

Parasites in cats and dogs

This workshop discussed the wide range of parasites that can infect cats and/or dogs, looked at routes of transmission, diagnosis and, most importantly, methods of treatment and control.

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Dogs and cats are exposed to a wide range of parasites. Some of them are rare, others are common, some cause mild infections, and others can cause life-threatening infections. Some parasites are specific to dogs and cats, and others are zoonotic and can be transmitted to humans.

The landscape of parasite treatment has evolved a lot over the last 10 years and there are now many treatment options. However, some challenges remain regarding the development of an optimal treatment model.

Additionally, there are lots of emerging and reemerging parasites which cause really serious challenges. Veterinarians are still trying to work out how to manage these, so a fresh look at this topic is always useful.

Parasites can live inside the animal's body (internal parasites), or live outside on the skin or fur of the animal (external parasites).

Internal parasites

Internal parasites live inside the animal's body, in different locations including the small intestine, the lung, the heart, the subcutaneous tissue or even inside the eye. The majority of internal parasites fall into two groups, roundworms (nematodes), or tapeworms (cestodes).

Cestodes, ascarids, hookworms and whipworms live in the gut, and cause symptoms such as vomiting, diarrhoea or a bloated abdomen. Sometimes the worms can be seen in the vomit or diarrhoea. Lung worms cause coughing, and heartworms produce exercise intolerance and bleeding. Subcutaneous worms form nodules in the skin and eye worms cause a range of ocular manifestations.

Routes of infection

There are many ways by which these parasites can spread from and between dogs and cats.

- Ingestion of embryonated eggs (eg ascarids, whipworms, hookworms)
- Ingesting encysted larvae in intermediate hosts (eg lungworms)
- Transmammary transmission (eg *Toxocara canis*, *Toxocara cati*)
- Transplacental transmission (eg *Toxocara canis*)
- Insect-borne infection (eg heartworms, subcutaneous worms, eye worms).

Ascarids (eg *T. canis*, *T. cati*, *Toxascaris leonina*)

Ascarids are the most common group of parasites infecting dogs and cats. They are more prevalent in kittens and puppies than adult dogs and cats.

In general, they do not cause clinical signs in adult animals, but they can cause vomiting, diarrhoea and coughing in kittens and puppies, and can even cause death if left untreated.

Ascarids are highly prevalent because there are many routes of transmission. Diagnosis is performed by detecting the ascarids' characteristic eggs using faecal flotation or McMaster technique.

Other internal parasites

Other groups of internal parasites include hookworms and whipworms. These are named for the appearance of their body and their eggs are also quite distinct.

Diagnosis is generally established by detection of the characteristic eggs in the faeces, and because they are also roundworms, they can be detected using faecal flotation or McMaster technique.

Hookworms and whipworms are less prevalent in the UK than ascarids and only cause clinical signs in heavy infestations. Hookworms can cause anaemia if there is a heavy infestation because they feed on the blood and

they have sharp teeth around their mouth cavity which can cut through the intestinal mucosa and cause bleeding. Whipworms can cause bloody diarrhoea and mucus-filled faeces.

Both have direct lifecycles, where eggs are released in the environment, hatch into the larval stage and then mature into the infective larval stage, which can then infect other dogs and cats.

Treatment is easy and lots of drugs are highly effective against them.

Lung worms

Aelurostrongylus abstrusus and *Angiostrongylus vasorum* are the main species of lungworms infecting cats and dogs respectively. There are many other respiratory and lung worms parasites and some cause serious clinical manifestations.

Transmission of lung worms is indirect, with dogs ingesting infected slugs and snails that act as intermediate hosts for the larval stage which then comes out in the faeces from infected dogs. Dog to dog transmission does not happen. The parasite must cycle through snails and slugs for the life cycle to be completed.

Infection is generally asymptomatic or subclinical. This parasite causes clinical signs ranging from mild cough or diarrhoea to blood clotting defects. It can be difficult to diagnose and can also be fatal, with up to 9% of infected dogs dying.

Diagnosis can be achieved using the Baermann technique or serological tests, such as the AngioDetect test, which can allow rapid diagnosis, especially in a clinical setting.

There are a range of anthelmintic therapies which can be highly effective, and resolution of infection is usually seen within 4 weeks of treatment.

Heartworm (*Dirofilaria immitis*)

Heartworm is not endemic in the UK. It is only

seen with imported dogs or dogs coming from geographical regions such as North America and southern Mediterranean countries. The life cycle is indirect and cannot be completed without a mosquito.

Macrofilariae are seen in the heart within 6–7 months after the initial mosquito bite and they can live for 5–10 years inside the heart of the dog.

This parasite causes cardiovascular disease, so all the clinical signs relate to abnormalities of the cardiovascular or circulatory system. Cardiopulmonary manifestations caused by *D. immitis* include narrowing of the pulmonary artery, exercise intolerance, hydrothorax, hydroperitoneum, chronic cough, dyspnoea, haemoptysis, eosinophilia in the lung and oedema in the lung parenchyma.

Diagnosis is mainly focused on blood analysis (ie complete blood counts and evidence of active infection), or histochemical techniques. Adult worms can be seen on echocardiograms.

There are lots of treatments directed against adult worms or against the larval stage, and some medications can also be used as preventative treatments for dogs and cats living in highly endemic areas.

The problem with the management of this disease is that after treatment other stages of the parasite will die and disintegrate. This can cause severe allergic reactions and can lead to thromboembolism, blood clots in the pulmonary circulation, pulmonary inflammation, congestive heart failure or even renal disease. So there is a risk of fatal complications from both the infection itself and also as a result of the treatment.

Many dogs can make a full recovery if complications are carefully managed, if the worm burdens are low and if the clinical disease itself is not at an advanced stage.

Other groups of parasites can come with imported or rescued animals from abroad, especially from areas like eastern Europe: *Dirofilaria repens* (subcutaneous worm) or *Thelazia callipaeda* (eye worm). These have zoonotic potential so they can infect humans.

Eye worm causes ocular manifestations, and those that are subcutaneous cause nodules containing the parasites, which can lead to allergic reactions because of the microfilaria. *Dirofilaria repens* is from the same group of parasites as the heartworm, so can be detected using the same methods.

Dirofilaria repens and *Thelazia callipaeda* require vectors (mosquitoes or muscid flies respectively). Management is easy – most medica-

tions used for the control of other roundworms are also effective against this group of parasites.

Tape worms

These are flat worms that have a long body composed of a small head connected to multiple segments, each of which contains a full set of male and female reproductive organs, including numerous eggs.

They require fleas and lice as intermediate hosts to complete their life cycle. So dogs become infected when they ingest infected fleas or lice, or rodents that are infected with tapeworm larvae. A cat infected with tape worms will often drag its bottom along the ground, bite its rear end, may have weight loss and may vomit up the worms or segments of worms. Segments carrying eggs will break off the distal end of the tapeworm and may be seen in faeces or in the fur around the anus (they look like small, cream-coloured grains of rice).

Tape worms do not cause serious health problems to dogs and cats compared to those caused by roundworms, but they have really high zoonotic risk to the pet owner, hence treatment is highly recommended.

Control revolves around anthelmintic administration, containing praziquantel or epsiprantel, especially for dogs and cats, and there is a higher risk of infection with some species. Other measures include hygienic measures like not allowing pets to eat raw diets, or to hunt.

Preventative treatment of worms

Toxocara spp and other ascarids are the most dangerous types of worms. Infection at young ages is common and can be life threatening, so the treatment has to be tailored to the age of the animals. For kittens and puppies, treatment involves anthelmintics at 2 or 3 weeks old, and then every fortnight until 2 weeks after weaning, then monthly until 6 months of age.

Puppies may be born infected, so the bitch should be treated during pregnancy. Kittens are slightly different in terms of the risk of infection and treatment requirements as there is no vertical transmission.

Nursing bitches and queens should be treated at the same time as the first treatment of their offspring, as they often develop latent infection at that time.

In other dogs and cats, treatment can be undertaken four times a year, but in certain scenarios, monthly treatment is recommended. This can reduce the shedding of eggs by 90%, so is very effective in high-risk groups like in

kittens, puppies, hunting pets, those on unprocessed raw diets and those living with young children, immunosuppressed individuals or pregnant women. A new strategy for prevention involves testing four times a year as an alternative to treatment.

Diagnosis relies on the modified McMaster technique and faecal flotation for eggs or the Baermann test for larvae. No test is 100% sensitive – up to one in three infections can be missed. The diagnostic accuracy can be improved by using more than one assay in addition to methods with high sensitivity, like faecal antigen testing or FLOTAC.

Management of worm infections

Once the diagnosis is established, the treatment is straightforward to effectively remove the worm infestation. Worming to control *Toxocara* will also control other roundworms as long as a treatment with an appropriate spectrum of activity is selected.

Measures such as feeding cooked food and hygiene, including disposal and removal of faeces, will reduce the risk of infection. Lung worm is transmitted through ingestion of infected slugs and snails, hence preventative measures include preventing contacts between dogs and cats, and slugs and snails, and controlling those gastropods in the pet's territory.

External parasites

External parasites are a completely different group which can infect dogs and cats; they live on the skin or the coat of the host. They include fleas, lice, ticks and mites.

Fleas

Infestation with fleas is very common and the most common fleas in the UK are cat fleas, *Ctenocephalides felis*. There are four different stages of the life cycle: eggs, larval stage, pupa (in a cocoon), and adult fleas. The duration of the life cycle can vary significantly, from a few days to many months to years, depending on the environmental conditions.

Flea infestation can be diagnosed by detecting flea dirt or seeing the fleas on the pet. Flea dirt is pepper-like specks in the fur of an infected dog or cat, which is a mix of blood meal and flea waste products. Flea dirt is found when the fleas have been on the pet long enough to consume and digest a blood meal.

Control of flea infestations needs to be tailored based on the severity and the likelihood of the risk, and the animal's lifestyle. Control

involves regular visual inspection using a flea comb – if fleas are found then insecticide needs to be applied at appropriate intervals to ensure that adults and larval stage fleas are eliminated.

Animals at high risk of continual reinfestation (ie those in pet shelters, breeders' premises, mixed pet households, hunting dogs) need sustained, integrated flea control, ideally at monthly intervals. Insecticides should be applied to the dogs or cats in conjunction with daily vacuuming, cleaning of cages or beds and bedding, and always consider the environmental control of immature stages.

Some animals develop a secondary condition called flea allergy dermatitis, so they are allergic to the flea bites and saliva, which can cause intense itching. Exposure to saliva needs to be minimised or even eliminated to prevent the clinical signs. Affected animals need additional treatments to reduce skin lesions, swelling and itching, and this requires really sustained flea control, frequent application of insecticides, and environmental control measures. The pet owner should understand how to tackle the life cycle and that there are multiple stages also needed to be controlled.

Lice

Lice are uncommon, but infestation does happen, especially in long-haired breeds living in conditions of poor hygiene. They are very small insects but can cause itchy, dry and flaky skin. They sometimes suck the blood of the animals and can cause anaemia, especially in very young and/or small dogs.

There are two groups of lice: chewing lice and sucking lice. Chewing lice have broad heads, and the anterior of the head is relatively blunt, whereas sucking lice have a very narrow head and the anterior of the head is pointed. Most lice that affect dogs and cats are chewing lice.

It is important to understand the life cycle to understand which stage should be targeted for treatment. Eggs will hatch to nymphal stage in 1–2 weeks, and then the nymphal stage become adult lice in 1–2 weeks, and then adults start to lay eggs (nits), so the life cycle repeats itself every 3–4 weeks. Most products kill the nymph or adult stage, but are ineffective against eggs.

Existing louse infestations can be treated using insecticides effective against lice. A number of licensed products have proven efficacy against chewing lice. There are no European products with claims against the sucking louse *L. setosus*. One treatment may be sufficient if the product persists beyond the egg to egg de-

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velopment time; otherwise reapplication after 14 days is required to treat nymphs hatching from eggs.

For long term control and prevention, bedding and grooming equipment should always be washed and the environment or any other contact area should be checked and cleaned to prevent transmission of lice to other animals.

The dog must be kept up to date with flea treatment because most drugs that are effective against fleas also work against lice.

Mites

There are many types of mites which can affect dogs and cats. They have different shapes and live in different places: some live in the sebaceous glands, deep in the skin or in the ears. Most mites are obligatory ectoparasites – they must live on the dog or cat. The life cycle can be completed in 8 days, but can extend up to 4 weeks. There many products around, some highly specific to mites, while others also have a broad spectrum of activity against ticks and other external parasites.

Ticks and tick-borne diseases

These are becoming more prevalent because of climate change and the milder weather, so pets are now at risk from ticks feeding on them for most of the year. With feeding comes the possibility of transmission of a blood-borne infection, such as *Borrelia*, *Anaplasma* and *Babesia*.

It is very important to check pets after any outdoor activities and look for any signs of ticks so they can be removed as soon as possible. This can be done using a tick hook with a twist and pull action or using fine-tipped tweezers or forceps to grasp the tick as close to the skin surface as possible and then pull upward with steady, gentle pressure. If the tick is removed incorrectly, mouth parts may be left in the animal's skin and could cause infection or inflammation. After removal of ticks the bite area and the hands should be thoroughly cleaned with alcohol or iodine scrub.

A range of ticks can be found in the UK and can cause a threat to dogs and cats. The most common are *Ixodes ricinus*, *Ixodes hexagonus* and *Ixodes canisuga*. They are present in most of the UK, especially in areas with long grass and deer and rodent species.

If the pet's owner plans to visit coastal areas or the countryside, it can be useful to tell them about areas where there is a high prevalence of ticks so they can avoid going to those areas or take appropriate measures.

Tick infestation can be avoided using preventative treatment with prophylactic compounds which can rapidly kill or repel the ticks (such as products which contain an isoxazoline or pyrethroid). With the exception of flumethrin, pyrethroid products must never be used in cats because of their toxicity.

No product is 100% effective at preventing tick infestation, so animals should be checked for ticks at least every 24 hours, particularly in high risk pets and those that have travelled abroad or to areas where the risk is very high.

Tick control is risk based – consider the level of severity of risk and plan accordingly.

Take home messages

- Some parasites are not life threatening but have zoonotic potential. A parasite control plan not only protects dogs and cats, but also protects the pet owner and family.
- Infection can be prevented by early diagnosis or routine testing, and then treatment as well as additional control measures such as restricting hunting, prompt removal of faeces (internal parasites) and treating other pets that are in regular or close contact (external parasite).
- Personal dog parasite risk checkers have been developed and are available in practise, and; they can offer a tailored parasite control programme.
- Animals imported from abroad should be checked thoroughly, any ticks, fleas or external parasites be removed, and repeated tapeworm treatments given, even if the animal has been treated before travel.
- Regular testing (at least once a year) alongside the treatment can be beneficial, because this could help to monitor resistance and product efficacy and also to verify if the treatment efficacy is sufficient.

This workshop can be watched on demand at <https://www.vetnurseworkshops.co.uk>