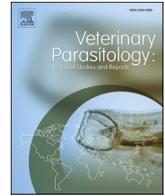




Contents lists available at ScienceDirect

# Veterinary Parasitology: Regional Studies and Reports

journal homepage: [www.elsevier.com/locate/vprsr](http://www.elsevier.com/locate/vprsr)

## Short Communication

# Efficacy of Afoxolaner (NexGard®) in the treatment of furuncular myiasis caused by *Dermatobia hominis* fly (Diptera: Cuterebridae) in naturally infested dogs

Juan Carlos Pinilla<sup>a,b,\*</sup>, Andrea Isabel Pinilla<sup>b</sup>

<sup>a</sup> Universidad de Santander, Programa de Medicina Veterinaria, Bucaramanga, Colombia

<sup>b</sup> Clinica Veterinaria Vet Center, Bucaramanga, Colombia



## ARTICLE INFO

### Keywords:

Canine  
Humanfly  
Isoxazolines  
Maggot

## ABSTRACT

Furuncular myiasis due to *Dermatobia hominis* is the second most common skin diseases in dogs that live in tropical climates in Central and South America, causing discomfort and injuring in the connective tissue of the affected dog. Therefore, the objective of the study was to evaluate the effectiveness of Afoxolaner (Nexgard®) in the treatment of canine furuncular myiasis. Twenty-five dogs naturally infested with *D. hominis* were selected and received a single oral dose of 2.5 mg/kg body weight of Afoxolaner (NexGard®). Larval infestations were classified as light (< 2 larvae), moderate (2 to 5 larvae) and severe (> 5 larvae), according to the number of larvae found in the wound. Twenty-four hours post-treatment, infested lesions were inspected, and all larvae were mechanically removed from the lesion site. All removed larvae were identified as *D. hominis* larvae and were found dead within 24 h after treatment, demonstrating 100% larvicidal efficacy of Afoxolaner against *D. hominis* larvae.

## 1. Introduction

The human fly, *Dermatobia hominis* (Diptera: Cuterebridae), is a common cause of furuncular myiasis in companion pets, humans and other animals such as cattle, equine, rabbits across Latin America (McGraw and Turiansky, 2008). *Dermatobia hominis* adults are large, measuring between 1.5 and 1.8 cm in length, and have a large head, grayish thorax, and a very intense metallic blue abdomen. The larvae are characterized by being claviform, tapered towards the posterior end, and with a spiny surface. The domestic species most frequently affected are cattle, dogs, and sheep, although it has also been described in felines (Campos et al., 2021), horses, and buffaloes (Ruiz et al., 2015). Furuncular lesions caused by *D. hominis* larvae can be single or multiple, presenting as an erythematous nodule that causes itching and pain. In companion animals, this myiasis is a debilitating disease and can be fatal depending on the time of diagnosis, level, site of infestation and treatment (Correia et al., 2010). Therefore, rapid and effective treatment is necessary to improve the recovery of affected animals and reduce the possibility of reinfection in affected patients. Various topical and systemic drugs are used for the treatment of myiasis, for example, macrocyclic lactones, nitentpyram, and spinosad (Correia et al., 2010; Han

et al., 2018; Campos et al., 2021).

Isoxazolines have also been described, which are a new class of ectoparasiticide with an inhibitory effect on the nervous system of invertebrates (Zhou et al., 2021). These isoxazoline compounds such as fluralaner, afoxolaner, sarolaner, and lotilaner are labeled only for the treatment and control of fleas, ticks, and mange mites in dogs and cats. However, they have been used for the treatment of myiasis caused by the New World screwworm (*Cochliomyia hominivorax*) fly. In this sense, the use of Afoxolaner in the treatment of myiasis due to *C. hominivorax* in pets has been reported (Cutolo et al., 2021), and Sarolaner in dogs naturally infested with *D. hominis* (Andriotti et al., 2021). Therefore, the objective of this study was to evaluate the effectiveness of afoxolaner in the treatment of furuncular myiasis caused by the *D. hominis* fly in naturally infested dogs.

## 2. Materials and methods

The study was conducted in the Bucaramanga city (7°07'07"N - 73°06'58"O) in the state of Santander, Colombia. Bioclimatic characteristics of the area are a mean annual temperature of 25 °C, with little weather variation along the year. Altitude is between 600 and 1700 masl

\* Corresponding author.

E-mail address: [jcpinilla65@gmail.com](mailto:jcpinilla65@gmail.com) (J.C. Pinilla).

<https://doi.org/10.1016/j.vprsr.2024.101076>

Received 6 April 2024; Received in revised form 28 June 2024; Accepted 30 June 2024

Available online 2 July 2024

2405-9390/© 2024 Elsevier B.V. All rights are reserved, including those for text and data mining, AI training, and similar technologies.



Fig. 1. Skin nodules containing a *D. hominis* larvae.

and mean annual rainfall is 1040 mm, with 78% of relative humidity (IDEAM, 2023).

Twenty-five healthy dogs (15 males and 10 females) between 1 and 6 years old, weighing between 10 and 25 kg were enrolled in the study. Dogs were fed and housed in the veterinary center for a couple of days. All dogs were naturally infested with *D. hominis* larvae. Clinical diagnosis was made by observing skin nodules (Fig. 1) and visualization of larval motility through the lesion orifice. The number of larvae and the body location of the furuncular myiasis were recorded before treatment. Infestations were classified as light (<2 larvae), moderate (2 to 5 larvae),

and severe (>5 larvae). Afoxolaner (Nexgard®, Boehringer Ingelheim, Colombia) was administered orally to all dogs at a dose recommended by the manufacturer for tick and flea control, providing at least the minimum dose of 2.5 mg/kg. All dogs were reexamined 6, 12, and 24 h after treatment to assess the viability of larvae by visual inspection. Subsequently, all larvae were carefully removed from the nodules by digital compression or gripper (Fig. 2) and were fixed in 70% alcohol and morphologically identified as *D. hominis* (Fig. 3). The larvae were then counted and classified as live or dead. The effectiveness was calculated using the formula described by Abbott (1925) and Cutolo et al. (2021):

$$E : \frac{\text{Number of death larvae } t1, t2, t3 - \text{Number of live larvae } t1, t2, t3}{\text{Number of death larvae } t1, t2, t3} \times 100$$

### 3. Results and discussion

This research reports the use of Afoxolaner administered orally in the clinical treatment of infestation by *D. hominis* in dogs. This compound is rapidly absorbed, has a high safety margin and has an inhibitory effect on gamma aminobutyric acid (GABA) in the nervous system of invertebrates, which causes death (Zhou et al., 2021).

Furuncular myiasis lesions were found in different body areas: head (2), neck (8), thorax (4), rump region (5) and tail (6). Regarding infestation levels, ten, four and eleven dogs had light (<2 larvae), moderate (2–5 larvae) and severe (>5 larvae) infestations, respectively (Table 1). No live larvae were observed after treatment with afoxolaner in the study. Furthermore, no adverse effects associated with the treatment were found during the first 24 h after administration of Afoxolaner. All dogs received enrofloxacin, at a dose of 5 mg/kg BW, IM, q24 h for five days, and meloxicam, at a dose of 0.1 mg/kg BW, IM, q24 h for 3 days

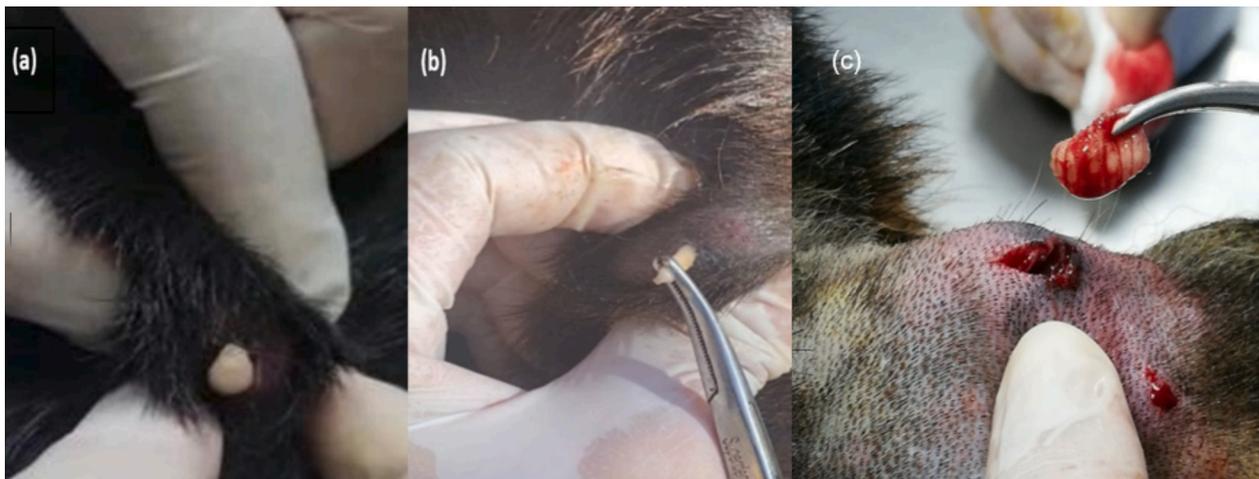


Fig. 2. Removal of *D. hominis* larvae: (a) by digital compression, (b) and (c) by gripper.



Fig. 3. *Dermatobia hominis* larvae.

**Table 1**

Lesion location, pre- and post-treatment larvae count and larvicidal efficacy of Afoxolaner (NexGard®) against *Dermatobia hominis* larvae in twenty-five naturally infested.

Animal	Location	Infestation	Pre-treatment live larvae count	Post-treatment live larvae count			% larvicidal efficacy
				6 h	12 h	24 h	
1	Tail	Light	1	0	0	0	100
2	Rump	Severe	5	0	0	0	100
3	Tail	Severe	6	0	0	0	100
4	Head	Light	2	0	0	0	100
5	Neck	Moderate	3	0	0	0	100
6	Tail	Light	1	0	0	0	100
7	Rump	Severe	5	0	0	0	100
8	Tail	Severe	6	0	0	0	100
9	Neck	Light	1	0	0	0	100
10	Neck	Severe	7	0	0	0	100
11	Thorax	Severe	8	0	0	0	100
12	Neck	Light	1	0	0	0	100
13	Neck	Severe	7	0	0	0	100
14	Thorax	Severe	8	0	0	0	100
15	Rump	Light	2	0	0	0	100
16	Thorax	Moderate	4	0	0	0	100
17	Neck	Severe	7	0	0	0	100
18	Rump	Light	2	0	0	0	100
19	Thorax	Moderate	4	0	0	0	100
20	Head	Light	2	0	0	0	100
21	Neck	Moderate	3	0	0	0	100
22	Tail	Light	1	0	0	0	100
23	Rump	Severe	5	0	0	0	100
24	Tail	Severe	6	0	0	0	100
25	Neck	Light	1	0	0	0	100

Infestation level: light (<2 larvae), moderate (2–5 larvae), and severe (>5 larvae).

due to inflammation and bacterial infection of the lesion within 24 h after treatment. All collected larvae were found dead within 24 h after treatment (Table 1) and were identified as *D. hominis* larvae based on morphological features, specifically the posterior respiratory spiracles with straight grooves and mouth hooks (Failoc-Rojas et al., 2018). Therefore, Afoxolaner demonstrated 100% larvicidal efficacy on *D. hominis* larvae, which made it possible to mechanically eliminate dead larvae from ten naturally infested dogs. Possibly, the death of the larvae decreased the discomfort and inflammation associated with furuncular myiasis. Therefore, treatment with afoxolaner facilitated the clinical management of the lesions, avoiding the need to resort to a more invasive procedure on the skin, including sedation of the patient.

In pet animals, the use of different drugs such as macrocyclic lactones, spinosins and neonicotinoids has been reported in the treatment and control of furuncular myiasis (Oliveira et al., 2018; Cutolo et al., 2021). However, there are no reports of the use of Afoxolaner on *D. hominis* larvae. On the other hand, the results of this study agree with those reported by other authors who reported excellent efficacy of unauthorized isoxazoline compounds in the treatment of myiasis caused by *C. hominivorax* and *D. hominis* in dogs. In this sense, Han et al. (2018) and Cutolo et al. (2021) reported 100% efficacy of Afoxolaner against *C. hominivorax* larvae 24 h after treatment, while Andriotti et al. (2021) demonstrated 100% efficacy in the larvicidal effect of Sarolaner against *D. hominis* larvae, while Campos et al. (2021) demonstrated 100% efficacy of fluralaner in the treatment of *D. hominis* in naturally infested cats.

In conclusion, in this study, orally administered a single oral dose of Afoxolaner (Nexgard®) at the dose suggested by the manufacturer demonstrated a high level of efficacy in the treatment of furuncular myiasis in dogs naturally infested by *D. hominis* larvae.

#### Ethical statement

The authors declare that the present research work Efficacy of Afoxolaner (NexGard®) in the treatment of furuncular myiasis caused by *Dermatobia hominis* fly (Diptera: Cuterebridae) in naturally infested

dogs, was conducted in an ethical manner according to International Guiding Principles For Biomedical Research Involving Animals.

#### CRediT authorship contribution statement

**Juan Carlos Pinilla:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Conceptualization. **Andrea Isabel Pinilla:** Writing – original draft, Investigation.

#### Declaration of competing interest

The authors have no conflict of interest with respect to the manuscript Efficacy of Afoxolaner (NexGard®) in the treatment of furuncular myiasis caused by *Dermatobia hominis* fly (Diptera: Cuterebridae) in naturally infested dogs.

#### Acknowledgements

We want to thank the technical staff of the Veterinary clinic for their support in the execution of this work.

#### References

- Abbott, W.S., 1925. A method of computing the effectiveness of an insecticide. *J. Econ. Entomol.* 18 (2), 265–267. <https://doi.org/10.1093/jee/18.2.265a>.
- Andriotti, P.A., Souza, C.P., Oliveira, P.C., Melo, R.C., Verocai, G.G., Fernandes, J.I., 2021. Effectiveness of sarolaner in the clinical management of furuncular myiasis in dogs naturally infested with *Dermatobia hominis* (Diptera: Cuterebridae). *Parasit. Vectors* 14 (1), 401. <https://doi.org/10.1186/s13071-021-04910-3>.
- Campos, D.R., Assis, R.C., Chaves, J., Almeida, G.P., 2021. Furuncular myiasis caused by *Dermatobia hominis* in five cats and efficacy of topical fluralaner for its treatment. *Vet. Dermatol.* 32 (5), 438–e117. <https://doi.org/10.1111/vde.12998>.
- Correia, T.R., Scott, F.B., Verocai, G.G., Souza, C.P., Fernandes, J.I., Melo, R.M., et al., 2010. Larvicidal efficacy of nitenpyram on the treatment of myiasis caused by *Cochliomyia hominivorax* (Diptera: Calliphoridae) in dogs. *Vet. Parasitol.* 173, 169–172. <https://doi.org/10.1016/j.vetpar.2010.06.019>.
- Cutolo, A., Perier, N., Menz, I., Thyssen, P., Silva, F., Beugnet, F., 2021. Efficacy of afoxolaner (NexGard→) on the treatment of myiasis caused by the New World screwworm fly *Cochliomyia hominivorax* (Diptera: Calliphoridae) in naturally

- infested dogs. *Vet. Parasitol.: Region. Stud. Report.* 24, 100569 <https://doi.org/10.1016/j.vprsr.2021.100569>.
- Failoc-Rojas, V.E., Molina-Ayasta, C., Salazar-Zuloeta, J., Samamé, A., Silva-Díaz, H., 2018. Case report: Myiasis due to *Cochliomyia hominivorax* and *Dermatobia hominis*: clinical and pathological differences between two species in northern Peru. *Am. J. Trop. Med. Hyg.* 98 (1), 150–153. <https://doi.org/10.4269/ajtmh.16-0437>.
- Han, H.S., Chen, C., Schievano, C., Noli, C., 2018. The comparative efficacy of afoxolaner, spinosad, milbemycin, spinosad plus milbemycin, and nitenpyram for the treatment of canine cutaneous myiasis. *Vet. Dermatol.* 312, e109 <https://doi.org/10.1111/vde.12548>.
- IDEAM, 2023. Instituto de Hidrología, Meteorología y Estudios Ambientales de Colombia (2023). Available from: <http://www.ideam.gov.co/>.
- McGraw, T.A., Turiansky, G.W., 2008. Cutaneous myiasis. *J. Am. Acad. Dermatol.* 58 (6), 907–926. <https://doi.org/10.1016/j.jaad.2008.03.014>.
- Oliveira, P.C., Moraes, P.A., Scott, F.B., Verocai, G.G., Correia, T.R., Fernandes, J.I., 2018. Efficacy of spinosad on the treatment of myiasis caused by *Cochliomyia hominivorax* (Diptera: Calliphoridae) in dogs. *Vet. Parasitol.* 258, 53–56. <https://doi.org/10.1016/j.vetpar.2018.06.006>.
- Ruiz, M., Torres, P., Zimmermann, R., Aguirre, F., Rinaldi, R., 2015. Miasis por *Dermatobia hominis* en un canino: descripción de un caso clínico. *Rev. Vet. Argentina* 32, 328. Available from: <https://www.veterinariargentina.com/revista/2015/08/miasis-por-dermatobia-hominis-en-un-canino-descripcion-de-un-caso-clinico/>.
- Zhou, X., Hohman, A.E., Hsu, W., 2021. Current review of isoxazoline ectoparasitocides used in veterinary medicine. *J. Vet. Pharmacol. Ther.* 45 (1), 1–15. <https://doi.org/10.1111/jvp.12959>.