Observations on topical ivermectin in the treatment of otoacariosis, cheyletiellosis, and toxocariosis in cats

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Abstract — The purpose of this study was to observe the efficacy of a topical pour-on formulation of ivermectin in the treatment of otoacariosis, cheyletiellosis, and toxocariosis in cats. Forty-five cats were treated. All cats received 2 to 4 topical applications of ivermectin on the skin between the shoulder blades in a narrow strip, 14 days apart. This practical treatment was effective in 96% (23/24) of cases of feline otoacariosis and in 100% (20/20) of cats with toxocariosis. All cats with cheyletiellosis (16/16) received 4 treatments and had resolution of clinical signs, but one *Cheyletiella* egg could still be found 45 days after the last treatment. The viability of this egg could not be evaluated, but the cats were still free of clinical signs on follow-up 6 months later. The treatment was well tolerated in all the animals. A few cats developed a transient small alopecic area and mild scaling at the site of application of the drug.

Résumé — Observations sur l'application topique d'ivermectine dans le traitement d'otoacarioses, de cheylétielloses et de toxocaroses chez les chats. Le but de cette étude était d'observer l'efficacité d'une forme d'ivermectine à verser dans le traitement d'otoacarioses, de cheylétielloses et de toxocaroses chez les chats. Quarante-cinq chats ont été traités. Tous les chats ont reçu de 2 à 4 applications topiques d'ivermectine sur la peau entre les omoplates, sur une bande étroite, à 14 jours d'intervalle. Ce traitement pratique était efficace dans 96 % des cas (23/24) d'otoacarioses féline et dans 100 % des cas (20/20) de chats atteints de toxocaroses. Tous les chats atteint de cheylétiellase (16/16) ont reçu 4 traitements et les signes cliniques ont disparus, mais un œuf de *Cheyletiella* a quand même été retrouvé 45 jours après le dernier traitement. La viabilité de cet œuf ne pouvait pas être évaluée mais les chats ne présentaient pas de signes cliniques lors d'un suivi 6 mois plus tard. Le traitement a été bien toléré par tous les animaux. Quelques chats ont développé une petite zone alopécique transitoire et une desquamation légère au site d'application de la drogue.

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Introduction

Ivermectin is used commercially for the control of nematode and arthropod parasites in domestic animals. In dogs, ivermectin (Heartgard, Merial Canada, Baie d'Urfé, Québec) is only licensed for the prevention of dirofilariosis at a dosage of 6 µg/kg body weight (BW), PO, once per month. In cats, it is licensed in the United States at the dose of 24 µg/kg BW. Broad spectrum activity against arthropods, such as mites (*Sarcoptes scabei, Notoedres cati, Otodectes cynotis, Cheyletiella* spp., *Demodex canis, Pneumonyssoides caninum*) and gastrointestinal nematodes (roundworms, hookworms and whipworms), can be obtained by using extra-label doses of ivermectin formulations marketed for other species (1–22).

The extra-label formulation of ivermectin most commonly used in dogs and cats for the treatment of endo- and ectoparasites is the injectable propylene glycol based product (Ivomec for cattle, sheep, and swine, Merial Canada). More recently, a 0.5% alcohol-based topical ivermectin formulation has become available for the control of endo- and ectoparasites in cattle (Ivomec Pour-on for cattle, Merial Canada). In cattle, this formulation is poured along the back to penetrate the skin and give systemic drug delivery; a dose of 500 µg/kg BW is needed to achieve the same therapeutic efficacy as with the injectable (SC) formulation used at 200 µg/kg BW (1,23).

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We reported previously the efficacy of the pour-on formulation of ivermectin at 500 µg/kg BW applied twice, topically, 14 d apart, in 90 dogs from a shelter naturally infested with *Sarcoptes scabei* (24). This treatment also resulted in the decrease in nematode counts (ascarids and hookworms) in multiple fecal analyses throughout the study (24).

The purpose of this clinical study was to observe the efficacy of the topical (pour-on) formulation of ivermectin in the treatment of *Otodectes cynotis, Cheyletiella* spp., and *Toxocara cati* in naturally infested cats.

Materials and methods

A total of 45 cats were enrolled in the study. All cats received topical treatments with 0.5% alcohol-based (pour-on) formulation of ivermectin for cattle at the dose of 500 µg/kg BW (0.1 mL/kg). The ivermectin solution was applied in a narrow strip on the skin over the dorsum between the shoulder blades.

Otodectes cynotis

Twenty-four domestic cats (13 males, 11 females) with natural *O. cynotis* ear infestation were included in this part of the study. Thirteen cats were from the University cat shelter and 11 were owned by veterinary students. Ages ranged from 2 mo to 5 y, with a mean age of 10 mo. Mean body weight was 2.2 kg.

Cats received 2 topical treatments with ivermectin 14 d apart, on Days 1 and 15. No other treatment or ear cleaning procedure was allowed during the trial. On Days 1, 15, and 30, all cats were examined with an otoscope and smears of otic exudates mixed with mineral oil were examined under 40X magnification.

Cheyletiella spp.

Sixteen Persian cats (5 males, 11 females) with naturally occurring *Cheyletiella* infestation were included in this part of the study. All cats were from one breeding cattery and were kept exclusively indoors during the treatment period. Ages ranged from 2 mo to 7 y, with a mean age of 2 y. Mean body weight was 3.1 kg.

Cats received 4 topical treatments with ivermectin 14 d apart, on Days 1, 15, 30, and 45. No other treatment or environmental decontamination was performed during the study. On Days 1, 15, 30, 45, and 90, all cats were examined, and a fleacomb was used to collect epidermal debris over the dorsum. Material was placed in a solution of 10% potassium hydroxide and heated for 10–20 min to digest hair and scale. The mixture was stirred and centrifuged. A concentrated sucrose solution was then added to the sediment, a coverslip was applied to the surface of the solution, the samples were again centrifuged, and, finally, the coverslip was transferred to a slide and examined microscopically (40X magnification). Fecal flotations (double centrifugation and use of a concentrated sucrose solution (25)) were performed on Days 1 (16 cats), 15 (15 cats), 30 (15 cats), and 90 (13 cats).

Toxocara cati

Twenty cats (9 males, 11 females) with natural *Toxocara cati* infection were included in this part of the study. Ten were Persian cats also affected with *Cheyletiella* spp and 10 were domestic cats, 5 of which were also affected with *O. cynotis,* from the University cat shelter. Ages ranged from 2 mo to 2 y, with a mean age of 1 y. Mean body weight was 2.6 kg.

Cats received 2 (n = 10) or 4 (n = 10) topical treatments with ivermectin, 14 d apart. The domestic cats were treated on Days 1 and 15, and the Persian cats were treated on Days 1, 15, 30, and 45. Fecal flotations were performed at least twice on all cats: Day 1 (n = 20), Day 15 (n = 19), Day 30 (n = 18), and Day 90 (n = 6).

Results

Otodectes cynotis

On Day 1, all 24 cats had ear pruritus or head shaking and moderate to large amounts of black debris within the ear canals. Live mites were observed in all ears. On Day 15, all 24 cats had improved clinically, based on a decrease in the overall degree of pruritus and/or head shaking, and a lesser amount of exudate was recovered from the ears. Twelve cats had negative smears on Day 15. The remaining 12 cats had an average of 2 dead mites and 1 egg recorded on smears at that time. On Day 30, pruritus had resolved in 23 cats, and no mites or eggs were recovered on microscopic examinations, except in 1 kitten, whose ears were still pruritic and from which 1 egg and 1 dead mite were recovered. That kitten was subsequently treated with parenteral ivermectin and was cured. Follow-up examinations of up to 6 mo failed to reveal any evidence of recurrence.

Cheyletiella spp.

On Day 1, all 16 cats had mild to moderate pruritus, and 9 cats had dorsal scaling and crusting. *Cheyletiella* mites and/or eggs were retrieved on 11 of the 16 cats at least once during the study. On Day 1, a total of 5 *Cheyletiella* mites and 65 eggs were observed from 8 cats after using either the fleacomb technique or fecal analysis (fleacomb, n = 5; fecal analysis, n = 7) . In all 16 cats, clinical signs gradually improved over the treatment period. On Day 15, a total of 2 *Cheyletiella* mites and 9 eggs were observed on 6 cats after using either one or other technique (fleacomb, n = 3; fecal analysis, n = 4). On Day 30, all fecal analyses were negative, and a total of 2 mites, 12 eggs, and 6 degenerated eggs were observed on 7 cats with the fleacomb technique. On Day 45, 4 degenerated eggs were observed on 1 cat (fleacomb technique). On Day 90, all fecal analyses were negative, and 1 nondegenerated egg was observed on 1 cat with the fleacomb technique. Telephone follow-up 6 mo later did not record any recurrence of clinical signs.

Toxocara cati

On Day 1, 20 of 20 fecal samples were positive for *T. cati.* Twelve samples contained more than 100 parasite eggs/field (100X magnification). On Day 15, 18 of 19 fecal samples were negative. The cat with a positive fecal analysis subsequently had a negative result on Day 30. All fecal flotations performed on Day 30 and on Day 90 were negative.

Side effects

The topical (pour-on) treatment regimen was well tolerated in all the animals. A few cats developed a small area of alopecia and mild scaling at the site of application of the drug, which resolved in 1 to 2 mo.

Discussion

Otodectes cynotis is the most common parasite associated with otitis externa in cats, being responsible for up to 50% of otitis externa cases (3). Treatment recommendations for *O. cynotis* infestation include the local applications of various acaricidal medications, ideally combined with whole body acaricidal treatments to eradicate the mites that can survive outside the ear canal (2,3,5,8,9). The efficacy of the topical application of injectable (propylene glycol-based) ivermectin formulation in feline otoacariosis has previously been investigated (9). An average of 5.4 treatments with 500 µg (0.05 mL) applied in each ear canal 7 to 14 d apart was required to control the infestation. There was a recurrence rate of 36%. Topical treatments in the ears can be difficult in uncooperative cats and labor intensive in multiple-pet households. The extra-label use of oral and SC ivermectin has been described as an effective treatment option. The injectable ivermectin formulation can be used either PO or SC, at a dose of 200–400 µg/kg BW (2–5,8–11). A minimum of 2 SC injections, 14 d apart, or a minimum of 3 oral treatments, 7 d apart, have been recommended (2).

Cheyletiellosis is a highly contagious mite infestation of dogs, cats, and rabbits. Scaling and pruritus are the main signs of the disease, but asymptomatic carriers have been reported (3,6,13). The ease of finding the mite or its eggs is variable. Direct examination of scales, acetate tape preparations, skin scrapings, flea combing (with or without dissolution of hair and debris with potassium hydroxide), and fecal flotations can be used to find the parasites, of which the flea combing technique appears to be the most reliable method (3,6,13). However, this test was negative in 58% of clinically infested cats in one study (13). Thus, in many cases, the diagnosis is assessed by response to treatment with an appropriate acaricidal compound (2,3,6). *Cheyletiella* infestation can be eliminated by weekly applications of various acaricidal products. Ivermectin was proven effective when administered at a dose of 200–400 µg/kg BW every 7 d (PO) or every 14 d (SC) (2). There have been anecdotal reports suggesting that the female mites could survive in the environment longer than the reported 10 d (6). In addition, eggs that are shed into the environment with the animal's hair could be a source of reinfestation. Therefore, the current recommendations, for whichever acaricidal product is chosen, are to cover a period of 6 to 8 wk (2,3,6). Environmental treatment has also been recommended (2,3,6–8).

Toxocariosis is probably the most common gastrointestinal helminth infection of domestic felids worldwide. The prevalence of patent *Toxocara* infection is more common in young cats than in adult animals (26). Various anthelmintics can be used for the treatment of this infection (26,27). Ivermectin is effective against *Toxocara cati* when administered at a dosage of 300 µg/kg BW, PO (22).

In small animals, there are very few published reports on the pharmacokinetics of the different ivermectin formulations. Therefore, the currently used dosage protocols are derived from large animal data. The frequency of ivermectin treatments can be influenced by the route of administration. The pharmacokinetics of the SC and pour-on administration are not described for small animals. In cats, when administered orally, the peak ivermectin plasma level occurs at 5.5 h, and most of the drug is eliminated from the plasma at 5 d (28). In cattle, the commercial injectable formulation has a biological half-life of 8.3 d, with persistence of therapeutic levels for 2 wk or more (29). Therefore, for the treatment of susceptible ectoparasites, ivermectin is administered in small animals, PO, once every 7 d, or, SC, every 14 d (2).

In the present study, the efficacy of the pour-on ivermectin treatment was assessed in cats. If proven effective, it would be a very practical treatment option for the control of 2 ectoparasites and 1 endoparasite that can commonly affect cats. Topical ivermectin treatment has some advantages over PO or SC administration. When administered PO, injectable ivermectin may have an unpleasant taste (4), and animals may refuse to swallow the drug. Subcutaneous administration might be time-consuming when treating a population of animals and can induce pain at the site of injection.

The dosage regimen used in this study, although no control group was used, seemed effective in the clinical control of *O. cynotis, Cheyletiella* spp., and *T. cati* infestations. The activity of the treatment on an endoparasite infestation suggests that the pour-on ivermectin is systemically absorbed in cats.

Based on the failure of the therapy on one cat with *Otodectes,* we could speculate that a third topical pour-on ivermectin treatment might be required in some cats to achieve eradication of the parasite. In the group of cats with cheyletiellosis, we chose to administer 4 treatments, to follow the currently suggested treatment duration period of 6 to 8 wk (2,6). On Day 90, a nondegenerated egg was found. The viability of this egg could not be assessed, but since all cats were still free of signs of recurrence on follow-up 6 mo later, we could speculate that cheyletiellosis was successfully eradicated from this breeding colony of cats.

This treatment is not approved for use in cats and should only be prescribed with the owner's consent. There have been toxicological reports on the use of ivermectin in cats. Between January 1986 and August 1988, 40 cases of ivermectin-induced toxicosis in cats were reported to the Illinois Animal Poison Information Center. All cats had received a dose of ivermectin that exceeded 500 µg/kg BW (30). One study reported that no treatment-related effects were observed in cats given ivermectin, PO, at 750 µg/kg BW (28). Toxicosis has been reported in a 3-month-old kitten following the administration of 300 µg/kg BW, SC (31). In another report, 3 kittens of approximately 3 mo of age had received an unknown amount of paste preparation of ivermectin labeled for oral administration to horses. Two of the 3 animals developed mydriasis and coma, and subsequently died (32). Ivermectin can potentially cross the

blood-brain barrier in immature animals, and it is not known when this barrier is completed in cats (31). In puppies, it has been recommended not to administer ivermectin in animals younger than 3 mo (3). It would be prudent to follow the same recommendation in kittens.

In conclusion, topical treatment with the pour-on formulation of ivermectin seems to be a practical and well tolerated alternative to SC or PO administration of the drug in cats for the control of otoacariosis, cheyletiellosis and toxacarosis. Further studies will be needed to corroborate these findings, and to determine the proper number of treatments required. The ideal protocol will probably be influenced by the life cycle of the parasite, the severity of the infestation, the number of animals involved, and whether or not there is concomitant topical or environmental decontamination.

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