK: Six Cases (2021)." *Journal of Small Animal Practice* 65: 132–43. https://doi.org/10.1111/jsap.13682.
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[34] Keay, G. 1937. "The Ecology of the Harvest Mite (Trombicula autumnalis) in the British Isles." Journal of Animal Ecology 6 (1): 23–35. https://doi.org/10.2307/1056.
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weight loss, especially in young or debilitated animals. Although there are risk factors that may suggest an animal is more likely to be infected and shedding eggs, eg during pregnancy, and in young puppies and kittens, it is difficult to predict when a cat or dog is likely to be shedding roundworm eggs, and they can be shed intermittently[36]. Roundworm infections are considered to be common in small animals, but there is limited published evidence of prevalence in the UK[37]. A 2022 soil study found Toxocara-type eggs in a high proportion of parks and recreational areas across the UK and Ireland[38], but further quantitative estimates of the relative sources of *Toxocara* spp. eggs in given localities would help to understand the risks roundworms pose[39].

In humans, *Toxocara* infection can, in rare cases, cause symptoms including breathing difficulties, abdominal pain, and blurred or cloudy vision, with young children and the immune-suppressed being most at risk[40]. There is also some preliminary evidence suggesting association between *Toxocara* seropositivity and neuropsychiatric function such as schizophrenia and epilepsy[41]. Cases appear to be rare, however it is possible that many may go unnoticed as symptoms are attributed to other causes[42]. Human infection comes from exposure to *Toxocara* spp. eggs within the environment, so responsible collection and disposal of cat and dog faeces is vital to reduce infection. While this can be achieved with most dogs, it is difficult with cats that have outdoor access. Sensible personal hygiene measures such as hand washing when gardening is an effective control.

Tapeworms

Tapeworms may cause dogs to become itchy around the anus, and may lead to sickness or diarrhoea, but do not usually pose a severe health risk. Tapeworms also do not pose a significant health risk to cats, unless they are debilitated or have other diseases. In both cats and dogs, owners are likely to be worried or repulsed if they see the segments (*Dipylidium caninum)* in faeces, and therefore seek treatment.

Zoonotic concerns arise when humans become the intermediate host for *Echinococcus granulosus,* which can lead to hydatid disease. This can be serious for livestock and for human health and has been the subject of specific public health programmes in Wales[43]. Hydatid disease has so far been considered rare in the UK, being prevalent only in certain geographical areas[44], but new research may suggest a wider distribution beyond known prevalence hotspots[45]. Further introduction of the disease is limited by the requirement to treat dogs with praziquantel or a similar product prior to entry to the UK[46], which also prevents introduction of *Echinococcus multiloccularis,* another tapeworm species of zoonotic concern[47].

The risk factors for tapeworm are clearer, eg having fleas and consuming infected prey or fallen livestock, meaning that not all animals need regular treatment to control these parasites.

Lungworm

Lungworm in the UK (*Angiostrongylus vasorum)* is not zoonotic[48], but can cause serious problems for dogs, including bleeding and coughing. The main bleeding problems are largely due to impairment of

[36] Overgaauw, P. A. M., and F. Van Knapen. 2013. "Veterinary and Public Health Aspects of Toxocara spp." *Veterinary Parasitology* 193: 398–403. https://doi.org/10.1016/j.vetpar.2012.12.035

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[42] Patterson, J. 2023. "Toxocarosis in Humans: How Much of a Problem Is It in the UK?" *Drug and Therapeutics Bulletin* 61: 7–11. https://doi.org/10.1136/dtb.2022.000052

[43] Welsh Government. n.d. "Hydatid Disease Poster." Accessed August 15, 2025. https://gov.wales/hydatid-disease-poster.

[44] Health and Safety Executive (HSE). n.d. "Hydatid Disease." Accessed August 15, 2025. https://www.hse.gov.uk/agriculture/assets/docs/hydatid-disease.pdf

[45] Collins, M. 2019. "The HyData Project: Epidemiology of Canine Echinococcosis and Livestock Hydatidosis in the United Kingdom." *PhD diss., University of Liverpool*. https://livrepository.liverpool.ac.uk/3089373/1/980455366_Oct2019.pdf.

[46] UK Government. n.d. "Tapeworm Treatment for Dogs." Accessed August 15, 2025. https://www.gov.uk/bring-pet-to-great-britain/tapeworm-treatment-dogs.

[47] UK Government. n.d. "Echinococcus multilocularis: How to Spot and Report the Disease." Accessed August 15, 2025. https://www.gov.uk/guidance/echinococcus-multilocularis-how-to-spot-and-report-the-disease

[48] Some *Angiostronylus spp* in other countries can cause serious zoonotic illness, particularly *Angiostrongylus cantonensis*

clotting that leads to a wide variety of secondary problems including neurological problems (due to bleeding the brain/spinal cord), haemorrhagic pneumonia, extensive spontaneous subcutaneous bruising, and increased risk of bleeding during surgery (including neutering). Animals can be asymptomatic until seriously ill, which makes testing and treatment difficult. Geographic factors, and consuming slugs, snails, or their slime on grass and other vegetation can make a significant difference to the risk levels and form the basis for preventative measures.

Heartworm
Heartworm (*Dirofilaria immitis*) can also cause serious illness or death in cats and dogs. It is rarely identified in the UK, but can be found in imported animals and can be a risk to animals travelling abroad. However, a combination of climate change and the potential spread of invasive mosquito species may change this scenario, exposing the UK to the risk of introducing heartworm and other filarial infections such as *Dirofilaria repens* (skin worm), which is also potentially zoonotic[49].

Eye worm
Eye worm (*Thelazia callipaeda)* is not endemic in the UK but has been diagnosed in imported dogs. Its intermediate host is the fruit fly, which has been found in the UK. It is capable of infecting a wide range of mammalian hosts including dogs, cats and humans, therefore may pose a potential threat to the UK dog population[50].

Recommendation 3: Existing information regarding the risks to animal and human health of common endoparasites should be collated, and further research undertaken to fill knowledge gaps. Academic institutions and Government have a role to play in this, and it should be carried out with a one health approach in mind, with animal and public health experts involved.

Risks of routine use of parasiticides

In the UK, both therapeutic and prophylactic treatment is given, with the aim of improving small animal welfare and protecting public health.

To reduce the animal and human health and animal welfare risks associated with parasites, a variety of compounds have historically been used to treat parasites. Many of these were of doubtful efficacy, until the 1940's when more effective organochloride and organophosphate products were developed. These were associated with significant environmental toxicity, resulting in many products being banned.

The development of "spot-on" products in the 1990s made applying parasiticides to animals easier, so the use of parasiticides has grown considerably[51]. In part this growth is also associated with comprehensive health-care packages based on routine and regular parasite control. The more recent development of parasiticides with longer duration or combination products, spot-on, injectable and oral, has further fuelled their use.

Given the many health and welfare concerns associated with parasites, routine use of parasiticide treatments is now widespread. However, this does not come without risks, and given the importance of being able to use these products, it is advisable to take note of these concerns now and to use them responsibly, to make sure they continue to remain available and effective in the future, whilst being used in a way that minimises harm to the environment.

[49] Panarese, R., R. Moore, A. P. Page, M. McDonald, E. MacDonald, and W. Weir. 2023. "The Long-Distance Relationship between Dirofilaria and the UK: Case Report and Literature Review." *Frontiers in Veterinary Science*, Section Parasitology, April 2023, Volume 10. https://doi.org/10.3389/fvets.2023.1128188
[50] Graham-Brown, J., P. Gilmore, V. Colella, L. Moss, C. Dixon, M. Andrews, P. Arbeid, J. Barber, D. Timofte, J. McGarry, D. Otranto, and D. Williams. 2017. "Three Cases of Imported Eyeworm Infection in Dogs: A New Threat for the United Kingdom." *Veterinary Record* 181. https://doi.org/10.1136/vr.104378.
[51] Rust, M. K. 2020. "Recent Advancements in the Control of Cat Fleas." *Insects* 11 (10): 668. https://doi.org/10.3390/insects11100668

Impact of parasiticides on non-target invertebrates

While modern parasiticides are more selective for invertebrates than previous ones, they do not discriminate between target and non-target invertebrates, so they are equally capable of killing bees, aquatic insects, and other invertebrate species that they come into contact with. They contain active substances used in pesticides (ie a substance intended for controlling pests), There is a widely documented fall in wild aquatic and terrestrial invertebrate populations, and clear evidence that use of pesticides from a wide variety of possible sources is contributing[52,53]. Invertebrates are a vital part of ecosystems, including food webs, as well as providing ecosystem resources for pollination and pest control, so minimising the threats to these species is therefore very important in a local and global context.

Some of the most commonly used parasiticide products that are used in companion animals which are neurotoxic to other species contain fipronil and imidacloprid[54,55] either alone or in combination with other parasiticides. These products are effective because of their potent toxicity even at low dose rates towards a wide range of invertebrates[56], their persistence and their water solubility[57]. These same properties also increase the environmental hazards associated with their use. Other parasiticides products are also used frequently and could have similar impacts, but data for these two products is more readily available.

Imidacloprid belongs to a class of insecticides called neonicotinoids, for which the detrimental effects in the environment are well known[58]. Fipronil is not a neonicotinoid, but acts in a similar way, also damaging an insect's central nervous system to cause paralysis and death. In sub-lethal quantities, these chemicals have also been shown to impair an insect's ability to navigate, harm the immune system and reduce fecundity, all of which can lead to populations declining[59]. Imidacloprid has a median lethal dose (LD50)[60] of just 3.6ng/bee and fipronil 2.5ng/bee[61], both more than 7,000 times more toxic than DDT, a chemical which became infamous for its environmental impacts and was banned in the UK in 1984. This means that one spot-on treatment for a medium sized dog contains enough active ingredient to kill 60 million bees[62].

Neonicotinoids were once widely used in agriculture, but in response to growing evidence of the harm they were causing to insect populations, the EU banned their use on flowering crops in 2013, and eventually banned all agricultural uses on outdoor crops in 2018. Fipronil was similarly banned in 2017. A 2020 study of English rivers[63] found fipronil and imidacloprid at levels exceeding their chronic toxicity limits, and suggested that these pollutants were likely to be coming from household drains rather than agricultural sources. The study indicated a high environmental risk to aquatic ecosystems from the measured levels of fiproles (fipronil and some of its degradation products), and a moderate risk from the levels of imidacloprid. The level of contribution from pet parasiticides has been questioned[64], but attempts to model the levels have been based on the assumption imidacloprid is

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[52] Sánchez-Bayo, F., and K. Wyckhuys. 2019. "Worldwide Decline of the Entomofauna: A Review of Its Drivers." *Biological Conservation* 232: 8–27. https://doi.org/10.1016/j.biocon.2019.01.020

[53] Wagner, D. L., et al. 2021. "Insect Decline in the Anthropocene: Death by a Thousand Cuts." *Proceedings of the National Academy of Sciences* 118 (2). https://doi.org/10.1073/pnas.2023989118.

[54] Rust, M. K., et al. 2018. "International Program to Monitor Cat Flea Populations for Susceptibility to Imidacloprid." *Journal of Medical Entomology* 55 (5): 1245–53. https://doi.org/10.1093/jme/tjy092.

[55] Tyler, S., C. Roberts, A. Foster, N. Barnard, and J. K. Murray. 2019. "Owner-Reported Flea Treatment Measures and Skin Disease in Cats." Journal of Feline Medicine and Surgery 21, no. 4: 282–285. https://doi.org/10.1177/1098612X18773911.

[56] Pisa, et al., "Effects of Neonicotinoids and Fipronil on Non-Target Invertebrates."

[57] Simon-Delso, N., et al. 2015. "Systemic Insecticides (Neonicotinoids and Fipronil): Trends, Uses, Mode of Action and Metabolites." *Environmental Science and Pollution Research* 22 (1): 5–34. https://doi.org/10.1007/s11356-014-3470-y.

[58] eg European Commission. n.d. "Neonicotinoids Factsheet." Accessed August 15, 2025. https://ec.europa.eu/food/plants/pesticides/approval-active-substances/renewal-approval/neonicotinoids_en.

[59] Pisa, L., D. Goulson, E. C. Yang, D. Gibbons, F. Sánchez-Bayo, E. Mitchell, and J. M. Bonmatin. 2017. "An Update of the Worldwide Integrated Assessment (WIA) on Systemic Insecticides. Part 2: Impacts on Organisms and Ecosystems." *Environmental Science and Pollution Research*: 1–49. https://doi.org/10.1007/s11356-017-0341-3

[60] Toxicity of insecticides is measured as LD50s, the amount required to cause the death of 50% of a group of test animals. LD stands for lethal dose.

[61] Yasuda, et al., "Insecticide Susceptibility in Asian Honeybees"

[62] Carrington, D. 2020. "Pet Flea Treatments Poisoning Rivers across England, Scientists Find." *The Guardian*, November 17, 2020. https://www.theguardian.com/environment/2020/nov/17/pet-flea-treatments-poisoning-rivers-across-england-scientists-find.

[63] Perkins et al., "Potential Role of Veterinary Flea Products in Widespread Pesticide Contamination of English Rivers."

[64] Anthe, M., B. Valles-Ebeling, J. Achtenhagen, M. Arenz-Leufen, J. Atkinson, M. Starp, and C. Corsing. 2020. "Development of an Aquatic Exposure Assessment Model for Imidacloprid in Sewage Treatment Plant Discharges Arising from Use of Veterinary Medicinal Products." *Environmental Sciences Europe* 32: 147. https://doi.org/10.1186/s12302-020-00424-4

only released into the environment for 24 hours after application[65], whereas further studies have shown it can be released for at least 28 days after application[66]. Additional research is needed to fully understand the exact source of contamination and toxicity levels of these and other potentially harmful parasiticides used in veterinary medicines.

Furthermore, little is known about the impacts of multiple parasiticides mixing in the natural environment, making evaluating the effects on non-target organisms a major challenge to scientists. In the environment these chemicals can co-occur with other contaminants such as fertilisers, metals and other pharmaceuticals, and products containing multiple chemicals are now commonly used to treat several parasites at once. Research has shown that in aquatic organisms, neonicotinoid mixtures have combined effects that cannot be predicted by simple additivity[67], and that even once some chemicals degrade, they remain as toxic as the original compound[68,69]. A systemic literature review carried out in 2022 found that extensive evidence exists of ecotoxicity for imidacloprid and fipronil, but most research focuses on exposure via agricultural rather than companion animal parasiticide use, and in addition little to no evidence exists for the ecotoxicity of other pet parasiticides[70]. The focus of further research should be on the knowledge gaps identified.

Impact of pet parasiticides on human health

As part of the licensing process, all veterinary medicines marketed in the UK must undergo independent scientific assessment by the Veterinary Medicines Directorate (VMD), taking into consideration the product's quality, efficacy, and safety for pets and people alongside environmental impact. While chronic low-level exposure to agricultural pesticides, most notably organophosphates and organochlorides[71], has been linked to health concerns, these compounds are not used in modern pet parasiticides, and currently there is little evidence for potential effects of pet parasiticides on human health.

Studies have shown an association between fipronil exposure and diabetes and hypertension[72], and there is evidence that fipronil sulfone (a metabolite and environmental degradation product of fipronil) may be associated with adverse outcomes in newborns[73], including low birth weight. However, there is no current evidence that these harms could be caused by pet parasiticides, and the main toxicity route is considered to be oral, whereas as human exposure to pet parasiticides would mainly be dermal.

It is also important to consider that fipronil and isoxazolines, together with other pesticides, are classified as per- and poly- fluoroalkyl substances (PFAS), which are known as 'forever chemicals' due to their persistence and capacity to accumulate in the environment[74]. Further research is needed to understand the potential implications of pet parasiticide contamination on the environment and on human health.

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[65] Perkins, R., M. Whitehead, and D. Goulson. 2021. "Dead in the Water: Comment on 'Development of an Aquatic Exposure Assessment Model for Imidacloprid in Sewage Treatment Plant Discharges Arising from Use of Veterinary Medicinal Products.'" *Environmental Sciences Europe* 33: 88. https://doi.org/10.1186/s12302-021-00533-8

[66] Perkins et al., "Down-the-Drain Pathways"

[67] Maloney, E. M., C. A. Morrissey, J. V. Headley, K. M. Peru, and K. Liber. 2017. "Cumulative Toxicity of Neonicotinoid Insecticide Mixtures to Chironomus dilutus under Acute Exposure Scenarios." *Environmental Toxicology and Chemistry* 36: 3091–3101. https://doi.org/10.1002/etc.3878

[68] Suchail, S., L. Debrauwer, and L. P. Belzunces. 2004. "Metabolism of Imidacloprid in Apis mellifera." *Pest Management Science* 60 (3): 291–96. https://doi.org/10.1002/ps.772

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[70] Wells, C., and C. T. Collins. 2022. "A Rapid Evidence Assessment of the Potential Risk to the Environment Presented by Active Ingredients in the UK's Most Commonly Sold Companion Animal Parasiticides." *Environmental Science and Pollution Research* 29 (30): 45070–88. https://doi.org/10.1007/s11356-022-20204-2

[71] Mostafalou, S., and M. Abdollahi. 2017. "Pesticides: An Update of Human Exposure and Toxicity." *Archives of Toxicology* 91: 549–99. https://doi.org/10.1007/s00204-016-1849-x.

[72] Peng, F.-J., C.-A. Lin, R. Wada, B. Bodinier, A. Iglesias-González, P. Palazzi, S. Streel, M. Guillaume, D. Vuckovic, M. Chadeau-Hyam, and B. M. R. Appenzeller. 2024. "Association of Hair Polychlorinated Biphenyls and Multiclass Pesticides with Obesity, Diabetes, Hypertension and Dyslipidemia in NESCAV Study." *Journal of Hazardous Materials* 461. https://doi.org/10.1016/j.jhazmat.2023.132637

[73] Kim, Y. A., Y. S. Yoon, H. S. Kim, S. J. Jeon, E. Cole, J. Lee, Y. Kho, and Y. H. Cho. 2019. "Distribution of Fipronil in Humans, and Adverse Health Outcomes of In Utero Fipronil Sulfone Exposure in Newborns." *International Journal of Hygiene and Environmental Health* 222 (3): 524–32. https://doi.org/10.1016/j.ijheh.2019.01.009

[74] Perkins, "A One Health Perspective on Pet Parasiticides."

Recommendation 4: Concerns about the possible environmental impacts of small animal parasiticide products should be taken seriously by the veterinary profession, pharmaceutical industry, and animal owners. Veterinary organisations, such as BVA, BSAVA and BVZS, have a role to play in proactively promoting discussion and highlighting these challenges.

Recommendation 5: Research should be conducted into any knowledge gaps relating to source, prevalence and impacts of veterinary parasiticide products in the natural environment. This should include all commonly used parasiticides, in addition to fipronil and imidacloprid, and consider the impacts of long acting and combination products.

Use and spread of products

Parasiticides can be administered directly onto the skin (spot-ons), orally, , or by injection, depending on the product and target parasite, and may be either topically or systemically acting. The chemicals in topical products, including most spot-on treatments, spread over the surface of the skin[75], where they are absorbed into the superficial epidermis and sebaceous glands, and slowly released via hair follicles[76,77]. This means that the parasiticides from these products can disperse widely throughout the household environment through pet hair, shedding skin and direct transfer after application[78,79], and they can then persist and accumulate in the animal's environment[80]. These products can also enter household wastewater when pets or their bedding are washed, as well as other sources such as hand washing after touching the animal's fur or applying the products. They may also enter the waterways directly if animals swim in them after treatment. Both fipronil and imidacloprid compounds have been detected in urban dog swimming ponds in the UK[81]. Although data sheet advice is usually to avoid dogs bathing and swimming for a few days after treatment, imidacloprid and fipronil have been detected up to 28 days post product application in wash-off samples from bathing dogs, owner handwashing and dog bed washing[82], as well as in the water after a simulated swimming situation[83]. Potentially significant quantities of active ingredients from small animal parasiticide products may be entering waterways via household drains[84,85].

Systemic products, including those given orally, or by injection, are absorbed into the body, so are less likely to enter the environment through swimming and washing, but the product is likely to be excreted to some extent in the faeces or urine[86] so can still reach the environment and potentially cause significant harm[87]. Hand washing after treatment, inappropriate disposal of packaging and poor handling of faeces and litter trays could also lead to environmental contamination from these products. Isoxazolines such as afoxolaner and fluralaner, products which can be given orally, have been found in pets' fur and urine after treatment[88] which may provide a route of environmental contamination through swimming or bathing as well as through fur shed into the environment and urination.

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[75] Dyk, M. B., et al. 2012. "Fate and Distribution of Fipronil on Companion Animals and in Their Indoor Residence Following Spot-On Flea Treatments." *Journal of Environmental Science and Health*, Part B. https://doi.org/10.1080/03601234.2012.706548.

[76] Cochet, P., et al. 1997. "Skin Distribution of Fipronil by Microautoradiography Following Topical Administration to the Beagle Dog." *European Journal of Drug Metabolism and Pharmacokinetics* 22 (3): 211–16. https://doi.org/10.1007/BF03189809.

[77] Chopade, H., et al. 2010. "Skin Distribution of Imidacloprid by Microautoradiography after Topical Administration to Beagle Dogs." *Veterinary Therapeutics* 11 (4): E1–10. http://www.ncbi.nlm.nih.gov/pubmed/21308663.

[78] Craig, M. S., et al. 2005. "Human Exposure to Imidacloprid from Dogs Treated with Advantage®." Toxicology Mechanisms and Methods 15 (4): 287–91. https://doi.org/10.1080/15376520590968842.

[79] Dyk et al., "Fate and Distribution of Fipronil."

[80] Jacobs, D. E., et al. 2001. "Accumulation and Persistence of Flea Larvicidal Activity in the Immediate Environment of Cats Treated with Imidacloprid." *Medical and Veterinary Entomology* 15 (3): 342–45. https://doi.org/10.1046/j.0269-283X.2001.00320.x.

[81] Yoder et al., "Dog Swimming and Ectoparasiticide Water Contamination in Urban Conservation Areas"

[82] Perkins et al., "Down-the-Drain Pathways"

[83] Perkins, R., G. Glauser, and D. Goulson. 2025. "Swimming Emissions from Dogs Treated with Spot-On Fipronil or Imidacloprid: Assessing the Environmental Risk." *Veterinary Record* 2025: e5560. https://doi.org/10.1002/vetr.5560.

[84] Perkins et al., "Potential Role of Veterinary Flea Products in Widespread Pesticide Contamination of English Rivers."

[85] Perkins et al., "Down-the-Drain Pathways"

[86] Veterinary Medicines Directorate, "Bravecto SPC"

[87] Webb, L., D. McCracken, D. Beaumont, and R. Nager. 2006. Conservation Considerations Regarding the Use of Avermectin Animal Health Products. RSPB Scotland and SAC. https://knepp.co.uk/wp-content/uploads/2022/10/avermectin_advice_note_tcm5-1124121.pdf

[88] Diepens, N. J., D. Belgers, L. Buijse, and I. Roessink. 2023. "Pet Dogs Transfer Veterinary Medicines to the Environment." *Science of the Total Environment* 858: 159550. https://doi.org/10.1016/j.scitotenv.2022.159550

Fluralaner has been detected in zoo carnivore faecal samples several weeks after administration[89] and several different types of pet parasiticides have been detected in songbirds' nests[90].

All uses of parasiticide products carry potential risks to the environment and must therefore be carefully considered. Further research is needed to confirm potential pathways of environmental contamination and identify an alternative sources. In the meantime, given the potential for serious harm to natural invertebrate population, a proportionate and targeted approach to treatment should be taken when using parasiticides.

Some spread of these chemicals can be controlled through correct usage. Current advice on using treatments includes:

- ensuring clients use the correct dosage, can apply a product correctly, and avoid hand contamination and spillage.
- refraining from washing an animal or allowing them to swim for a certain number of days after treatment. As a minimum, owners should follow the advice on the data sheet, although it should be noted that recent evidence has shown topical parasiticides may be available for release into the environment for at least 28 days after application[91]. Therefore, where reasonable and possible, products that are administered topically or through a collar should not be selected if pets swim, are having hydrotherapy, or are bathed.
- disposing of unused products, packaging, faeces and used cat litter trays responsibly and disposing of pet hair so there is no environmental and wild bird risk.
- not applying topical products prior to a grooming appointment which will involve bathing the dog.

It is possible that this advice is not strictly followed, especially when animal owners have purchased treatments without professional advice. Many of those products classified as AVM-GSL are readily available in pet shops, supermarkets and online and can be purchased without professional advice on their suitable usage. Ultimately, subject to confirming a sound evidence-base and situational assessment, we'd like to see these AVM-GSL products reclassified to either NFA-VPS or prescription only (POM-V) to ensure suitable advice can be given by either a Suitably Qualified Person (SQP) or vet. The training and code of practice for SQPs should be updated to ensure environmental impacts are taken into consideration when products are recommended to owners. In the meantime, clearer communication from professionals who provide the treatments, and on the product packaging for those on general sale, may help to ensure owners are aware of the advice and the risks associated with not following this. There has been some work to improve communication in recent years, including from BVA and NOAH, but more work is needed to ensure clear consistent messages reach the public. It may also be helpful to employ behavioural science techniques to encourage owners to act responsibly, such as the EAST (Easy, Attractive, Social and Timely) framework developed by the Behavioural Insights Team[92].

There is evidence to show that the majority of cat and especially dog owners purchase parasiticide products from veterinary practices[93,94], but little is known about how well owners follow the advice provided, or how safely they use parasiticide products at home, especially when purchased without professional advice. A 2023 UK survey found that although spot-on treated dogs were reported to swim and be bathed less frequently than non-spot-on treated dogs, a third were still reported to swim at least monthly[95]. How the packaging and any unused products are disposed of in homes could also be having an impact, as owners are unlikely to bring the medicines to their vet for safe disposal. Further insights into how these products are being used, and how they or their packaging are disposed of needs to be developed in order to understand how this might impact on the environment

[89] Berny, et al., "Fecal Elimination of Fluralaner in Different Carnivore Species after Oral Administration".
[90] de Montaigu, et al., "High Prevalence of Veterinary Drugs in Bird's Nests."
[91] Diepens et al., "Pet Dogs Transfer Veterinary Medicines."
[92] Behavioural Insights Team. 2014. *EAST: Four Simple Ways to Apply Behavioural Insights*. https://www.bi.team/wp-content/uploads/2015/07/BIT-Publication-EAST_FA_WEB.pdf
[93] Berny et al., "Fecal Elimination of Fluralaner."
[94] PDSA. 2024. *Animal Wellbeing (PAW) Report 2024*. https://www.pdsa.org.uk/what-we-do/pdsa-animal-wellbeing-report/paw-report-2024
[95] Perkins, R., and D. Goulson. 2023. "To Flea or Not to Flea: Survey of UK Companion Animal Ectoparasiticide Usage and Activities Affecting Pathways to the Environment." PeerJ 11: e15561. https://peerj.com/articles/15561/

and to help focus the advice provided. Any criteria applied to disposal of packaging needs to be consistent whether the product is bought from a veterinary practice, an SQP, or off the shelf.

Recommendation 6: Being mindful of the potential for serious harm to natural invertebrate populations, a proportionate and targeted approach to treatment should be taken when using parasiticides. Where possible and reasonable, topical products should not be used on pets which are likely to swim or be bathed.

Recommendation 7: Further research should be conducted into the sources of parasiticide pollution in the environment.

Recommendation 8: Existing data should be collated and where gaps exist, research should be carried out into how companion animal parasiticide products are bought, used, and disposed of, and evidence on how they may be contaminating the environment should be developed. Academic institutions and Government have a role to play in this.

Recommendation 9: Until products can be re-classified, consumers should be educated on the correct use of parasiticide products. Veterinary professionals, product manufacturers, and suppliers all have a role to play in making sure this information reaches the user.

Volume and frequency of usage

Estimates for the number of pets in the UK vary but are in the region of 9.66 million dogs and 10.77 million cats, with around 80% of each receiving flea treatment[96]. Although the actual frequency of use is unknown, many topical spot-on products are licensed for monthly use, and routine prophylactic parasite treatment is widely recommended by product manufacturers and vets[97], with many animals receiving year-round treatment as part of their healthcare plans[98].

Total sales data from the Veterinary Medicines Directorate (VMD) shows that 27,471 kg of fipronil and 33,036 kg of imidacloprid have been sold as flea treatments since the products were first authorised as veterinary medicines in 1994 and 1997, respectively[99,100]. VMD sales data in 2017 shows that 4,218kg of imidacloprid and 1,882kg of fipronil was sold in the UK that year[101], although accurate annual sales data for these products are not currently available. Additional monitoring from the VMD on sales and usage of parasiticides, in line with that for antimicrobials, would be helpful in understanding the scale of the potential threat to the environment and to measure how usage changes over time. Combined with research on environmental harms, this information could highlight if any compounds should be restricted or phased out.

As part of the licensing process, manufacturers are required to provide detailed information on the environmental impacts of veterinary medicines for use on livestock. Companion animal treatments are exempt from this level of scrutiny, as they are used as individual treatments and usually in much smaller quantities. However, as parasiticides are used for prevention as well as treatment of companion animals, and they are used widely on an increasingly large population, the quantities are significant enough to warrant this additional level of risk assessment.[102] It could also be worthwhile surveying owners regarding their use of parasiticides in small animals to ascertain accurate levels of usage as owners may not use parasiticides dispensed to them by vets or bought off the shelf.

Recommendation 10: Data on the annual sales of parasiticide products and actual frequency of use on companion animals should be collected, and sales data published annually, as the VMD does for antimicrobials.

Recommendation 11: The VMD should review the requirements for environmental impact assessment of companion animal parasiticide products. In the meantime, manufacturers

[96] PDSA. 2021. *Animal Wellbeing (PAW) Report 2021*. https://www.pdsa.org.uk/media/12078/pdsa-paw-report-2021.pdf
[97] *ESCCAP. 2022. Guideline 03: Control of Ectoparasites in Dogs and Cats*. 7th ed. Malvern, UK: ESCCAP. https://www.esccap.org/uploads/docs/cgqtqpf1_0720_ESCCAP_GL3__English_v19_1p.pdf
[98] Berny et al., "Fecal Elimination of Fluralaner."
[99] VMD. 2020. *Product Information Database*. https://www.vmd.defra.gov.uk/ProductInformationDatabase/Default.aspx
[100] VMD. 2020b. *Freedom of Information Request, August 2020*. FOI request submitted 10 August 2021. Reference ATI0721
[101] Ibid.
[102] European Medicines Agency. 2020. *Concept Paper on Environmental Risk Assessment for Parasiticide Veterinary Medicinal Products*. https://www.ema.europa.eu/en/documents/scientific-guideline/concept-paper-development-reflection-paper-environmental-risk-assessment-parasiticide-veterinary_en.pdf

should consider undertaking their own environmental impact assessments to better understand the potential risks associated with their products.

Resistance

Overuse of parasiticide products can lead to resistance developing in the target parasites, which if not checked could have a serious impact on animal welfare. In this respect, parasiticides differ little from other antimicrobials, such as antibiotics, where there is great awareness of the risk of antimicrobial resistance (AMR).

In grazing animals, resistance to anthelmintics used to treat endoparasites is serious and increasing. In the UK, resistance is reported mainly in gastrointestinal nematodes[103] and, increasingly, in liver fluke. Currently resistance significantly impacts the efficacy of the three older classes of anthelmintics (Group 1 Benzimidazoles, Group 2 Acetylcholine receptor agonists, and Group 3 Macrocyclic lactones) but is a threat against the efficacy of all anthelmintic groups. Anthelmintics must be used judiciously, and BVA currently recommends avoiding unnecessary or routine treatment of grazing animals[104]. Resistance has also been demonstrated to treatments for common farm animal ectoparasites. For example, *Psoroptes* mites, which cause Sheep Scab, have developed resistance to parasiticides, specifically macrocyclic lactones, and become unresponsive to treatment[105]. This is likely to cause major difficulties in scab management if resistance becomes widely established in the UK.

There are currently very few proven cases of treatment failure for modern parasiticides in cats and dogs due to resistance[106],with the exception of anthelmintic resistance of Heartworm *(Dirofilaria immitis)* larvae[107], multiple anthelmintic drug resistance in Hookworms (*Ancylostoma caninum*)[108,109] and permethrin resistance and fipronil tolerance in *Rhipicephalus* ticks[110] in the USA as well as a report of multiple anthelmintic drug resistance in Hookworm and Whipworm (*Trichuris vulpis*) in Portugal[111]. There have been reports of treatment failure, especially for fleas[112]. In the UK, a national survey found that 62% of cats and 45% of dogs that had been treated with a fipronil-based product that was 'in date' at the point of inspection still had fleas, potentially demonstrating a lack of efficacy of fipronil based products, although compliance could be a factor[113]. Historically, resistance has developed to many of the insecticides used to control fleas, including carbamates, organophosphates, and pyrethroids plus increased use could increase selection pressures, so this is clearly an issue to be aware of. The slow development of resistance in cats and dogs when compared with equines and ruminants is possibly due to the large natural reservoirs of infection, lower stocking density, large range of available products, and often more complex lifestyles of the parasites.

Research and guidance should be developed to help prevent or delay resistance in common parasites. Increased use of diagnostic testing and faecal egg counts would help inform the profession on any signs of resistance developing. In the meantime, any cases of suspected resistance or lack of

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[103] Rose, H., et al. 2015. "Widespread Anthelmintic Resistance in European Farmed Ruminants: A Systematic Review." *Veterinary Record* 176 (21): 546–46. https://www.zora.uzh.ch/id/eprint/110037/1/AR_Vet_Rec_accepted-1.pdf

[104] British Veterinary Association 2025. "Responsible use of parasiticides in grazing animals." https://www.bva.co.uk/take-action/our-policies/anthelmintic-resistance-and-responsible-use-in-livestock/

[105] Sturgess-Osborne, C., et al. 2019. "Multiple Resistance to Macrocyclic Lactones in the Sheep Scab Mite Psoroptes ovis." *Veterinary Parasitology* 272: 79–82. https://doi.org/10.1016/j.vetpar.2019.07.007

[106] ESCCAP, *Guideline 03*, 2022.

[107] ESCCAP. 2025. *Guideline 01: Worm Control in Dogs and Cats*. 7th ed. Malvern, UK: ESCCAP. https://www.esccap.org/uploads/docs/vp2gim8y_0778_ESCCAP_GL1__English_2025_v20.pdf

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[110] Tian, Y., C. E. Taylor, C. C. Lord, and P. E. Kaufman. 2023. "Evidence of Permethrin Resistance and Fipronil Tolerance in Rhipicephalus sanguineus s.l. (Acari: Ixodidae) Populations From Florida and California." *Journal of Medical Entomology* 60 (2): 412–16. https://doi.org/10.1093/jme/tjac185

[111] Batista, C. L., R. Cabeças, C. Araújo-Paredes, M. A. Pereira, and T. L. Mateus. 2024. "Smells Like Anthelmintic Resistance—Gastrointestinal Prevalence, Burden and Diversity in Dogs from Portugal." *Pathogens* 13 (9): 799. https://doi.org/10.3390/pathogens13090799

[112] Rust, M. K. 2016. "Insecticide Resistance in Fleas." *Insects* 7 (10). https://doi.org/10.3390/insects7010010

[113] Cooper et al., "Fleas Infesting Cats and Dogs," 452–58.

efficacy should be reported, and medicines used responsibly to limit the risks of resistance developing.

Recommendation 12: Research should be undertaken to identify the extent of the threat posed by resistance to common companion animal parasiticides.

Recommendation 13: Guidance should be developed to help prevent or delay resistance in common parasites and consideration given to more active monitoring for resistance, taking lessons from previous work on antimicrobial resistance (AMR).

Recommendation 14: Vets and owners should report to the VMD any cases of suspected resistance to parasiticides or lack of efficacy of products.

Recommendation 15: Parasiticides should be used responsibly to limit the risks of resistance developing.

Responsible use

The RCVS code of conduct states that "Veterinary surgeons must seek to ensure the protection of public health and animal health and welfare and must consider the impact of their actions on the environment". As a health-centred profession, and key players in the One Health Agenda, vets recognise the interconnections between human health, animal health, and the health of the environment.

The BSAVA Scientific Position Statement on parasite control recommends that companion animals are treated against parasites, taking into account individual circumstances, in the interests of animal health and welfare and to minimise the risk to human health, and that owners should consult their veterinary surgeon to discuss the appropriate prevention and treatment for individual animals. The position also recommends that appropriate hygiene measures are taken (eg removal of faeces from the environment, which as well as reducing contamination of the environment with parasites, would also reduce contamination with parasiticides passed in the faeces[114], and hand washing) in order to reduce the risk of parasite infection, and strongly encourages further valid scientific research.

Vets have a duty to responsibly recommend and prescribe appropriate parasiticides to clients, to protect animal health and welfare and ensure public health is protected from zoonotic parasites. Balancing human and animal health with that of the environment is challenging, especially given the many gaps in the knowledge base outlined throughout this position, but it is important. Being one of the most trusted professions in the UK, vets are also well placed to engage clients in considering the environmental impact of caring for their pet. In addition, vet schools can increase awareness amongst future vets of responsible use and application of tailored as opposed to 'blanket treatments' (ie those that are given routinely and/or year round) of parasiticides. Veterinary businesses will also need to consider how best to support professionals to make risk based decisions, including as part of their health plans (refer to 'Practice considerations' section below for further details).

The impact of animal ownership on the environment is coming under increasing scrutiny, and owners have been looking for ways to reduce the harms they cause. As new evidence comes to light, it is therefore important to reconsider routine treatment and take steps to address the environmental concerns associated with parasiticides, as a moral and ethical duty, in addition to preventing the potential reputational damage. Changing messaging to clients has the potential to impact negatively on levels of trust, but well-communicated evidence-based change will demonstrate leadership.

One Health risk-based prescribing

Like all medicines, parasiticides should be used responsibly, and a risk-based approach to treatment should be taken. When deciding what parasiticides to use to treat an animal, usage should be appropriate, evidence-based, and monitored. Vets should consider the One-Health risks from all parasites and come up with a treatment plan tailored to that individual.

[114] Berny et al., "Fecal Elimination of Fluralaner."

In line with the RCVS 'Under Care' guidance, vets can prescribe parasiticides for a maximum of 12 months before requiring a clinical examination, and in many cases, this annual visit will be the only time at which treatments are reviewed. Currently year-round prophylactic flea treatment is often recommended for cats and dogs, focussed on preventing the potential risks to animal and human health. This approach aims to achieve, as much as is possible, completely flea and tick-free animals. Regular de-worming, around four times a year, is also recommended to keep parasite levels in the environment low, and monthly worming usually encouraged for higher risk animals. Regular treatment intervals are recommended on most parasiticide product datasheets and supported by bodies such as The European Scientific Counsel for Companion Animal Parasites (ESCCAP).

However, due to the environmental risks associated with this, members of the profession and scientific community have suggested less frequent treatment intervals may be more appropriate. There are risks on both sides – not treating animals could lead to an animal or public health concern, but the potential harm to the environment must also be taken very seriously. Veterinary professionals should be challenging the status quo and facilitating informed decision-making on the part of the client.

Guidance to support risk-based decision making is needed, and this should be updated as our understanding of the risks develops. As already highlighted, independent research on the disease risk to animals and humans from parasites is needed, in addition to evidence about the presence and effects of parasiticide drugs in the environment. It would also be beneficial to research:

- the optimal use of parasiticides, with a focus on the required frequency of treatment for effective prevention; and
- the extent of the impact of certain risk factors on the prevalence and severity of parasitic infections in pets including factors such as seasonality, multi-pet households, geography, lifestyle and type of pet, and optimal use of parasiticides to control those risks, including frequency of administration.

Sufficient data is key to allowing veterinary professionals to make responsible decisions when prescribing, both in terms of when to do so and which products to choose. Risk of environmental contamination must be a key part of this once data is available. In the large animal sector, the National Animal Disease Information Service (NADIS) provides useful information and forecasting on parasite risks in geographical areas[115]. The Small Animal Veterinary Surveillance Network (SAVSNET) Flea Activity Dashboard[116] and Tick Activity Index[117] provide valuable data for veterinary professionals to support risk assessments and decisions on treatment. Similarly, ESCCAP has produced parasite infection maps based on laboratory test data[118]. A similar approach would be useful for other common small animal parasites, and veterinary associations could play a role in signposting to this information as it becomes available. Recording negative test results in endemic areas will also help to build a more accurate picture of parasites distribution. In the meantime, we have a duty to take a proportionate and targeted approach to treatment and minimise use of these medicines, since losing invertebrate populations could have severe impacts on ecosystems, which in turn could seriously affect human and animal health.

The way in which the parasiticides works may also need to be taken into account when prescribing. Topical treatments stay on the skin, so are more likely to be washed off if an animal gets wet, whereas systemic treatments are less likely to be washed off, but are likely to be excreted in the faeces or urine[119]. There is some evidence[120] that systemically acting oral and injectable products are less likely to be spread into the environment than topical treatments, but these chemicals are still likely to reach the environment through urine and faeces as well as potentially through fur and hair[121]. The consequences of using each type of product need to be understood. In the meantime, prescribing non-topical treatments to animals who regularly swim or are washed and reminding animal owners of

[115] National Animal Disease Information Service https://nadis.org.uk/
[116] SAVSNET. n.d. "Flea Activity Dashboard." https://public.tableau.com/app/profile/savsnet.at.liverpool/viz/Fleaactivitydashboard/fleadashboard
[117] SAVSNET. n.d. "Tick Activity Dashboard." https://public.tableau.com/app/profile/savsnet.at.liverpool/viz/Tickdashboard/Tickdashboard
[118] ESCCAP. n.d. "Parasite Infection Map." https://www.esccap.org/parasite-infection-map/
[119] eg Veterinary Medicines Directorate, "Bravecto SPC"
[120] European Medicines Agency. 2013. *CVMP Assessment Report for Bravecto* (EMEA/V/C/002526/0000). 44 (December): 22. https://medicines.health.europa.eu/veterinary/en/documents/download/29a09ab2-880c-4c11-9e26-a45348d1e8e2
[121] Diepens et al., "Pet Dogs Transfer Veterinary Medicines."

the importance of collecting and disposing of faeces could help to reduce environmental contamination. It is also necessary to consider that some pets may have a history of adverse reactions after administration of some types of product, and the owner may feel more able to apply some forms of medication than others, so it will not always be possible to prescribe systemic oral treatments.

The key principles of responsible parasiticide prescribing should be:

- Approach parasiticide use with similar care to antibiotic use, taking a holistic approach to parasite control rather than using them as a routine preventative.
- Be aware of local parasite risks and risk factors for individual pets.
- Use targeted prescribing rather than treating routinely.
- Prescribe in a way that balances the risk to an individual animal's health and welfare, against the risk to future population health and welfare; the environment; and human health.
- Ensure the client understands the importance of correct administration and disposal and the environmental risks of not doing so.
- Be committed to reporting adverse events to the MA holder, as recommended by the VMD, including suspected lack of expected efficacy.
- Have a system which records reasons for not prescribing a parasiticide, and any alternative or additional management advice given.
- Have a tailored and holistic approach to parasite management, avoiding focus on the prescribing aspect alone.

Recommendation 16: As part of their responsible prescribing measures, 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, in addition to knowledge of the individual's lifestyle or environment and the results of routine examination to look for parasites eg faecal examinations for worms.

Recommendation 17: Veterinary schools should increase awareness amongst future vets of responsible use and applying tailored, as opposed to blanket, treatments of parasiticides

Recommendation 18: Veterinary businesses should not have blanket treatment policies in place, they must empower individual vets to discuss tailored treatment plans with their clients, and allow for risk assessment within practice health plans so vets can base prescribing decisions accordingly.

Recommendation 19: Research on the balance of harms and benefits from current prescribing of all parasiticide compounds should be undertaken to help inform future guidance and recommendations.

Recommendation 20: Clear independent guidance to assist vets making evidence-based decisions should be produced and updated as new research is produced.

Recommendation 21: Independent research into the optimal use of parasiticide products should be conducted, with a focus on the required frequency of administration and application to control parasite risks.

Recommendation 22: Research should be undertaken to better understand the extent of the impact of certain risk factors on the prevalence and severity of parasitic infections in pets including factors such as seasonality, multi-pet households, geography, lifestyle and type of pet, and optimal use of parasiticides to control those risks, including frequency of administration.. Independent surveillance data, including negative results in endemic areas, will be especially helpful. Veterinary associations have a role to play in signposting the profession to this information as it develops.

Recommendation 23: Academic institutions or Government should undertake a literature search of the existing evidence base available followed by focussed research on knowledge gaps into the presence and effects of both topical and systemic parasite medications in the environment.

Parasite prevention and testing

Since parasiticide use on cats and dogs is often prophylactic, alternative methods of prevention and diagnosis are important considerations when looking to mitigate potential environmental harms.

Veterinary professionals are well placed to advise owners on lifestyle factors which can reduce the risks of their pet getting parasites, or the impacts of these. For example, picking up dog faeces, avoiding scavenging, raw food and routinely checking for visible ectoparasites. A public awareness campaign on the importance of picking up dog faeces in relation to public health and zoonoses would be especially beneficial for highlighting health risks associated with fouling.

For some ectoparasites, regular checks can help to identify if an animal needs treatment. Regularly checking for fleas, ticks, and those mites which are visible to the naked eye, will increase the chances of spotting these early, helping to provide treatment when it is needed. This may help to reduce the need for parasiticide treatment, especially during the winter when prevalence of some parasites is likely to be lower. In addition, there are non-chemical means to reduce risks of infestations, including regular vacuuming and washing of pet beds, and avoiding areas with high parasite load, such as by keeping dogs to paths in areas of known high tick activity. Owners should be supported to understand the risk factors for different parasites for their individual pet, including when travel abroad.

An increased use of testing by veterinary practices, such as faecal egg counts, could help to identify the presence of endoparasites, meaning only those pets with confirmed presence of parasites may need to be treated. This approach is used widely in the farm and equine sectors due to resistance issues. There is also evidence of a growing demand for testing before treatment within small animal medicine, for example a number of clients now opt for an antibody titre test before deciding whether to have booster vaccinations for their animals. Whilst some basic diagnostics tests for the presence of parasites are very simple to do, they can be time consuming and they can give false negatives or, less frequently, false positives, especially if not carried out correctly, eg using wet paper test for fleas, where the number of helminth eggs is under the detection limit of the analysis, or where pooling of samples may mean some parasites such as Giardia are missed. In addition, a variety of pre-prepared diagnostic tests for small animal parasites are also available to vets, for in-clinic use and by professional diagnostic laboratories, however industry-wide agreement is needed on best practice for testing and interpretation to ensure consistency. It also needs to be borne in mind that tests are not available for all parasites, and the delay between testing and treatment may not be acceptable to some clients. Some parasites for which pets are routinely prophylactically treated have a low prevalence, which is likely to result in repeated negative test results, that may discourage some clients from continuing with the testing, further exposing their pet to health and welfare risks. Lessons could be learnt from other countries which routinely undertake faecal sampling for small animals.

Unfortunately, the lifecycles of some parasites mean that they may not always be detected, and so infected animals may give false-negative results, for example with prepatent infections. Not detecting parasites which are present may increase the risk of household infestation, leading to more parasiticides being needed. This may also increase the associated animal and human health risks, so the testing approach needs to be risk- assessed on a case-by-case basis, considering the human, animal, and environmental risks. If clients are concerned about the health risks to themselves or their pets, this approach might encourage them to obtain medicines elsewhere without professional guidance, which in turn may increase the likelihood of products being used incorrectly, posing a risk to animal health and welfare and potentially furthering environmental contamination. Further research should be conducted into preventative measures which do not involve chemicals both on the animal and in the home environment, eg efficacy of vacuum cleaner types, washing bedding and choice of diet.

Testing is used widely in the farm animal sector before treating livestock for endoparasites. Blanket treatment is avoided as resistance can build up very quickly on a pasture and render medicines ineffective, so farmers need to think very carefully about which animals they treat routinely. Taking a

risk-based approach means that some worms will escape treatment, which has the benefit of making sure those in refugia are not exclusively resistant specimens. It is important to recognise that medicine use in a flock or herd situation is not directly comparable to use in individual companion animals where allowing a degree of infestation might be less acceptable to the keeper.
In the equine veterinary profession, there has been general recognition of the need to minimise the use of anthelmintics over the past twenty years. This is largely due to serious concerns about resistance, with many parasites now showing ubiquitous resistance to equine medicines. Before treatment of horses, it is widely recommended that risk factors are taken into account, and tests are carried out. Unfortunately, there does not appear to have been a significant reduction in the volume of anthelmintics being used, possibly because testing for parasites may be more expensive than the treatment itself, and medicines are widely available to purchase in stores or online without any professional advice. In Sweden, reclassifying anthelmintics to prescription only has reduced the volume sold by over 50% in a ten-year period, showing this to be an effective way to reduce usage[122]. The small animal sector should learn from this to make sure their efforts to use parasiticide responsibly can be successful.

Recommendation 24: Clear information on how to prevent animals getting parasites, and how to check for them, should be promoted to the animal owning public.

Recommendation 25: The veterinary profession should work to agree on the best practice for parasite testing protocols

Recommendation 26: Veterinary professionals should consider more frequent use of testing as part of a risk-based approach to prescribing parasiticides.

Recommendation 27: Alternative approaches to parasite control currently in place in other European countries should be explored and considered by UK veterinary practices.

Recommendation 28: Research should be conducted into non-chemical methods of parasite prevention, both on the animal and in the home environment.

Practical considerations

To shift away from routine parasiticide use, a change in mindset of both veterinary professionals, veterinary business owners and animal owners will be needed. Veterinary professionals wanting to use parasiticides more responsibly may be presented with challenges within their working environment, such as practice protocols, the prescribing behaviours of team members and neighbouring practices, retaining client trust if there is a shift from vets historically promoting blanket or prophylactic parasiticide use to now advising otherwise, and a lack of client understanding. As new evidence develops, the small animal sector as a whole needs to acknowledge the challenges and work together to consider what constitutes responsible use of parasiticides.

Prophylactic treatment for parasites often forms part of veterinary practice health plans for small animals, which provide important income for veterinary practices whilst providing clients with peace of mind that a large proportion of their animal's healthcare costs are covered in an affordable way. Moving away from blanket treatment will pose challenges to veterinary practices, but health plans can be restructured to ensure costs continue to be spread out and affordable over time, and that customer loyalty is maintained. Greater personalisation of plans and increased testing for parasites will also add to workloads for already stretched veterinary teams, and the additional time needed could have cost implications for clients. Owner ability and capacity to observe parasite infestations on their pets will also need to be considered if this is a key element of a new plan.

However, these are challenges that have been successfully overcome in the large animal sector, and associations such as BVA, BSAVA and BVZS can support vets by providing resources and advice as they work to incorporate testing and associated costs into health plans. The reduced need for blanket parasiticide treatments may help to ensure affordability, so comparisons between costs-to-client of major parasiticide products, in-clinic risk assessments and laboratory testing would be helpful for practices working to adapt their health plans. RVNs would be well placed to take on a greater role in personalised parasite health plans, which should be considered as practices adapt.

[122] Girma, K. 2016. "Försäljning av Djurläkemedel 2016." https://www2.jordbruksverket.se/download/18.7914403215ba2c44596ccde7/1493359271184/ovr404.pdf

Recommendation 29: The small animal sector as a whole needs to acknowledge the challenges and work together to consider what constitutes responsible use of parasiticides. Associations such as BVA, BSAVA and BVZS have a role to play in engaging small animal vets in this discussion.

Recommendation 30: Comparisons between costs-to-client of major parasiticide products, in-clinic risk assessments and laboratory testing should be produced to help practices adapt their health plans.

Information and regulation

Vets have an important role in educating clients on the One Health considerations associated with use of parasiticides. It is important to provide owners with clear information about the risks, and to have a conversation about whether treatment is necessary on that occasion. Provided the owner is aware of the risks, it may be acceptable not to treat an animal prophylactically, and in some cases even when a small number of low-risk parasites are present. Veterinary professionals providing these treatments should also make sure clients understand how to use the products safely, including advice on washing their pet, handling the medicines and safe disposal. It would be helpful for practices to have a designated parasite control champion, who has completed additional CPD in this area, and can act as a point of contact for clients.

The data sheets provided with veterinary medicinal products can be very technical and detailed, and it is likely that many owners do not read these. Pharmaceutical companies should look at how they can make sure owners understand the key points, providing clearer and more easily accessible messaging.

Veterinary professionals should make sure they are aware of the risks themselves, in order to effectively communicate this with their clients. There has been some work to improve information and resources for veterinary professionals since this position was first published, including from BVA, BSAVA and BVZS, and from Vet Sustain. However, as highlighted throughout this position, vets also need access to clear, independent information about the products they are using to help make responsible decisions.

There has recently been a tendency for parasiticides to be reclassified from POM-V to NFA-VPS and to AVM-GSL, meaning that many are now readily available in supermarkets and online[123]. There is a risk that those products being purchased without professional advice are more likely to be used incorrectly, potentially reducing efficacy and increasing the amount of product contaminating the environment. Given the concerns outlined above, there is an argument for removing some of the products from general sale (AVM-GSL), so that they are only available where there is professional advice (POM-V and NFA-VPS). This could affect availability in terms of consumer choice and access to treatment options, but the environmental impacts may mean that such barriers are justified. This risk can also be mitigated by researching compounds with the lowest environmental harms and only allowing those to remain on the general sales list.

Another concern is the prevalence of combination products and broad-spectrum treatments, designed to treat multiple parasites at once. This could lead to overtreatment and unnecessary treatment, though evidence is lacking to show which products are most harmful in the environment. Wherever possible, veterinary professionals should use targeted and specific treatments unless they assess there is a need to treat for multiple types of parasite. An increased range of individual products will enable more appropriate treatment of each parasite without the need to overuse another medication. Development of a narrow spectrum product to treat lungworm (*A. vasorum)* would be especially useful, as the serious animal health and welfare impacts are a concern for veterinary professionals . This principle is already in use for grazing animals through the Sustainable Control of Parasites in Sheep (SCOPS) and Control Of Worms Sustainably (COWS) initiatives.

Parasiticide products and the risks of not treating pets are widely advertised, both to the veterinary profession and general public, which is likely to increase demand for these products. In the large

[123] Competition Commission. 2003. "Recommendation 6 on the Supply of Prescription-Only Veterinary Medicines." https://webarchive.nationalarchives.gov.uk/ukgwa/20120120001958/http://www.competition-commission.org.uk//rep_pub/reports/2003/478vetmeds.htm

animal sector, VMD currently restrict the advertising of pharmaceutical products to professional keepers, so controls on advertising of companion animal products may need to be considered as part of any effort to reduce the volume of products being used.

Recommendation 31: Information provided with veterinary medicines should be improved to ensure that key points on safe usage are clearly and simply presented, such that it can be easily understood by the general pet-owning public.

Recommendation 32: Veterinary professionals should ensure they understand the risks associated with parasiticide treatments and be able to advise clients appropriately. Independent information on these medicines should be available to assist in decision making.

Recommendation 33: Wherever possible, veterinary professionals should use targeted and specific treatments rather than combination or broad-spectrum products, unless they assess there is a need to treat for multiple types of parasite, or have evidence that a broad-spectrum product poses a lower environmental risk.

Recommendation 34: An increased range of narrow spectrum parasiticide products, as opposed to combination products, should be made available, to reduce the need for overtreatment. A narrow spectrum product for lungworm should be prioritised.

Recommendation 35: The VMD should reconsider the classification of parasiticides which are currently AVM-GSL.

Recommendation 36: The VMD should extend the restrictions on the advertising of pharmaceutical products to professional keepers to cover companion animal products.