ESCCAP

EUROPEAN SCIENTIFIC COUNSEL COMPANION ANIMAL PARASITES

Worm Control in Dogs and Cats

ESCCAP Guideline 01 Second Edition* – September 2010

*This edition supercedes ESCCAP Guideline 01 First Edition

ESCCAP

The Mews Studio, Portland Road
Malvern, Worcestershire, WR14 2TA

First Published by ESCCAP 2010

A catalogue record for this publication is available from the British Library

ISBN 978-1-907259-16-6

ESCCAP Guideline No. 1

Worm Control in Dogs and Cats

Second Edition Published in September 2010

Table of Contents

Tables

Figures

INTRODUCTION

There is a wide range of helminths that include nematodes, cestodes and trematodes that can infect dogs and cats in Europe.

Major groups by location in the host are:

Intestinal worms

- Ascarids
- Hookworms and *Trichuris vulpis*
- Tapeworms

Non-intestinal worms

- Heartworms (*Dirofilaria immitis* and *Angiostrongylus vasorum*†)
- Lungworms
- Subcutaneous worms (*Dirofilaria repens*) and eye worms (*Thelazia* spp.)

These groups are further summarised in Tables 2A-C and 4.

Factors affecting the importance of these worms include:

- prevalence
- pathogenicity for the host
- zoonotic potential
- a combination of these factors

This guideline aims to give an overview of these worms, their significance and, importantly, suggests control measures for the most important species, in order to prevent animal and/or human infection and these may be customised according to the situation. This guideline concentrates mainly on worm control, with other canine and feline parasites being addressed in other guidelines; these will be referred to where appropriate in the text. For a complete list of ESCCAP guidelines please see www.esccap.org.

For simplicity the nematodes, cestodes and trematodes referred to in this guideline will be referred to as "worms" and therapies are referred to as "anthelmintics".

The guideline is divided into seven sections:

1. Preventive measures
2. Key companion animal parasites
3. Other important parasites
4. Treatment regimens
5. Diagnosis of helminth infections
6. Preventing zoonotic infection
7. More information

† *A. vasorum* is sometimes referred to as a lungworm and sometimes named 'The French Heartworm'. Here, since the adult worms are located in the circulatory system and not the lungs, the worm is classified as a heartworm.

1. PREVENTIVE MEASURES

1.1. Lifelong Control of Common Worms

Important preventive measures include:

- All worms within this guideline, with the exception of *Dirofilaria* species, are transmitted by the passage of eggs or larvae in faeces, hence hygiene measures, especially cleaning up pet faeces regularly, will reduce environmental contamination with infective parasite stages (section 1.2).
- Feeding commercial diets or cooked food to prevent raw meat-transmitted parasite infection (See Tables 2A-C and 4), and dogs and cats should not be allowed access to rodents, carcasses or placentae and aborted foetuses of cattle or sheep; they should also be provided with fresh, potable water.
- Controlling parasite infections through endoparasite and ectoparasite management and treatment.

Few parasite infections are strictly age-related; the risk continues throughout life and so consideration should be given to provide each dog and cat with appropriate worm control throughout their life.

Where a specific worm infection is diagnosed, the infection should be appropriately treated and then preventive measures put in place. Symptomatic dogs or cats should have an accurate physical examination, including faecal examination or blood sample (where heartworm is suspected), and complete history considered, as these are crucial for diagnosis, treatment and control of parasitic infections. In addition faecal examinations can be useful especially for stray animals, kennels or cattery situations and after travelling.

For the healthy dog or cat, prevention of worm infection is imperative. To simplify preventive measures, ESCCAP has identified three "key" parasite groups (A., B., C.) that themselves can cause severe disease and/or pose a zoonotic risk and have high prevalence in some or all areas of Europe.

A. Ascarids (*Toxocara* spp; *Toxascaris leonina*) (prevalent all areas)

B. *Echinococcus* spp. (Figs 1a and 1b)

C. *Dirofilaria immitis* heartworm (Fig 2)

D. Other: *Dipylidium caninum* and *Taenia* spp., hookworm, *A. vasorum*, *T. vulpis*

Ascarid infections occur across Europe, whilst distribution of the other infections is geographically related. By adding *Echinococcus* spp. and/or *D. immitis* heartworm control to ascarid control measures, basic control plans can be produced for dogs and cats anywhere in Europe. Control of other parasites, such as hookworms, lungworms and whipworms can be added as necessary. Appropriate anthelmintic treatment for all parasites can then be identified and the animals treated at suitable intervals.

More detailed considerations for each of the key parasites can be found in Section 2.

1.2. Environmental Control of Parasite Transmission

Control of parasite stages (eggs or larvae) in the environment is essential to minimize the infection pressure to humans (zoonosis) or animals for those parasites whose eggs or larvae are passed in faeces. Parasitic contamination of the environment can occur in a number of ways, including excretion of parasitic eggs or larvae in the faeces and the release of cestode proglottids. Furthermore, environmental infection pressure of dog-transmitted parasites can be maintained by wild foxes and stray dogs in both rural and urban areas, and feral and wild cats can similarly form a reservoir of feline infection.

Most environmental parasite stages are highly resistant to environmental degradation (for months to years). Freshly excreted stages for many parasites can be directly infective (e.g.*Taenia* and *Echinococcus* eggs). Other parasites, such as eggs of nematodes, require anything from a few days to a few weeks at appropriate

temperatures, usually above 16°C, to reach the infective stage. Therefore, appropriate disposal of faeces is recommended. This should be on a daily basis and faeces should not be flushed down the toilet or disposed of in compost. Infections in intermediate hosts (e.g. birds, rodents, slugs and snails) may result in prolonged survival in the environment.

Leash laws and faecal cleanup laws especially for urban areas should be enforced by the appropriate authorities. Legislation to control stray dogs and feral cat populations should also be enforced by the appropriate authorities. Other measures to facilitate faecal removal, such as provision of disposal bins and bags should be encouraged. As it is difficult to control where outdoor cats defaecate, particular attention should be given to worm control in cats.

It is most important to prevent initial parasite environmental contamination by implementing comprehensive parasite control programmes, which have to be designed based on local epidemiological knowledge. Parasitised animals should be treated to minimise environmental contamination and monitored, where necessary, by faecal examination to confirm treatment efficacy.

All eggs of cestode and nematode worms are highly resistant in the environment and may persist in the soil for months or years. For highly contaminated areas, extreme measures are needed for decontamination, including removal of sand or soil or covering the soil with concrete or asphalt (for example in highly populated kennels). Therefore, for kennel or animal homes strict treatment and quarantine of new entrants is required to avoid introduction of infected animals.

Children's playgrounds should be well fenced to prevent entry of animals especially cats. Sandboxes should be covered when not in use. Sand, particularly if it is uncovered and is likely to have been contaminated with faeces, should be replaced regularly, e.g. at least once or twice a year. Desiccation and ultraviolet light are highly detrimental to worm eggs, so allowing exposure to sunlight and drying of contaminated areas can assist in reducing the level of contamination.

2. KEY COMPANION ANIMAL PARASITES

2.1. Roundworm (*Toxocara* spp.)

Puppies can be heavily infected by *T. canis* worms in *utero* or via nursing and these may cause serious illness before diagnosis is possible by faecal examination. For this reason, puppies should be treated with appropriate anthelmintics normally starting when they are 2 weeks of age, continuing at fortnightly intervals until two weeks after weaning and then monthly treatments to six months of age. Because prenatal infection does not occur in kittens, fortnightly treatment can begin at 3 weeks of age and be repeated fortnightly until two weeks after weaning, then monthly for six months. Nursing bitches and queens should be treated concurrently with the first treatment of their offspring, since they may have patent infections.

Toxocara spp. infection can occur in older dogs and cats, and is extremely unlikely to be associated with clinical signs; thus it is difficult to tell whether a dog is infected unless regular faecal examinations are conducted. In addition, these parasites are prolific egg-layers and just a few worms can produce large numbers of eggs. Continued regular treatment of dogs and cats using a suitable anthelmintic is therefore appropriate if regular diagnostic testing is not instituted (see next paragraph). An anthelmintic with a broad or narrow spectrum of activity can be chosen according to the risk of multiple worm infections.

As the pre-patent period for *Toxocara* spp. after ingestion of larvae via predation of paratenic hosts (rodents) or infective eggs from the environment is a little over four weeks, monthly treatment will minimise the risk of patent infections and can be recommended in risk scenarios such as the pet living in a family with small children and common use of a garden (or similar situations). There is surprisingly little information about the impact of re-treatment intervals on parasite burdens and environmental contamination on which to base a maximum re-treatment interval. However current information suggest annual or twice yearly treatments does not have a significant impact on preventing patent infection within a population, so a treatment frequency of at least 4 times per year is a general recommendation.

Where an owner chooses not to use anthelmintic therapy regularly or local legislation requires diagnosis or risk assessment prior to treatment, then monthly or 3 monthly faecal examination may be a feasible alternative (see section on diagnosis).

- **Puppies** should be treated with an appropriate anthelmintic (see therapy tables www.esccap.org) beginning at the age of two weeks. Subsequently the treatment should be repeated fortnightly until two weeks after weaning.
- **Kittens** should be treated with an adequate anthelmintic (see therapy tables www.esccap.org) beginning at the age of three weeks on the assumption that the queen is infected with *Toxocara cati*. According to present experience a fortnightly treatment until two weeks after weaning is advisable.
- **Nursing bitches and queens** should be treated concurrently with the first treatment of their offspring as they often develop patent infections at this time.

For **adult dogs and cats**:

- It has been shown that an increase in treatment frequency effectively reduces the occurrence of positive animals; studies have shown that worming four times a year does not necessarily eliminate patent infections, while a monthly worm treatment can largely prevent patent infections as it takes into account the biology of the parasites.
- In cases of increased risk (such as a kennels or households where there are children) monthly treatment can minimise the risk of patent infections and the excretion of infective parasite stages, as the prepatent period for *Toxocara* spp. is a little more than four weeks.
- As an alternative to repeated treatments, faecal examinations can be performed at suitable intervals from monthly to three monthly.
- No treatments or diagnostic tests are completely reliable.

2.2. Tapeworm (*Echinococcus* spp.) Areas

Both the tapeworms *Echinococcus granulosus* (dog) and *Echinococcus multilocularis* (red fox, racoon dog and rarely dogs and cats) have metacestode stages that cause zoonoses of major public health concern. In humans *E. granulosus* causes hydatid disease or cystic echinococcosis and *E. multilocularis* causes alveolar echinococcosis, which if untreated has potentially fatal consequences. Both infections result in the formation of cysts, most commonly in the liver. Eggs are immediately infective to intermediate hosts including humans when passed in the faeces by their final hosts.

Care should be taken to prevent dogs having access to raw offal and carcasses. Additionally, in areas where *E. granulosus* (including the equine and bovine species, i.e. *E. equinus*, formerly known as *E. granulosus* horse strain, and *E. ortleppi*, formerly known as *E. granulosus* cattle strain respectively) is endemic (Fig. 1A) dogs that may have access to carcasses or raw viscera especially from sheep, pigs, cattle or horses (depending on the *Echinococcus* genotypes present locally) should be treated at least every 6 weeks with an effective anthelmintic containing praziquantel or epsiprantel.

In the Central and Eastern European endemic area of *Echinococcus multilocularis* (Fig. 1B) with red foxes as main definitive hosts and voles as intermediate hosts, dogs that have access to rodents should be treated at four weekly intervals with an effective anthelmintic containing praziquantel or epsiprantel (see www.esccap.org). Cats, in contrast to dogs, are epidemiologically insignificant as sources of egg output as they are poor hosts for this worm. Although they do sporadically acquire infection and occasionally pass eggs. In contrast to dogs, where it is common to find eggs in the fur of infected animals, no eggs have been recovered to date from the coat of an infected cat. Since there is a small risk of cats carrying an infection, it is reasonable to recommend treatment in high risk situations, for example prior to entry into countries where the infection is not present.

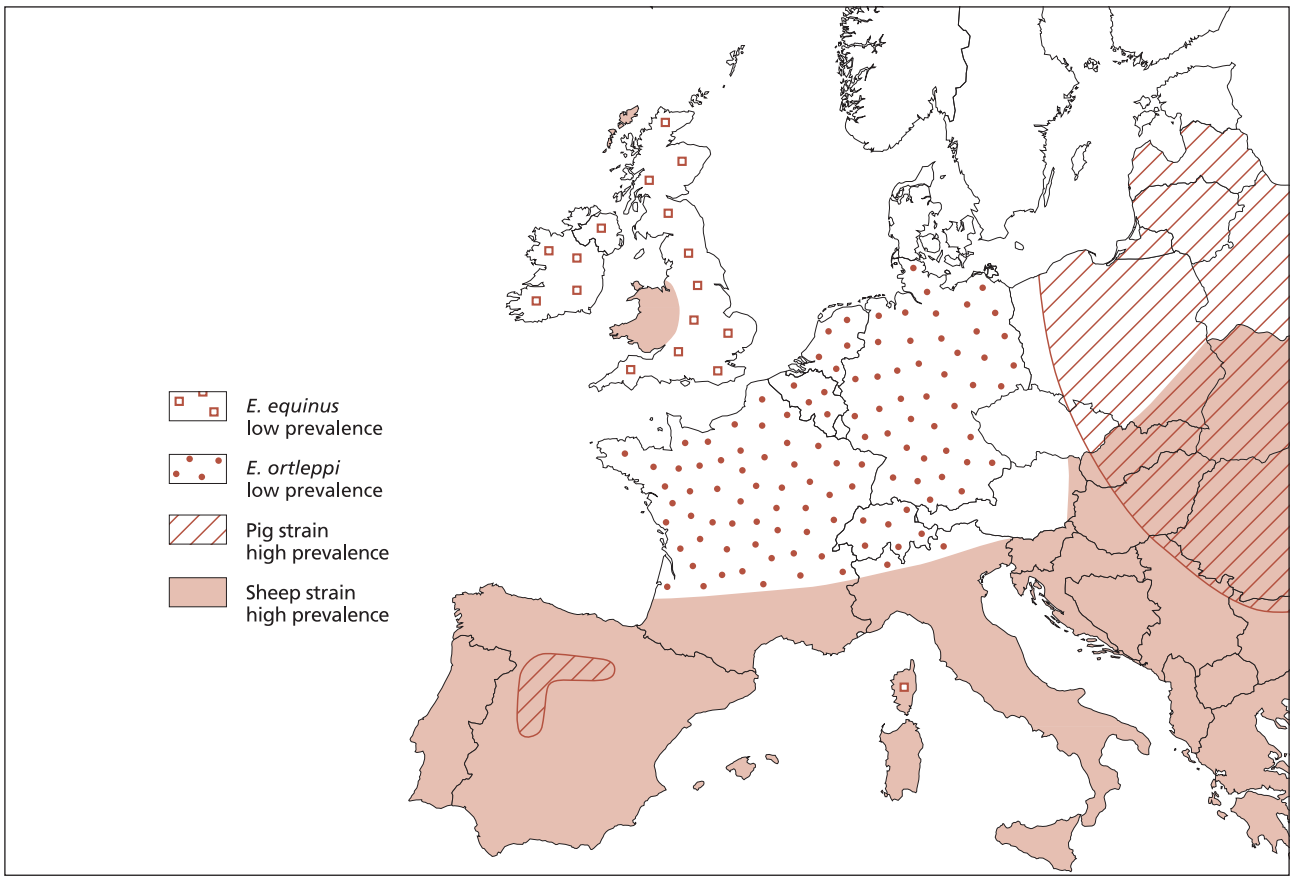

Fig. 1A Summary of distribution of *Echinococcus granulosus* and related species in Europe

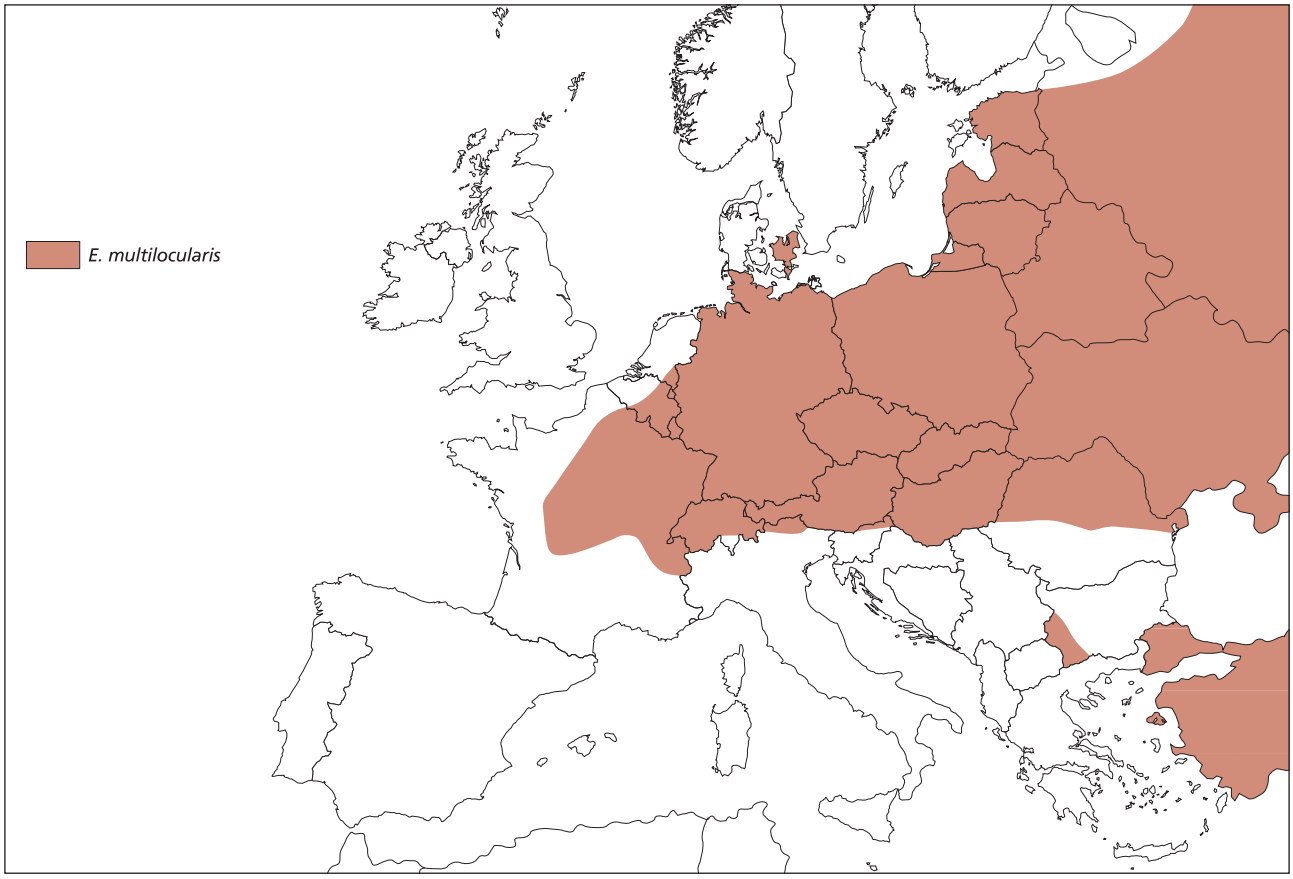

Fig. 1B Distribution of *Echinococcus multilocularis* in the fox in Europe

Specific diagnosis of *Echinococcus* infections in definitive hosts is difficult as the taeniid-eggs cannot be differentiated morphologically and are passed intermittently.

Coproantigen tests are not available commercially and Polymerase Chain Reaction tests (PCRs) for species and/or genotype identification are only performed in specialised laboratories. Therefore, in *Echinococcus* endemic areas taeniid-infections based on egg detection should be handled as potential *Echinococcus* infection. Where animals are infected with *Echinococcus* species, it is advisable that they are treated under the supervision of a veterinarian on two consecutive days with a highly effective anthelmintic and that the dogs are shampooed to remove any parasite eggs adhering to the coat. The personnel involved should use suitable protective clothing such as protective gloves and a mask.

2.3. Heartworm & Subcutaneous Worm (*Dirofilaria immitis & D. repens*) Areas

2.3.1. *Dirofilaria immitis*

Heartworm infection (*Dirofilaria immitis*) is endemic in many southern and eastern European countries (Fig. 2) and infection has now been reported in Hungary. Climatic changes favourable to parasite development and the increasing number of pets that travel have increased the risk of infection for dogs and cats. More information about heartworm infection in dogs and cats can be found in ESCCAP Guideline 5: Control of Vector-Borne Diseases in Dogs and Cats at www.esccap.org.

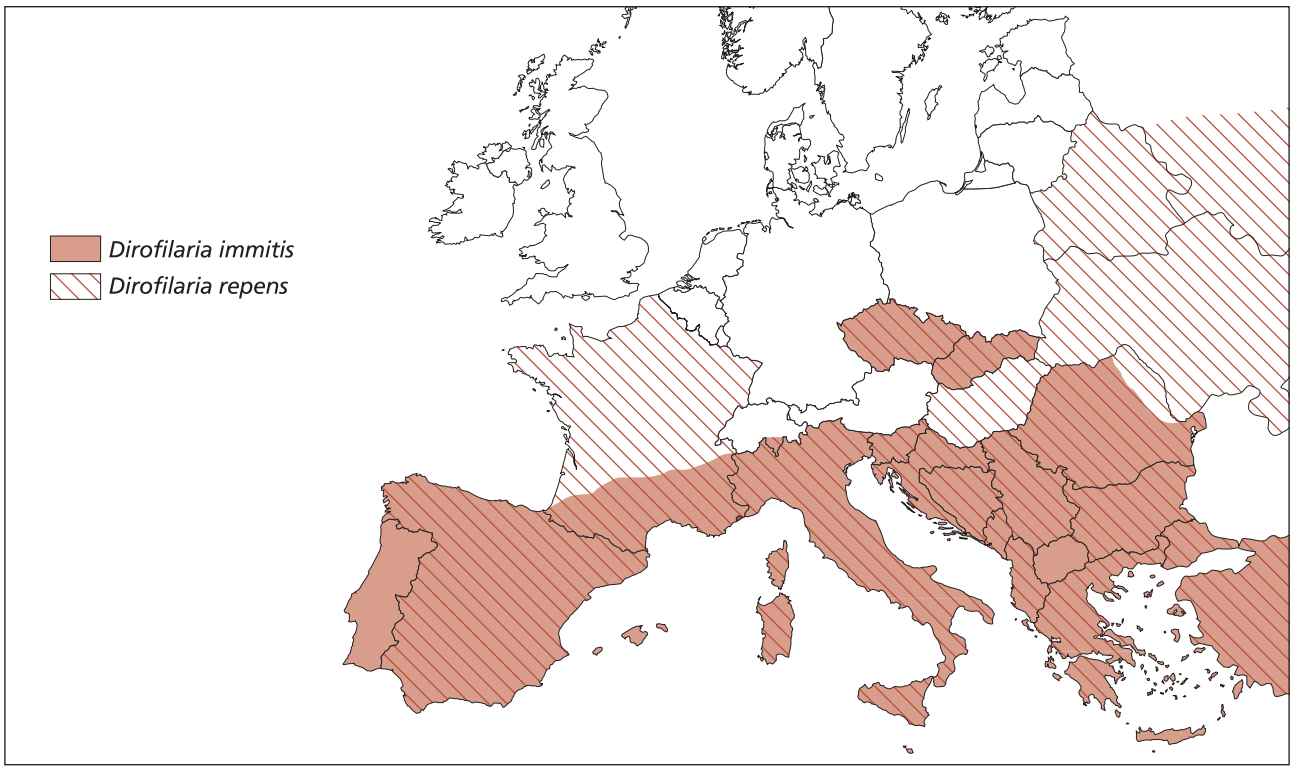

Fig. 2 Distribution of *Dirofilaria immitis* and *Dirofilaria repens* in Europe

Currently there are no repellents/insecticides that have been demonstrated to prevent transmission of heartworm, therefore control in dogs and cats depends on the use of heartworm preventive treatments that kill the young heartworm stages prior to their migration towards the heart. Using appropriate products, adult heartworm infection can be effectively prevented. In most parts of Europe where infection is endemic, the transmission season of heartworm infection generally lasts from April to October. Puppies and kittens have to be placed on preventive heartworm treatment as soon as possible after birth (consistent with label recommendations). Most heartworm preventive anthelmintics have the potential to control a range of other worms, so an appropriate product should be chosen to control other helminths as required, supplemented as necessary by additional product or products. In addition, treatment can be extended throughout the year to ensure the continued control of non-seasonal parasites such as *Echinococcus* spp. and *Toxocara* spp., where

necessary. See ESCCAP Guideline 5: Control of Vector-Borne Diseases in Dogs and Cats for more details about heartworm.

2.3.2. *Dirofilaria repens*

D. repens can infect both dogs and cats. Most infections are asymptomatic, though cold, painless nodules containing the adult parasites can be found in the skin of infected animals. Seldom, in cases of heavy infection or in sensitised animals, a mild to severe dermatitis can be observed. Most cases of zoonotic *Dirofilaria* infections in Europe are caused by this species. The distribution of *D. repens* is shown in Fig. 2. In addition there are now some individual case reports of transmission in Germany, the Netherlands, Poland and Austria. See ESCCAP Guideline 5: Control of Vector-Borne Diseases in Dogs and Cats for more information.

3. OTHER IMPORTANT PARASITES

3.1. Other Tapeworms: *Dipylidium caninum* and *Taenia* spp.

Infection of the intermediate host occurs by ingestion of tapeworm eggs in proglottids passed in the faeces of the final host.

3.1.1. *Dipylidium caninum*

Dipylidium caninum are rarely associated with clinical signs in the dog or cat. This tapeworm of dogs or cats has the flea or the canine chewing louse as its intermediate host. Infection occurs as a result of ingesting infected insects. Rarely the adult tapeworm may establish in humans. The prepatent period is approximately three weeks. Treatment is with an effective anthelmintic (www.esccap.org) and control is effected by controlling fleas or lice.

3.1.2. *Taenia* species

Taenia spp. are rarely associated with clinical signs in the dog or cat, although the mature segments leaving the anus may result in anal irritation and cause an animal to rub its bottom along the ground. Owners may notice motile segments crawling on the animal's coat after leaving the anus. The effects on the intermediate host may be more profound. *Taenia taeniaeformis*, the species that occurs in cats, uses rodents as intermediate hosts. The intermediate hosts of the various *Taenia* species found in dogs are shown in Table 1.

Table 1: Summary of *Taenia* spp. found in dogs and foxes

Final hosts	**DOG**			**DOG AND FOX**		
Species	***Taenia multiceps***	***Taenia serialis***	***Taenia crassiceps***	***Taenia pisiformis***	***Taenia hydatigena***	***Taenia ovis***
Pre-patent period (approx. in weeks)	6	-	4 - 6	6-8	7-10	6-8
Intermediate host	Sheep and cattle	Rabbits	Rodents	Rabbits	Sheep, cattle and pigs	Sheep and goats
Intermediate stage and site	*Coenurus cerebralis* brain and spinal cord	*Coenurus serialis* connective tissue	*Cysticercus longicollis* in body cavities or subcutaneous tissue	*Cysticercus pisiformis* abdomen or liver	*Cysticercus tenuicollis* abdomen or liver	*Cysticercus ovis* muscle

Dogs or cats are infected when they eat tissues or viscera of infected hosts. The prepatent period for *Taenia* spp. ranges from about 4 – 10 weeks in dogs (depending on species) and is approximately 5 - 10 weeks for *Taenia taeniaeformis* in cats. In the case of *T. taeniaeformis*, the intermediate hosts are small rodents that are infected when they ingest eggs present in the environment. Patency can last for several months up to several years, for example *T. ovis* can be patent for up to 5 years.

3.2. Other Nematodes: Hookworms, *Angiostrongylus vasorum*, & *Trichuris vulpis*

3.2.1. Hookworms

Hookworms are small nematodes characterised by large mouthparts that are at an angle to the rest of the worm, hence the common name. There are three species of significance in Europe: *Ancylostoma caninum* (dogs) *Ancylostoma tubaeforme* (cats) and *Uncinaria stenocephala* (dogs and rarely cats).

The adult worms inhabit the small intestine and have a direct life cycle with eggs passed in the faeces developing to third stage larvae (L3) in the environment. When these are ingested they develop within 2 – 3 weeks to adult worms. Hookworms, most notably *Ancylostoma* spp. larvae, are capable of penetrating skin and thus making their way to the intestine. It is unlikely that this route of infection contributes greatly to the *U. stenocephala* life cycle.

All species feed by grasping the intestinal mucosa with their mouthparts and damage the surface to obtain nutrients: largely blood in the case of *Ancylostoma* spp. and plasma protein for *U. stenocephala*.

U. stenocephala is known as the northern hookworm, tolerates colder climates than *A. caninum* and is found throughout Europe. *A. caninum* is found predominantly in central and southern Europe and *A. tubaeforme* is found throughout Continental Europe.

Ancylostoma species can cause significant anaemia when present in numbers or over a period of time. Lactogenic transmission of larvae by *A. caninum* can result in acute anaemia and death of young pups. *Uncinaria* spp. are less pathogenic.

Immunity develops after exposure, but is unlikely to be absolute. Infection thrives best where animals have access to outdoor environments such as runs in kennels. Diagnosis is based on identifying hookworm eggs in faeces.

Treatment and control can be achieved with regular anthelmintic treatment: see www.esccap.org for details of licensed anthelmintics available in each country.

3.2.2. *Angiostrongylus vasorum*

A. vasorum is a nematode that resides as the adult stage in the pulmonary arteries and the right side of the heart in dogs and other carnivores (excluding cats). Clinical manifestations of *A. vasorum* infection in dogs are variable. Naturally infected asymptomatic dogs are reported, but respiratory signs induced by verminous pneumonia are frequent. Coagulopathies with bleeding disorders, neurological, gastrointestinal or non-specific signs such as anorexia and exercise intolerance may occur. Infection may lead to sudden death due to obstruction of the pulmonary or other important arteries or heart failure.

The distribution of *A. vasorum* includes endemic areas in several European countries. However former reports of isolated endemic foci are being increasingly replaced by the description of larger endemic areas, involving dogs and wildlife. Foxes in particular are considered an important reservoir, but also wolves, European otters, badgers and ferrets can be sources of infection as can the coyote and jackal (cats are not affected).

Like other metastrongylids, the life cycle of *A. vasorum* includes many species of slugs and snails as intermediate hosts. Dogs may acquire infection through ingestion of frogs or other amphibians acting as paratenic hosts.

Following ingestion of L3 by a dog, larvae develop and migrate to the right side of the heart and pulmonary artery. Female worms begin laying eggs from 38-60 days after infection. Eggs hatch rapidly and larvae penetrate the alveoli, are coughed up and excreted in faeces as first stage larvae (L1). Once an infection is established, patency is very long – possibly lifelong if left untreated.

There are a wide variety of presentations:

In early infections, coughing (may be harsh and dry), dyspnoea, anaemia, depression, anorexia, and signs of

coagulopathy e.g. melaena, haemoptysis, prolonged bleeding from minor injuries and subcutaneous haematomas may be seen. In severe infections right sided heart failure and even sudden death may occur.

In chronic infection, verminous pneumonia can develop leading to anorexia and weight loss, emaciation and pulmonary hypertension.

Occasionally larvae and rarely adult stages of *A. vasorum* are located in ectopic locations such as brain, bladder, kidney or the anterior chamber of the eye. This may result in clinical signs related to invasion of these organs.

Anthelmintic therapy includes use of macrocyclic lactone based anthelmintics or repeated daily administration of benzimidazole based anthelmintics (5 days to several weeks). Administration of macrocyclic lactone based products has been shown to be effective. Supportive treatment, with antibiotic and glucocorticoid based products may be needed in severe clinical cases and the animal should be rested during the treatment period (at least 2-3 days). See www.esccap.org for specifically indicated anthelmintics.

3.2.3. *Trichuris vulpis*

Trichuris vulpis can cause disease in dogs, but heavy infection tends to be localized to geographic areas or specific premises such as a kennels. It is most likely to occur in central and southern parts of Europe where temperatures are most suitable for the environmental development of eggs. Considerable and persistent contamination of the environment can occur with infective eggs. Control can therefore be difficult, as dogs may become re-infected if they remain in the same environment.

Eggs are passed in the faeces of infected dogs and the L1 develops within the egg in 1-2 months. No development occurs below 4ºC. The larvae are protected by the egg shell and can survive in the environment for years. Dogs are infected when they eat eggs containing infective larvae (L1). The pre-patent period is 2 - 3 months and infected dogs may continue to shed eggs for up to a year.

A heavy infection will result in diarrhoeic bloody, mucus-filled faeces and ultimately, the animal will no longer be able to compensate and will become acutely ill. Metabolic disturbance including hyponatraemia may be seen.

Infection can be diagnosed by finding characteristic "lemon-shaped" eggs in faeces.

Control depends on removing dogs where possible from the contaminated environment and repeated anthelmintic treatment. Since the eggs are difficult to eliminate from the environment it may be necessary to pave or plough affected areas. See www.esccap.org for therapies with specific indications for *T. vulpis*.

4. TREATMENT REGIMENS

4.1. Consideration of Pet Health and Lifestyle Factors

Animals require care tailored to their individual needs. Certain factors may dictate more intensive monitoring and/or treatment, whilst others may suggest a less aggressive approach. When recommending a parasite management programme, veterinarians should consider the following (see tables 2A-C and 4 for more details).

- Animal:

  Age: puppies, kittens and geriatric animals are at greater risk than healthy adults

  Reproductive status: pregnant and lactating bitches (pregnant bitches may pass *Toxocara canis* larvae to the foetus *in utero* and to their sucking pups in their milk; lactating bitches can also pass *A. caninum* infections to their pups via their milk and lactating queens may also pass *T. cati* in their milk to sucking kittens. It is also the case that pregnant or lactating bitches often have patent *T. canis* infections)

  Health status: including ectoparasite infection

  History: including travel

- Environment:

  Dogs: in kennels, living outdoors, living with other dogs or cats or stray dogs and hunting dogs may be at greater risk of acquiring parasites and may require special consideration

  Cats: in catteries, stray or feral cats and cats living with other cats or dogs may be at greater risk of acquiring parasites and may require special consideration

- Nutrition

  Dogs and cats with access to rodents, slugs and snails, raw fish and raw meat including viscera, placenta or aborted foetuses may be at risk of acquiring specific parasites

- Location and travel

  Dogs and cats living in or travelling to specific geographic areas (e.g. for holidays or relocation, boarding facilities, shows and field trials), may be at increased risk of acquiring infections that occur in those areas. Non-endemic diseases can be a diagnostic challenge for veterinarians who are unfamiliar with them

4.2. Resistance to Anthelmintics

To date there are few proven cases of anthelmintic resistance in dogs and cats. At present there is no way of detecting anthelmintic resistance in dogs or cats other than the faecal egg-count reduction test. It is desirable that more sensitive tests including molecular techniques are developed to allow monitoring of continued efficacy.

Traditional anthelmintic treatment of dogs and cats has always left many parasite stages outside the final host that are unselected for resistance by treatment. If the frequency of anthelmintic treatments increases, then this could increase the selection pressure for resistance and is most likely to occur in the case of the kennel situation, where there may be simultaneous treatment of a group of dogs or cats with the same product. It is therefore recommended that careful consideration should be given to worm control programmes for dogs in a kennel situation and faecal monitoring should be conducted regularly to identify worm species present and the effectiveness of any control programme.

The faecal egg count reduction test can be used to assess the effectiveness of treatment against nematode infections: a faecal sample is taken at or before the time of treatment and a second faecal sample collected approximately two weeks later. Faecal egg counts are performed on both samples, and if treatment is effective a reduction in faecal egg count of 90% or more would be expected with most anthelmintics. Care should be taken to identify and eliminate false positive results caused by coprophagia.

5. DIAGNOSIS OF HELMINTH INFECTIONS

Patent infections of all of the worms mentioned can be identified by faecal examination, except for *D. immitis* and *D. repens* where a blood sample is examined for microfilariae, antigens or antibodies (cats only) (Tables 6 and 7). Faecal examination for worm eggs should be carried out with at least 3 – 5 g faeces and can be carried out using a modified McMaster or other flotation technique (Tables 6 and 7).

Eggs of ascarids, hookworms, *Trichuris* and taeniids are easily recognizable. In some cases, worm burden can be crudely estimated from the number of eggs present in the sample. However, it should be noted that for ascarids such as *Toxocara*, a negative correlation between fecundity per worm and number of adult worms has been reported. Since dogs and cats may ingest or eat faeces, care should be taken to identify and eliminate false positive results caused by coprophagia.

Where larvae (L1) are produced (lungworms and *A. vasorum*), faecal samples should be examined using the Baermann technique (Tables 6 and 7). For *A. vasorum* faeces are sampled on 3 consecutive days due to large daily variation in larval excretion. Faeces should be collected from a fresh sample and should not be collected from the ground in a kennel or run. Larvae may be numerous and may be coiled or very active. Differentiation

of the metastrongylid L1 is based on size measurements and morphology of the tail. Repeat samples can be examined approximately 7 – 10 days after the first day of treatment with benzimidazoles such as fenbendazole, or three weeks after treatment with macrocyclic lactones such as moxidectin or milbemycin, to check that treatment has resulted in the removal of adult worms. Where larvae remain present then continued monitoring up to three weeks is recommended, with treatment repeated as necessary. Dogs clinically affected by angiostrongylosis should be further investigated to evaluate pulmonary and circulatory status, and clotting parameters. Serology and detection of circulating antigens or DNA are tests under development, but not yet commercially available.

6. PREVENTING ZOONOTIC INFECTION

6.1. Owner Considerations in Preventing Zoonotic Diseases

Important preventive measures for pet owners include:

- practicing good personal hygiene, particularly washing hands after handling pets and before eating food
- controlling pet parasite infections through repeated treatments and/or regular diagnostic testing
- preventing infection by reducing, where possible, the risk of the pet acquiring infection
- cleaning up pet faeces regularly to reduce environmental contamination with infective parasite stages. Don't dispose of the faeces or cat litter in recyclable waste or compost
- minimizing exposure of children in particular to potentially contaminated environments and teaching them good personal hygiene. Keep their nails short
- grooming dogs regularly to minimise the risk of coat contamination with worm eggs

People in contact with animals that may transmit zoonotic parasites should be advised of the risks and made aware that health risks generally increase with conditions such as pregnancy, underlying other illnesses or immunosuppression. This information should be made available through physicians and veterinarians, without a need for a medical history of the client and his/her family.

In this respect special care should be taken in the case of:

- immunocompromised individuals such as:

  elderly people, diabetics, people with HIV-infection, patients undergoing immunosuppressive chemotherapy, organ transplantation, or treatment for autoimmune diseases
- other susceptible groups such as:

  pregnant women, babies and toddlers and the mentally handicapped
- people with specific occupational risk such as farmers, kennel workers and hunters

6.2. Staff, Pet Owner and Community Education

Protocols for the control of parasitic infection should be communicated to veterinary and para-veterinary staff and consistently applied. Awareness of parasitic zoonoses, including clinical manifestations in people and particularly children, should be created as a minimum in the medical profession through information brochures. Cooperation between the medical and veterinary profession should be encouraged wherever possible and its benefits underlined in case of zoonoses.

Pet owners should be informed about the potential health risks of parasitic infection, not only to their pets but also to family members and all people living within the action radius of their pets. Brochures in veterinary practices, pet shops, posters or specific websites are useful tools to facilitate this. Regular deworming or joining "pet health-check programmes" should be made clear to the general public by veterinary surgeons, veterinary nurses and other animal health professionals (e.g. by wearing clear coloured fobs associated with a calendar year). Responsible dog and cat ownership can remove public health concerns.

7. MORE INFORMATION

Additional information and resource materials can be obtained at www.esccap.org.

Table 2A: Characteristics of major worms of dogs in Europe: intestinal nematodes

Worm species	Pre-patent period	Patent period	Infective stages and route of infection	Distribution in Europe	Final hosts
Roundworms or ascarids					
Toxocara canis	Variable, typically 21 days after prenatal infection; 27 – 35 days after lactogenic infection; 32 – 39 days after ingestion of eggs	4 – 6 months except where immunity intervenes, for example in pups	Ingestion of embryonated eggs from soil or on fur, larvae in milk or paratenic hosts. *In utero* from dam	Everywhere	Dogs and foxes
Toxascaris leonina	About 8 weeks	4 – 6 months	Ingestion of embryonated eggs from soil or larvae from paratenic hosts	Everywhere	Dogs, cats and foxes
Hookworms					
Ancylostoma caninum	2 – 3 weeks	Can be prolonged depending on immune status (7 months to 2 years)	Ingestion of L3 from environment, larvae in bitches' milk or paratenic hosts. Percutaneous infection of larvae	Predominantly southern Europe, sporadic in northern Europe	Dogs and foxes
Uncinaria stenocephala	3 – 4 weeks	Can be prolonged depending on immune status	L3 orally from environment	Predominantly central and northern Europe	Dogs and foxes (and cats)
Threadworms or *Strongyloides*					
Strongyloides stercoralis	Variable, from 9 days	Several months (3 – 15 months)	Larvae from environment percutaneously. Orally through milk	Everywhere but more predominant in the southern Europe	Dogs (and humans and cats)
Whipworm					
Trichuris vulpis	8 weeks	Up to 18 months	Ingestion of embryonated eggs from the environment	Everywhere but most predominant in central and southern Europe	Dogs

Table 2B: Characteristics of major worms of dogs in Europe: tapeworms (cestodes)

Worm species	Pre-patent period	Patent period	Infective stages and route of infection	Distribution in Europe	Final hosts
Tapeworms					
Taenia spp.	4 – 10 weeks	Months up to several years	Ingestion of larval stages in intermediate host (cysticercus or coenurus)	Everywhere	Dogs and foxes (and cats)
Mesocestoides spp.	4 – 10 weeks	Several years	Ingestion of larval stages in meat or tissues of prey	Everywhere	Dogs, cats and foxes
Dipylidium caninum	3 weeks	Several months	Ingestion of larval stages in fleas or lice	Everywhere	Dogs, cats and foxes
*Echinococcus granulosus complex**	45 days	Several months	Ingestion of larval stages in intermediate hosts (herbivores and omnivores)	See map (Fig.1A)	Dogs
Echinococcus multilocularis	28 days	Several months	Ingestion of larval stages in intermediate hosts (rodents)	See map (Fig.1B)	Foxes, dogs, racoon dogs (and cats)

*: There are different species and strains: *E. ortleppi* (cattle), *E. equinus* (horse), sheep-, pig-, cervid- and other strains, see Fig. 1A for distribution.

Table 2C: Characteristics of major worms of dogs in Europe: non-intestinal nematodes

Worm species	Pre-patent period	Patent period	Infective stages and route of infection	Distribution in Europe	Final hosts
Heartworm					
Dirofilaria immitis	6-7 months	Several years	L3 transmitted by mosquito vector (intermediate host). Cutaneous infection	Portugal, Spain, South of France, Italy, Greece, Croatia, Bosnia, Czech Republic and Turkey (Fig.2)	Dogs (and cats)
French heartworm					
Angiostrongylus vasorum	40 – 49 days	Up to 5 years	Larvae within mollusc or paratenic host, infection orally	Everywhere in endemic foci	Foxes and dogs
Lungworms					
Oslerus osleri	10 weeks	Unknown	Direct oral transmission from bitch to pups	Everywhere sporadically	Foxes and dogs
Filaroides hirthi	10 - 18 weeks	Unknown	Unknown	Everywhere sporadically	Dogs
Capillaria spp.	4 weeks	10 – 11 months	Ingestion of larvae from environment or via earthworms	Everywhere	Foxes dogs and cats
Crenosoma vulpis	3 weeks	Up to 10 months	Larvae within mollusc or paratenic host, infection orally	Everywhere	Dogs and foxes
Subcutaneous worms					
Dirofilaria repens	27 – 34 weeks	Several years	L3 transmitted by mosquito vector (intermediate host). Cutaneous infection	Spain, South of France, Italy, Greece, Croatia, Bosnia, Czech Republic, Turkey and Hungary (Fig.2)	Dogs (and cats)
Eye worms					
Thelazia callipaeda	About 3 weeks	Months to years	Arthropod, probably dipteran,vector	Italy, France (Dordogne) and southern Switzerland	Dogs and cats

Table 3: Risk factors for major worms for dogs in Europe

Some dogs are more likely to have parasite infections than others, although the difference is rarely absolute. This table highlights those factors that are likely to increase the likelihood of dogs carrying specific parasites. It has been drawn up on the basis of available understanding, but is not the result of a formal risk assessment. Shaded boxes indicate increased risk.

Worm species	Dog type			Health	Environment		Nutrition			Location and travel
	Pup	Lactating	Stray	Fleas or lice	In kennels	Outdoors	Rodents/ amphibians/ reptiles	Molluscs	Raw meat /viscera	
INTESTINAL WORMS										
Ascarids										
Toxocara canis	■	■	■		■	■	■		■	
Toxascaris leonina			■		■	■	■			
Hookworms										
Ancylostoma caninum	■	■	■		■	■				More in southern Europe
Uncinaria stenocephala	■		■		■	■				
Threadworms (Strongyloides)										
Strongyloides stercoralis	■	■			■	■				
Whipworm										
Trichuris vulpis					■	■				
Tapeworms										
Taenia spp.			■			■	■		■	
Mesocestoides spp.						■	*			
Dipylidium caninum			■	■	■					
*Echinococcus granulosus***			■						■	
Echinococcus multilocularis			■			■	■			Central and northern Europe

* rodents and other prey
** There are different species and strains: *E. ortleppi* (cattle), *E. equinus* (horse), sheep-, pig-, cervid- and other strains, see Fig. 1A for distribution.

Table 3: Risk factors for major worms for dogs in Europe (continued)

Shaded boxes indicate increased risk.

Worm species	Dog type			Health	Environment		Nutrition			Location and travel
	Pup	Lactating	Stray	Fleas or lice	In kennels	Outdoors	Rodents/ amphibians/ reptiles	Molluscs	Raw meat /viscera	
NON-INTESTINAL WORMS										
Heartworm										
Dirofilaria immitis						■				Portugal, Spain, South of France, Italy, Greece, Croatia, Bosnia, Czech Republic and Turkey (Fig. 2)
French heartworm										
Angiostrongylus vasorum						■	■	■		
Lungworms										
Oslerus osleri					■					
Filaroides spp.	■				■					
Capillaria spp.			■			■				
Crenosoma vulpis			■			■		■		
Sub-cutaneous worms										
Dirofilaria repens			■			■				Spain, South of France, Italy, Greece, Croatia, Bosnia, Czech Republic,Turkey and Hungary (Fig. 2)

Table 4: Characteristics of major worms of cats in Europe: nematodes and tapeworms (cestodes)

Worm species	Pre-patent period	Patent period	Infective stages and route of infection	Distribution in Europe	Final hosts
INTESTINAL WORMS					
Roundworms or ascarids					
Toxocara cati	Variable, usually around six weeks after ingestion of eggs	4 – 6 months	Ingestion of embryonated eggs from soil, larvae in milk or paratenic hosts	Everywhere	Cats
Toxascaris leonina	About 13 weeks	4 – 6 months	Ingestion of embryonated eggs from soil, larvae from paratenic hosts	Everywhere	Dogs, cats and foxes
Hookworms					
Ancylostoma tubaeforme	2 – 3 weeks	Can be prolonged depending on immune status	Primarily ingestion of larvae from soil. Some percutaneous infection	Continental Europe	Cats
Uncinaria stenocephala	3 – 4 weeks	Can be prolonged depending on immune status	Ingestion of larvae from soil	Predominantly northern Europe	Dogs, foxes (and cats)
Tapeworms					
Taenia taeniaeformis	5 – 10 weeks	Several years	Ingestion of larvae in rodents	Everywhere	Cats
Mesocestoides spp.	4 – 10 weeks	Several years	Ingestion of larval stages in meat or tissues	Everywhere	Cats, dogs and foxes
Dipylidium caninum	3 weeks	Several months	Ingestion of larval stages in fleas or lice	Everywhere	Dogs, cats and foxes
Echinococcus multilocularis	28 days	Several weeks	Ingestion of larval stages in intermediate hosts (rodents)	See map (Fig.1B)	Foxes, dogs, racoon dogs (and cats)
NON-INTESTINAL WORMS					
Heartworm					
Dirofilaria immitis	about 8 months	Rarely occurs with cats, and usually short	3rd stage larvae transmitted by mosquito vector (intermediate host)	Portugal, Spain, South of France, Italy, Greece, Croatia, Bosnia, Czech Republic and Turkey (Fig. 2)	Dogs (and cats)
Lungworms					
Aelurostrongylus abstrusus	7 – 9 weeks	Several years	Larvae in mollusc or paratenic host	Everywhere	Cats
Subcutaneous worms					
Dirofilaria repens	27 – 34 weeks	Several years	3rd stage larvae transmitted by mosquito vector (intermediate host)	Spain, South of France, Italy, Greece, Croatia, Bosnia, Czech Republic, Turkey and Hungary (Fig. 2)	Dogs (and cats)
Eye worms					
Thelazia callipaeda	About 3 weeks	Unknown	Arthropod, probably dipteran, vector	Italy and southern Switzerland	Dogs and cats

Table 5: Risk factors for major worms of cats in Europe

Some cats are more likely to have parasite infections than others, although the difference is rarely absolute. This table highlights those factors that are likely to increase the likelihood of cats carrying specific parasites. It has been drawn up on the basis of available understanding, but is not the result of a formal risk assessment. Shaded boxes indicate increased risk.

Worm species	Cat type			Health	Environment		Nutrition			Location and travel
	Kitten	Lactating	Stray	Fleas or lice	In cattery	Outdoors	Rodents/ amphibians or reptiles	Molluscs	Raw meat /viscera	
INTESTINAL WORMS										
Roundworms or ascarids										
Toxocara cati	■	■	■		■	■	■		■	
Toxascaris leonina			■			■				
Hookworms										
Ancylostoma tubaeforme	■	■	■		■					Continental Europe
Uncinaria stenocephala			■							
Tapeworms										
Taenia taeniaeformis			■				■			
Mesocestoides spp.							■			
Dipylidium caninum			■	■	■					
Echinococcus multilocularis			■				■			Central Europe
NON-INTESTINAL WORMS										
Heartworm										
Dirofilaria immitis						■				Portugal, Spain, South of France, Italy, Greece, Croatia, Bosnia, Czech Republic and Turkey (Fig. 2)
Lungworm										
Aelurostrongylus abstrusus			■			■	■	■		■

Table 6: Worm infection of dogs: main clinical signs and diagnosis

Worm infection	Clinical signs	Material	Diagnosis
INTESTINAL NEMATODES			
Toxocara canis	Low burden asymptomatic, higher burden may appear as cachexia and pot-bellied appearance in pups. Large number of worms may cause intestinal blockage or intussusception	3 - 5 g faeces (fresh or fixed)	Egg detection by flotation
Toxascaris leonina	Mostly asymptomatic	3 - 5 g faeces (fresh or fixed)	Egg detection by flotation
Hookworms: *Ancylostoma caninum, Uncinaria stenocephala*	Diarrhoea, bloody diarrhoea in the case of *A. caninum*, weight loss and anaemia. May be acute or chronic signs	3 - 5 g faeces (fresh or fixed)	Egg detection by flotation
Trichuris vulpis	Asymptomatic but heavy infections associated with anaemia, diarrhoea and weight loss	3 - 5 g faeces (fresh or fixed)	Egg detection by flotation
TAPEWORMS			
Taenia spp, including *T. hydatigena, T. multiceps, T. ovis* and *T. pisiformis*	Asymptomatic	Proglottids in faeces	Proglottids grossly visible with only one genital pore. Taeniid eggs in faeces (see *Echinococcus* below for methods of distinguishing taeniid eggs)
Dipylidium caninum	Mostly asymptomatic, anal pruritus	Proglottids in faeces	Proglottids similar in size to *Taenia* spp. proglottids but morphologically distinct as they have two genital pores. Eggs within proglottids are grouped in egg packets. These can be seen microscopically in faecal samples
Echinococcus granulosus, E. multilocularis	Asymptomatic	At least 4 g faeces. Freezing faeces at -80° C kills eggs	Morphology and size of proglottids. Egg detection with flotation, sedimentation or combined techniques (not very sensitive and taeniid eggs cannot be differentiated morphologically). Coproantigen detection enables detection of prepatent infections 10 days p.i.. Sensitivity more than 90% if more than 50 worms are present, less if under 50 worms*. PCR/sequencing allows species identification (from isolated eggs or proglottids)*

*In specialised laboratories only ** ethylenediaminetetraacetic acid p.i. post infection

Table 6: Worm infection of dogs: main clinical signs and diagnosis (continued)

Worm infection	Clinical signs	Material	Diagnosis
HEARTWORM			
Dirofilaria immitis	Low worm burdens asymptomatic. First clinical manifestation 5-7 months p.i. loss of condition, dyspnoea, cough. Chronic disease cough, tachycardia. "Caval syndrome": tachypnoea	2-4 ml EDTA blood 1 ml serum or plasma	Detection of microfilariae from 6.2 month p.i.. Detection improved by concentration of microfilariae with Difil-Test or Knott's Test. Microfilariae can be speciated using morphological, biochemical or molecular species identification*. Circulating antigens* (from 5 months p.i.) (sensitivity around 90% if 1 female worm or approximately 100% if more are present)
FRENCH HEARTWORM			
Angiostrongylus vasorum	Often asymptomatic, cardiovascular and respiratory symptoms: cough dyspnoea, coagulopathy (eg subcutaneous haematomas anaemia), neurological symptoms	Fresh faeces (at least 4 g) or bronchial lavage fluid	Detection of live larvae from fresh faeces using the Baermann method, or microscopic detection of larvae in bronchial lavage material
LUNGWORMS			
Crenosoma vulpis, Oslerus osleri, Filaroides spp.	Respiratory symptoms coughing and possibly exercise intolerance	Fresh faeces (at least 4 g) or bronchial lavage fluid	Detection of live larvae from fresh faeces using the Baermann method, or microscopic detection of larvae in bronchial lavage material
SUBCUTANEOUS WORMS			
Dirofilaria repens	Mostly asymptomatic, subcutaneous lesions	2-4 ml EDTA blood	Detection of microfilariae from 6.2 months p.i.. Detection improved by concentration of microfilariae with Difil-Test or Knott's Test. Microfilariae can be speciated using morphological, biochemical or molecular species identification*
EYE WORMS			
Thelazia callipaeda	Blepharospasm and epiphora	Material from the surface of the eye	Detection of adult or larval stages from samples of the tear film from the surface of the conjunctiva

*In specialised laboratories only ** ethylenediaminetetraacetic acid p.i. post infection

Table 7: Worm infection of cats: main clinical signs and diagnosis

Worm infection	Clinical signs	Material	Diagnosis
INTESTINAL NEMATODES			
Toxocara cati	Low burden asymptomatic, higher burden may appear as cachexia and pot-bellied appearance in kittens. Large number of worms may cause intestinal blockage or intussusceptions. Occasional pneumonia in kittens	3 - 5 g faeces (fresh or fixed)	Egg detection by flotation
Toxascaris leonina	Mostly asymptomatic	3 - 5 g faeces (fresh or fixed)	Egg detection by flotation
Hookworms: *Ancylostoma tubaeforme, Uncinaria stenocephala*	Diarrhoea, bloody diarrhoea in the case of *A. tubaeforme*, weight loss and anaemia. May be acute or chronic signs	3 - 5 g faeces (fresh or fixed)	Egg detection by flotation
TAPEWORMS			
Taenia taeniaeformis	Asymptomatic	Proglottids in faeces	Proglottids grossly visible: morphology of proglottids particularly that each proglottid has a single genital pore. Taeniid eggs in faecal sample (see *Echinococcus* section for methods to differentiate Taeniid eggs)
Dipylidium caninum	Mostly asymptomatic	Proglottids or eggs in faeces	Proglottids similar in size but morphologically distinct to proglottids of *Taenia* spp. as each proglottid has two genital pores. Eggs within proglottids are grouped within egg packets which can be seen microscopically within faecal samples
Echinococcus multilocularis	Asymptomatic	At least 4 g faeces. Freezing faeces at -80° C kills eggs	Morphology and size of proglottids. Egg detection with flotation, sedimentation or combined techniques (not very sensitive and taeniid eggs cannot be differentiated morphologically). PCR/sequencing allows species identification (from isolated eggs or proglottids)*

*In specialised laboratories only ** ethylenediaminetetraacetic acid p.i. post infection

Table 7: Worm infection of cats: main clinical signs and diagnosis (continued)

Worm infection	Clinical signs	Material	Diagnosis
HEARTWORM			
Dirofilaria immitis	Often worm burdens asymptomatic Initial signs as the worms reach the heart Later disease acute symptoms associated with worm death including cough, tachycardia, tachypnoea	2-4 ml EDTA blood 1 ml serum or plasma	Microfilariae and/or antibody detection. Detection of microfilariae from 8 months p.i. may be negative as levels can be very low in cats. Detection may be improved by concentration of microfilariae with Difil-Test or Knott's Test. Microfilariae can be speciated using morphological, biochemical or molecular species identification*. Antibody tests are sensitive, but can be positive in pre-patent infections which will not develop into a patent infection. Often a definite diagnosis of heartworm infection can only be obtained by a combination of haematological and serological tests in conjunction with thoracic radiography and echocardiography.
LUNGWORMS			
Aelurostrongylus abstrusus	Respiratory symptoms, coughing and possibly exercise intolerance	Fresh faeces (at least 4 g) or bronchial lavage material	Detection of live larvae from fresh faeces using the Baermann method or microscopic detection of larvae in bronchial lavage material
SUBCUTANEOUS WORMS			
Dirofilaria repens	Mostly asymptomatic, cutaneous lesions	2-4 ml EDTA blood	Detection of microfilariae from 6.2 months p.i.. Detection improved by concentration of microfilariae with Difil-Test or Knott's Test. Microfilariae can be speciated using morphological, biochemical or molecular species identification*
EYE WORMS			
Thelazia callipaeda	Blepharospasm and epiphora	Material from the surface of the eye	Detection of adult or larval stages from samples of the tear film from the surface of the conjunctiva

*In specialised laboratories only ** ethylenediaminetetraacetic acid p.i. post infection

APPENDIX 1 - BACKGROUND

ESCCAP (European Scientific Counsel Companion Animal Parasites) is an independent, not-for-profit organisation that creates guidelines and promotes good practice for the control and treatment of parasites in and on companion animals. With the proper advice the risk of diseases and parasitic transmission between animals and humans can be minimized. ESCCAP aspires to see a Europe where companion animal parasites no longer threaten the health and wellbeing of animals and humans.

There is a great diversity in the range of parasites and their relative importance across Europe and the ESCCAP guidelines summarize and highlight important differences which exist in different parts of Europe and, where necessary, specific control measures are recommended.

ESCCAP believes that:

- *Veterinarians and pet owners must take measures to protect their pets from parasitic infections*
- *Veterinarians and pet owners must take measures to protect the pet population from risks associated with travel and its consequent potential to change local parasite epidemiological situations through the export or import of non-endemic parasite species*
- *Veterinarians, pet owners and physicians should work together to reduce the risks associated with zoonotic transmission of parasitic diseases*
- *Veterinarians should be able to give guidance to pet owners regarding risks of parasite infection and diseases and measures which can be taken to minimise these risks*
- *Veterinarians should attempt to educate pet owners about parasites to enable them to act responsibly not only for their own pet's health but for the health of other pet animals and people in their communities*
- *Veterinarians should wherever appropriate utilise diagnostic tests to establish parasite infection status in order to provide the best possible advice*

To achieve these objectives, ESCCAP produces guidelines in different formats:

- *A detailed guideline for veterinary surgeons and veterinary parasitologists*
- *Translations, extracts, adaptations and summarised versions of guidelines which address the varied requirements of European countries and regions*

Versions of ESCCAP guidelines can be found at www.esccap.org.

Disclaimer:

Every effort has been taken to ensure that the information in the guideline, which is based on the authors' experience, is accurate. However the authors and publishers take no responsibility for any consequence arising from the misinterpretation of the information herein nor is any condition or warranty implied. ESCCAP emphasises that national, regional and local regulations must be borne in mind at all times before following ESCCAP advice. All dose-rates and indications are provided for guidance. However, vets should consult individual data sheets for details of locally approved treatment regimens.

ESCCAP

EUROPEAN SCIENTIFIC COUNSEL COMPANION ANIMAL PARASITES

Worm Control in Dogs and Cats

ESCCAP Guideline 01 Second Edition* – September 2010

*This edition supercedes ESCCAP Guideline 01 First Edition

Bayer HealthCare Animal Health

MERIAL

NOVARTIS ANIMAL HEALTH

Intervet Schering-Plough Animal Health

Elanco

ESCCAP Secretariat
The Mews Studio, Portland Road, Malvern,
Worcestershire, WR14 2TA, United Kingdom
Tel: 0044 (0) 1684 568998
Fax: 0044 (0) 5603 102013
Email: esccap@btinternet.com
Web: www.esccap.org

ESCCAP Company No: 5821601 Registered in England and Wales
Registered Office: Granta Lodge, 71 Graham Road, Malvern, Worcestershire, WR14 2JS, United Kingdom

ISBN 978-1-907259-16-6