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Introduction

The control of worms is not as simple as it seems. If it were simple, we would have no problem in controlling worms. The reality however is that breeders often get feedback from new puppy owners that their dogs were found infested with worms despite the fact that these very puppies were dewormed several times. Worm control is also important because worms and giardia together with other pathogens form part of an erosive disease complex. The relevance of this is that failure to control worms adequately, may contribute to increased susceptibility to gastro-enteritis and other diseases in particularly puppies. This newsletter wishes to explain the reasons why worms are difficult to control and suggest measures which may improve matters.

Verminosis (Worm infestation in dogs)

Verminosis refers to the infestation of an animal with worms. Worms are internal parasites and are one of the most common and sometimes most frustrating health problems which dog breeders may encounter. With the odd exception, worms should be considered cosmopolitan. It is important for breeders to understand the lifecycle of worms in order to control them. Reestablishment of the worm infestation in kennel situations is common despite frequent deworming with worm remedies of known efficacy. Factors which aid in this reestablishment will be discussed.

Roundworms (*Toxacara canis* and other *Toxacara* spp)

Roundworms are the most common worms found in dogs. All these roundworm species have a direct lifecycle (therefore they have no secondary host) and all the stages of the worm are found in the gastro intestinal tract of the dog. *Toxacara canis* has a life cycle where the immature stages of the worm (larvae) migrate to the dog's organs and muscles. The adult stages (males and females) of the worms are found in the intestines of dogs. This has important implications for the breeder. The females lay many thousand eggs per day which are excreted with the dog's faeces. The first larval stage develops inside the egg, which can be ingested by other dogs or the same dog. When dogs are infested with roundworm, the larvae hatch from the eggs and migrate (travel) through the gut wall, enter the bloodstream and end up in the organs and muscles of the dogs. The larval stages can survive in the dog's muscles for over a year and remain dormant in these tissues. During pregnancy the larvae become reactivated/"awakened" and by around day 42 of pregnancy the larvae make their way through the placenta into the intestines of the puppies. This type of infestation is termed prenatal infection or transplacental infection. The puppies are therefore born with worm infections. The larvae can also be dormant in the mammary glands of the bitch. In late pregnancy the dormant larvae in the mammary glands become active and find their way into

the bitch's milk and are ingested by puppies nursing on these bitches. Bitches can carry the dormant (somatic) worms in their tissues for many years perpetuating infections in their offspring. Generally the dormant larvae in the tissues are very resistant to single worm remedy treatment protocols, complicating worm control. This means that even if the breeder did deworm the pregnant bitch with an effective dewormer, the worms in the bitch's gut may be controlled but not those worms that were "hiding" in the tissues.

Excretion of the worm larvae into the milk starts within a few days after whelping and reaches a peak during the second week of lactation, before it gradually drops again. This mode of infection is termed trans-mammary or lactogenic transmission of worms from the dam to her puppies. The larvae develop into adults within 3-5 weeks and start producing eggs found in the faeces of the puppies. This results in 4 week old puppies being heavily infested with worms further contaminating their environment leading to a heavy worm burden in all in-contact animals.

Generally roundworm infestation will cause few clinical signs. With heavier worm burdens they may cause vomiting and diarrhoea. In very heavy infestations, worm associated pneumonia may occur as well as obstruction caused by the worms themselves. In very heavy worm burdens, the sudden worm-kill caused by administration of an effective dewormer can cause release of neurotoxins leading to nervous symptoms and convulsions in the puppies. The symptoms usually disappear within a day or two.

Hookworms (*Ancylostoma* spp)

Hookworms are common worms of dogs. Hookworms also have a direct lifecycle, thus worm eggs from infected dogs get passed in faeces and these eggs develop to free living larvae and infect other dogs again. Following hookworm infestation in bitches, larvae also migrate (travel) through the gut wall, enter the bloodstream and end up in the organs and muscles of the dogs. Again these larval stages can survive in the dog's muscles for years in the dormant (immobilised) stage. There is also lactogenic (via milk) transfer of worms from dam to puppies in hookworms but no prenatal infections can occur.

Hookworms are not only transferred by mouth, but can also penetrate the skin. Larvae of hookworms are very sensitive to desiccation and can only survive where there is sufficient dampness. High temperatures are also needed for larvae to become infectious. Hookworms flourish in areas with high rainfall and high temperatures. It is very difficult to control hookworms where puppies are raised on grass, because larvae survive easily in the wet warm grass. The larvae creep up the grass stems and will hook onto the puppies as they make contact with the grass and penetrate their skins.

Hookworm is more likely to result in clinical signs in dogs than do roundworms. The most obvious symptom of heavy hookworm infestation is anaemia, the degree of which depends on severity of infestation, nutritional status and age. Emaciation and weakening can also be seen. Puppies grow poorly, the coat becomes dull and loss of hair is visible. Upset stomachs are common and the faeces often have a slimy, bloody, jelly-like appearance. Deterioration of infected puppies may be very noticeable after weaning.

Treatment and control of worms in dogs

There is a wide range of worm remedies (dewormers) available for dogs. These medications are mostly broad-spectrum remedies, which are effective at treating most known worms in dogs. Breeders need be mindful that not all remedies sold are equally effective. Also, not all remedies are effective against all worm types and larval stages of the worms. This has very important implications for the successful control of worms in dog kennels.

It is well known that single treatment products are not highly effective in the treatment of larval stages of roundworm and hookworm. This means that when the puppy is dewormed and there are numerous worm larvae still migrating in its body which have not yet settled in the intestinal tract, the worm remedy may not kill all those worms. This partially explains why single dose remedies are less effective than multi-dose protocols. Another reason is that following the administration of a single dose dewormer, even in deworming remedies that are considered good, not all the worms will be killed all the time. Research has shown that fenbendazole (the deworming remedy commonly used for sheep and cattle) is effective in killing the larval stages of *Toxocara canis* and *Ancylostoma* spp, which are dormant/reactivated in the muscles of the bitch and can infect the puppies either prenatally or lactogenically. To effectively prevent transmission of these worms from dams to their puppies it is advised that bitches should be treated daily with fenbendazole from day 40 of pregnancy up till 14 days after whelping at a dose of 50 mg per Kg body mass of the bitch.

Deworming program for dogs by ordinary pet owners

Worm control for ordinary pet owners whom have few dogs and do not breed is simple. Following the normal puppy deworming schedule, bi/tri-annual deworming is usually sufficient to keep their dog's worm free. It is recommended that all dogs and cats sharing the premises be dewormed by an effective broad spectrum deworming remedy simultaneously.

Deworming program for dogs in breeding kennels

Deworming in breeding kennels requires a different approach. Kennels usually have large numbers of adult dogs and puppies. If they are roaming freely and there is direct contact with most individuals within the breeding colony the risk for inter-dog worm transmission is increased. Breeders should worm all puppies at 2, 4, 6 and 8 weeks. By around 8 weeks the puppy is likely to be with its new owners and henceforth deworming at each follow up inoculation is advised until 12 weeks. The early deworming will prevent the early worm infections transferred from the dam. The choice of deworming agent depends on area and availability. Breeders should save themselves the embarrassment of selling a puppy to a new owner, only to be reminded a couple of days later that the puppy was "riddled" with worms. It is important that breeders do not rely on deworming medication only to reduce worm infestations. Preventative practises are also just as important in the fight against worms. The most important method is to remove dog faeces regularly from the dog's environment and prevent accumulation of water which aids in worm egg and larvae survival. Provision of camps with cement floors is also very important. Grassy camps are more dog friendly, but nearly impossible to sterilise. As mentioned before, hookworms flourish mainly in the grass camps. Cement floors will drastically decrease the infestation of the environment. Breeders wishing to prevent prenatal and lactogenic worm infestations in puppies may consider the fenbendazole treatment protocol. To some breeders this may be cumbersome

and expensive. Therefore a shortened protocol is used by others involving fenbendazole treatment for only 10 days starting at around day 40 of pregnancy till day 50. This protocol is almost as effective as the longer protocol. Reactivated somatic larvae can only be controlled by these remedies when treated over extended periods and high doses. It is very important that the breeder be aware that these remedies do not work for dormant larvae in the tissues outside pregnancy or lactation. This is because the larvae only become susceptible to the worm remedy when pregnancy followed and lactation has reactivated them. Although research suggests that this treatment is safe for the embryos, breeders must realise that these medications are not registered for this use.

Unsuccessful control of worms

The factors which are conducive to worm re-infestation are crowding, restricted kennel space, wet conditions, constant supply of susceptible puppies, reactivation of dormant larvae in pregnant dams and very high egg shedding by late pregnant dams and especially the puppies, contaminating the kennel environment with very high worm egg burdens. Under these circumstances breeders often become despondent because their dogs are still infested with worms, despite regular treatment with expensive deworming remedies. These breeders will then often suspect that the worms have become resistant to the dewormers they use. This is rarely the case. Re-infestation is the most common cause of apparent failure to control worms. It is also important to realise that no deworming is a 100 % efficacious.. Worm infections can never be totally eradicated by breeders, but at best be controlled. The aim is to control their numbers.

Strategic deworming versus routine deworming

Routine deworming implies deworming at regular intervals e.g. 2-4 times per year. Whilst this may work well for the breeder with a limited number of active breeding bitches, it may prove unsuccessful in the larger establishment. Strategic deworming implies doing regular checks on the faeces by performing egg flotations before and after deworming and amending the deworming regimen accordingly. This establishes whether there is a worm infestation in the first place, which dogs are affected, what type of worms are around, how severe the infestation is and whether the dewormer used is effective or not. It is best to have the faeces from puppies around weaning time and post whelp bitches, examined as those are more likely to show worm eggs. This is because puppies at weaning age and bitches post whelp are the most stressed individuals in the kennel and are therefore most likely to show the worm eggs if there is a problem.

Multi-dose deworming protocol

The most common multi-dose deworming protocol proposed in the literature to both combat worms effectively and to prevent lactogenic and transplacental worm transfer to puppies is the use of fenbendazole. There are various protocols using fenbendazole in the prevention of transplacental and lactogenic infections. The most commonly proposed protocol is the following as given above : Fenbendazole from day 40 of pregnancy up till day 50 at a dose of 50 mg per Kg body mass of the bitch. There are longer protocols (

fenbendazole from day 40 of pregnancy up till 14 days after whelping at a dose of 50 mg per Kg body mass of the bitch) but they are only slightly more efficacious in that they kill a slightly higher percentage of the worms as opposed to the shorter treatment protocol.

Fenbendazole is used in cattle and sheep and popular formulations in liquid form are made for this purpose. Breeders however find its use somewhat cumbersome due to the large volumes that need to be dosed daily. The same manufacturer makes a paste for puppies which is very convenient and cost effective. Breeders however find it costly in larger dogs. Likewise the horse formulation is somewhat expensive.

We have now formulated a paste which is both convenient and cost effective and appropriate for bitches in late gestation . Breeders who are interested in acquiring this product may contact me and our personnel will give you further details, prices and so forth.

Kind regards

Kurt

KIND REGARDS

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