

THE EFFICACY OF SELAMECTIN TOPICAL FORMULATION AGAINST DOG ROUNDWORMS

EFICACITATEA SELAMECTINEI ADMINISTRATĂ TOPIC ÎMPOTRIVA ASCARIZILOR, LA CÂINI

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ABSTRACT | REZUMAT

Roundworms are very common in young carnivores. Selamectin is an anthelmintic substance used in dog deworming. It can be used in animals starting from the age of six weeks and in pregnant females, even during the last period of gestation. The efficacy of Stronghold® (Zoetis), based on selamectin, was investigated in this study. The results revealed an efficacy of 80.44%, against *Toxocara canis* adults and 77.71%, against *Toxascaris leonina*, 30 days after the first administration. The absence of parasitic elements, proving a 100% efficacy against both ascarid species, was observed after the second administration, within 60 days. Thus, selamectin has high efficacy and can be used to deworm dogs infected with ascarids.

Keywords: selamectin, efficacy, roundworms, dogs

Ascarizii sunt foarte frecvent întâlniți la carnivorele tinere. Selamectina este o substanță antihelmintică folosită pentru deparazitarea câinilor, cu vârsta de peste șase săptămâni și chiar a cățelelor gestante, în ultima perioadă a gestației. În prezentul studiu a fost investigată eficacitatea produsului Stronghold® (Zoetis), a cărui substanță activă este selamectina. Rezultatele au indicat o eficacitate de 80.44%, împotriva adulților de *Toxocara canis* și 77.71%, împotriva celor de *Toxascaris leonina*, la 30 de zile de la prima administrare. Absența elementelor parazitare, cu o eficacitate de 100% a produsului împotriva ambelor specii de ascarizi, a fost observată după cea de-a doua administrare, la 60 de zile. Astfel, selamectina are o eficacitate ridicată și poate fi utilizată în deparazitarea câinilor cu ascarizi.

Cuvinte cheie: selamectină, eficacitate, ascarizi, câini

Selamectin is a semi-synthetic macrocyclic lactone (4), commonly used in dogs and cats, with very good efficacy against ectoparasites like *Notoedres cati* (8), *Pneumonyssoides caninum* (6), *Cheyletiella* sp. (1), *Neotrombicula autumnalis* (11) and endoparasites like *Ancylostoma ceylanicum* (17), *Brugia malayi*, *Brugia pahangi* (16), *Toxocara* spp. or *Toxascaris leonina* (9, 10, 18).

Selamectin acts by binding to chlorine glutamate channels. Therefore, the channels remain open, leading to an increase in chloride ion influx. Stimulus transmission is interrupted and the paralysis and death of the parasite occur after the hyperpolarization of nerve cells (4).

According to some studies, the maximum concentration of selamectin, in cats, after topical administration, is 5513 ± 2173 ng/mL at 15 ± 12 h post-administration,

compared to dogs, with 86.5 ± 34.0 ng/mL after 72 ± 48 h (15).

Domestic dogs (*Canis lupus familiaris*) are recognized as important definitive hosts for a wide range of parasites with relevance for the public health (3, 12, 14), as well as for livestock production (3, 7). Results of coprological examinations showed that young carnivores are most commonly parasitized with roundworms. The most common parasites identified following coprological examinations, in young carnivores, are the roundworms. The stray dogs are the main source of infestation (12). Wild carnivores can also play an important role in public health (2). Different parasite eggs have been identified in public areas, like parks, dog pens and sandpits (3, 14). The ascarid eggs are very resistant in the external environment, being difficult to destroy with chemical substances or through physical methods. Thus, prevention is very important. Some studies suggest a good efficacy of selamectin against dog roundworms. This action is also mentioned by the manufacturer. The present study aims to test the efficacy of the topical formulation of

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selamectin against *Toxocara canis* and *Toxascaris leonina*.

MATERIALS AND METHODS

The study was conducted between November 2017 and October 2019. A total number of 150 dogs (67 females and 83 males) from two public shelters and two veterinary clinics were involved.

The age ranged between two and 32 months.

Fresh fecal samples were taken and examined by flotation assay, qualitatively (Willis method) and quantitatively (Mc Master method).

After the ascarid species identification (*Toxocara canis* and *Toxascaris leonina*), the dogs were clinically examined, for the general assessment of their health status.

Stronghold® (Zoetis), a selamectin based product, was used for deworming. The product was applied twice, with one month distance between administrations, according to the indications provided by the manufacturer. The first administration was performed on day 0 and the second one, 30 days apart. The product was topically applied on the neck area, between the shoulder blades.

The doses used for treatment were as follows: 15 mg selamectin - dogs weighing ≤ 2.5 kg; 30 mg selamectin - dogs weighing between 2.6-5 kg; 60 mg selamectin - dogs weighing between 5.1 - 10 kg

To evaluate the product efficacy, we used the following formula (18):

$$\%R^* = \frac{C-T}{C} \times 100$$

*R - reduction; C - pre-treatment geometric mean fecal egg count; T - post-treatment geometric mean egg count for day 30 or day 60.

Statistical interpretation of the results was performed using the GraphPad Prism program, Quick Calcs. The p-value was determined using Fisher's exact test, 2x2 contingency table. The EPG means for treated and control groups and between ascarid species, were compared.

RESULTS AND DISCUSSIONS

The eggs per gram mean, after each administration, in treated dogs, can be seen in Table 1.

The absence of parasitic elements was noted in the examined faeces, following the two administrations. The efficacy of the product was 80.44%, against *Toxocara canis* and 77.71%, against *Toxascaris leonina*, 30 days after the first administration. The differences were extremely significant compared to the control group, with $P < 0.0001$. After the second administration, the efficacy of the product was 100% ($P < 0.0001$) The difference regarding the products' efficacy on the

two ascarid species was insignificant ($P > 0.05$).

Table 1

The EPG mean after each administration

Roundworms	Day of study	EPG* mean
<i>Toxocara canis</i>	0	317
	30	62
	60	0
<i>Toxascaris leonina</i>	0	332
	30	74
	60	0

*EPG - eggs per gram

It should be noted that most of the examined dogs were dewormed for the first time and thus the product efficacy can be higher. In the case of periodically dewormed dogs, the product efficacy may show significant variations.

McTiera et al. (2000) noticed a highly increased efficacy of selamectin when used topically at a 6-12 mg/kg dose, in dogs. Eight laboratory and field controlled tests were conducted, including both naturally infested dogs and dogs infested experimentally with *Toxocara canis* and *Toxascaris leonina*. The dogs used in laboratory-controlled trials were necropsied at the end of the research in order to identify the number of adult ascarids in the small intestine. The efficacy of selamectin, in the case of owner dogs, under field conditions, was evaluated by calculating the geometrical average of the total number of ascarid eggs shed after every topical application of the substance. Thus, the efficacy of the product, in the case of dogs infected experimentally with *Toxocara canis* and included in laboratory-controlled trials was 93.9-98.1% ($P=0.0001$), following a single administration; $\geq 88.3\%$ ($P \leq 0.0001$), after 2 administrations and 100% ($P \leq 0.0002$), after 3 administrations, within 1 month intervals between administrations. A high efficacy was also noticed in dogs naturally infected with *Toxocara canis*, respectively 84.6, 91.3 and 97.9%, after 2 administrations within 30 days intervals. In the case of administration at 14 and 30 days intervals, the efficacy was 91.1% respectively 97.6%. In dogs treated on the field, the rates were similarly high. In the case of single administration of selamectin, the efficacy was 89.5 and 95.5% ($P = 0.0001$), at 14 and 30 days intervals and 94.0% ($P = 0.0001$), after 2 consecutive applications, within 1 month intervals. In the case of dogs infected naturally with *Toxascaris leonina* and treated on the field, efficacy was 93.3%, after 2 monthly administrations. Thus, the authors indicate the use of selamectin against *Toxocara canis* and *Toxascaris leonina* adults.

No adverse effects have been noticed following the administration of the product (13).

In a similar study, Vatta et al. (2019) examined the efficacy of two products, one based on selamectin and the other, based on a selamectin and sarolaner combination, against *Toxocara cati* adults.

The efficacy of both products has been 100% after the first administration (18). Geurden et al. (2017) obtained the same results against *Toxocara cati*, using a product based on a selamectin and sarolaner combination (5).

Another highly effective product against *Toxocara cati* is Broadline® (Merial). The active substances are fipronil, (S) - methoprene, eprinomectin and praziquantel. According to Knaus et al. (2014), the efficacy of this product is 99.4% and 100%, against *Toxocara cati* larval and adult forms (9).

In cats, Broadline® (Merial) product had 95.8% and 98.1% efficacy against *Toxascaris leonina* adults (10).

Prevention is highly important in the case of roundworm infections, especially in young animals. Thus, monthly dewormings with selamectin can significantly decrease the number of infesting elements from the environment (sandpits, parks). This is very important, especially in public spaces.

Due to its topical formula, the product can also be used in aggressive animals that are hard to contain. However, it should not be used excessively, in order to avoid the installation of resistance.

CONCLUSIONS

Topically administered selamectin has high efficacy against *Toxocara canis* and *Toxascaris leonina* adults (80.44% and 77.71%, respectively – 30 days; 100% against both ascarid species – 60 days).

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