Effectiveness of Sarolaner in the Clinical Management of Furuncular Myiasis in Dogs Naturally Infested with *Dermatobia Hominis* (Diptera: Cuterebridae)

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Research Article

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Abstract

Background – The human botfly, *Dermatobia hominis* is a common cause of furuncular myiasis in dogs in Latin America. Lesions can be single or multiple, each harboring an individual larva, presented as an erythematous nodule that causes pruritus and pain. Typical treatment consists of sedation for removal of larvae by surgical incision or manual pressure. Medications to kill the larva before its extraction can reduce inflammation and discomfort, and provide a less traumatic larval removal. Isoxazolines are broad-spectrum ectoparasiticides with larvicidal activity previously reported in the treatment of screwworm myiasis in companion animals. The aim of this study was evaluate the effectiveness of sarolaner as part of the clinical management of furuncular myiasis in dogs caused by *D. hominis* larvae.

Methods and materials – Ten short-haired mixed breed dogs naturally infested. Clinical diagnosis was achieved by observation of skin nodules and visualization of larval motility through the lesion orifice. Sarolaner was administered at manufacturer recommended dose for fleas and ticks. Lesions were reexamined 24 hours post-treatment and assessed for viability of larvae. Larvae were removed by digital compression and identified as *D. hominis.*

Results – Seventy-five *D. hominis* larvae were retrieved from 10 dogs. No live larvae were observed, demonstrating 100% larvicidal efficacy of sarolaner. Skin lesions were healed 30 days post-treatment and new lesions were not observed.

Conclusions – Sarolaner seems to be effective as larvicidal treatment for dogs with furuncular myiasis, reducing discomfort caused by the presence of the larva in the skin and facilitating its safe removal.

Background

Myiasis is the infestation of a vertebrate host by dipteran larvae, usually known as maggots or bots. When humans and different animal species develop furuncular lesions as a result of skin penetration by an individual larva of a primary myiasis-causing fly, it is called furuncular myiasis. The human botfly, *Dermatobia hominis*, is a common cause of furuncular myiasis in companion animals, livestock and humans across Latin America, whereas *Cuterebra* sp. is commonly reported causing furuncular myiasis in companion animals, rodents and lagomorphs in North America [1].

Furuncular myiasis lesions can be single or multiple, each harboring a single larva. Clinically, the lesions present as erytemathous nodules with an orifice that exudates serosanguineous discharge, and where the posterior end of the larva can be seen [2]. The infested dogs experience pruritus and pain from the various rows of robust, outer spines of the larva within the skin [3].

The usual treatment for furuncular myiasis consists of complete removal of larva by a surgical incision and insertion of an instrument to pull the larva out, or manual pressure preceded by lidocaine injection around the lesions. Ideally, the dogs should be sedated for adequate removal of larvae and larval products. The use of medications to kill the larvae before their extraction can be an alternative to help

reducing inflammation, to prevent discomfort and to allow for a less traumatic larval removal in infested dogs, in special when multiple lesions exist [3].

The isoxazolines are a novel class of ectoparasiticides with inhibitory activity on glutamate and gamma aminobutyric acid-gated chloride channels located in nervous system of invertebrates [4]. Isoxazoline compounds such as fluralaner, afoxolaner, sarolaner and lotilaner are labeled for the treatment and control of fleas and ticks in dogs and cats. Additionally, effective off-label use of several isoxazolines have been reported for the treatment of mange mites in different animal species and primary myiasis caused by the New World screw worm fly, *Cochliomyia hominivorax*, and the Old World screw worm, *Chrysomya bezziana*, in dogs and cats [4,7].

The objective of the present study was to evaluate the effectiveness of sarolaner as part of the clinical management of furuncular myiasis in dogs naturally infested with *D. hominis* larvae.

Material And Methods

The study was approved and conducted in accordance with the institutional animal care and use committee (number 2165240619 CEUA/UFFRJ).

Dogs with naturally occurring furuncular myiasis caused by *D. hominis* were enrolled in the study. As inclusion criteria, dogs were presented with at least three furuncular myiasis lesions and withdrawal time of 90 days from previous endectocide treatment was observed at the time of enrollment.

Clinical diagnosis was achieved by the observation of skin nodules and visualization of larval motility through the lesion orifice. On physical examination of dogs, the number and body areas of furuncular myiasis lesions were registered.

Sarolaner (Simparic^{TM} – Zoetis®, Brazil) was administered orally to all dogs at a dose recommended by the manufacturer for flea and tick treatment and control (Table 1).

Table 1. Signalment, sarolaner dose administered, affected body areas and number of lesions in 10 dogs with furuncular myiasis caused by *Dermatobia hominis*.

Dogs	Gender	Age (years)	Weight (Kg)	Dose (mg/kg)	Number and body areas with furuncular myiasis lesions					
					TH	BE	LT	Limbs	Tail	Total
1	FS	3	11	3.6	0	2	5	0	0	7
2	FS	3	12	3.3	0	3	0	1	0	4
3	FS	6	18	2.2	0	0	9	0	1	10
4	FS	2	14	2.9	10	0	0	1	0	11
5	MN	4	14	2.9	0	0	2	1	0	3
6	FS	5	17	2.4	2	0	1	0	0	3
7	MN	6	16	2.5	0	0	3	0	2	5
8	FS	5	18	2.2	0	1	7	0	2	10
9	MN	4	16	2.5	2	0	14	0	0	16
10	MN	4	13	3.1	0	1	5	0	0	6

All dogs were reexamined 24 hours after treatment for the presence of lesions and for assessing the viability of larvae by visual inspection. Larvae were carefully removed from the nodules by digital compression, fixed in 70% alcohol and morphologically identified as *D. hominis.* All dogs were examined one more time 30 days after sarolaner administration to follow up on the initially diagnosed lesions and assess for the potential presence of new ones.

Results

Ten naturally infested short-haired mixed breed dogs from the same household in Rio de Janeiro, Brazil were included in the study. The number of furuncular myiasis lesions with a single larva ranged from three to sixteen in the enrolled dogs. Signalment, sarolaner administered dose, number of lesions and affected body areas are presented in Table 1.

The areas of the body presenting with furuncular myiasis varied in the affected dogs. The largest number of nodules were observed on the lateral thorax bilaterally (46 of 75; 61.4%) followed by the top of the head (14 of 75; 18.7%) and base of the ears (7 of 75; 9.4%).

At 24 hours post sarolaner administration, a total of 75 *D. hominis* larvae were retrieved from all 10 dogs. No live larvae were observed, demonstrating 100% larvicidal efficacy of sarolaner. No adverse events associated with the sarolaner treatment were noticed during the first 24 hours post administration.

Upon physical examination 30 days post-treatment with sarolaner, all previously observed furuncular myiasis lesions were healed and no new lesions were noticed in any of the dogs.

Discussion

Furuncular myiasis by *D. hominis* larvae is of veterinary and medical concern due to the high incidence in companion animals, in special dogs, livestock, and human. Travel-associated human dermatobiosis has been reported from North America and Europe, areas in which *D. hominis* is not endemic [8]. However, the increase in international traveling of pets along their owners and in importing pets from foreign countries, may increase the risk of infestation in pets living in non-endemic areas.

Dogs with furuncular myiasis due to *D. hominis* larva infestation present with lesions characterized as erythematous draining nodules that cause intense discomfort. Infested human patients report pruritus, a sensation of movement and nocturnal stabbing pain within the lesions [1]. Treatment options to control the discomfort and the inflammatory reaction caused by the larva movement within the skin prior to its safe removal, can be valuable in the clinical management and well-being of dogs with furuncular myiasis. In humans, the *D. hominis* lesions typically involve exposed areas of the body such as scalp, legs, arms and face [9]. Comparable situation has been previously reported in dogs where short-haired individuals tend to be more commonly affected [10]. The fact that all 10 studied dogs were mixed breed dogs with a short hair coat further corroborate these observations. The differential diagnoses for these nodular lesions in affected dogs can be extensive, including deep bacterial or fungal infections, sterile nodular panniculitis, sterile granuloma/pyogranuloma syndrome, foreign body, and other parasitic infestations. The body areas where the lesions are found, number and size of the lesions, as well as geographic origin and/or travel history of the affected dog should always be considered along with thorough physical and dermatological examinations.

Topical and systemic administration of different ectoparasiticides have been used mostly in cattle for the treatment and prevention of *D. hominis* myiasis, in cases of widespread lesions and for animals at high risk of infestation [11]. Dogs are also reported as common hosts of *D. hominis* in both urban and rural areas of Latin America, and different options for clinical management and control of myiasis are relevant. We describe the use of oral sarolaner, an isoxazoline, in the clinical management of *D. hominis* larvae infestation at a standard dose recommended for the treatment and control of fleas and ticks. Isoxazolines are a novel class of ectoparasiticides that has unique characteristics of rapid absorption, prolonged duration, high margin of safety and broad-spectrum activity against fleas/insects, ticks and mites [4]. In the present study, 100% larvicidal efficacy of sarolaner was achieved within 24 hours post-treament, allowing dead, non-motile *D. hominis* larvae to be mechanically removed from all 10 dogs by digital compression. The death of the larvae likely decreased the discomfort caused by their motility within the furuncular lesion and associated inflammation. Overall, it also, facilitated larva removal and the clinical management of the lesions. Also, avoiding the need of sedation or a more invasive procedure on the skin. Moreover, dogs were reexamined 30 days after sarolaner administration and not only all previously diagnosed lesions were healed, but new lesions were not observed. It can be speculated that the monthly preventive efficacy of sarolaner against fleas and ticks may also provide protection against myiasis, which can be particularly useful in endemic areas where dogs are constantly challenged.

List Of Abbreviations

BE: Base of ear

CEUA: Ethics committee on the use of animals

LT: Lateral thorax

Sp: Espécie

TH: Top of head

UFRRJ: Universidade Federal Rural do Rio de Janeiro

Declarations

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study was approved and conducted in accordance with the institutional animal care and use committee (number 2165240619 CEUA/UFFRJ).

The owner of all the dogs in this article and the owner of the study place signed a consent form.

CONSENT FOR PUBLICATION

Not applicable

AVAILABILITY OF DATA AND MATERIALS

The results obtained from the execution and result of this article are available from the publication for other researchers interested in the subject.

COMPETING INTEREST

All authors declare no conflict of interest.

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AUTHOR´S CONTRIBUTIONS

PAA participated in the experimental design, execution and text preparation.

PCO participated in the execution, preparation of the text and contributed to the corrections of the manuscript.

RCM participated in the execution and experimental design.

JIF participated in the coordination of the study, drafted the protocol, defined the experimental design, execution and writing of the manuscript.

GGV and CPS contributed with the review and helped with the writing of the manuscript.

All aurhors read and approved the final manuscript.

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