



INVESTIGATION OF THE EFFICACY OF DORAMECTIN (DECTOMAX™) AGAINST *BOVICOLA CAPRAE* GURLT, 1843 IN NATURALLY INFESTED DOMESTIC GOATS

N. NIZAMOV

Department of Veterinary Microbiology, Infectious and Parasitic Diseases,
Faculty of Veterinary Medicine, Trakia University, Stara Zagora, Bulgaria

Summary

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Bovicolosis in goats is caused by the biting louse *Bovicola caprae*, Gurlt (1843), from the family *Bovicolidae*, suborder *Ischnocera*, order *Phthiraptera*. Although this species does not feed on blood, its parasitism causes skin irritation, biting, scratching, and disruption of feeding and resting behaviours in the animals, ultimately leading to decreased productivity. The present study investigates the efficacy of subcutaneously administered doramectin against the biting louse *Bovicola (Damalinia) caprae* in domestic goats. The study included 20 naturally infested Bulgarian White Dairy goats, divided into two groups. Animals in Group A (n=10) were treated with doramectin (Dectomax™) at a dose of 0.2 mg/kg body weight, while animals in Group B (n=10) received subcutaneously the same volume of normal saline. Treatment efficacy was assessed on post-treatment days 3, 14, and 30. In the experimental group, a 94.2% efficacy of the drug was observed as early as the third day post-treatment, which remained consistent until day 30. In contrast, the control group showed no significant differences in the mean infestation intensity compared to the level recorded on the day before treatment. This study confirms the high efficacy of doramectin against *Bovicola caprae*, making it a suitable option for controlling bovicolosis in goats.

Key words: *Bovicola caprae*, doramectin, efficacy, goats, lice

INTRODUCTION

Goat farming plays a vital role in the agricultural economy of Bulgaria, especially in rural and mountainous regions, where it supports both subsistence and commercial livestock production. The Bulgarian White Dairy goat, a breed recognised for its high milk yield and adaptability, is widely reared across the country and participates

in breed foundation of many small-scale dairy operations (Slavova, 2024). In recent years, there has been increasing interest in enhancing goat health and productivity through improved management of parasitic diseases, which are among the leading causes of economic loss in goat herds.

Like other ruminants, goats are susceptible to a variety of parasitic infestations that adversely affect animal welfare and farm profitability. Among these, ectoparasitic lice infestations are particularly problematic due to their impact on health, productivity, and general well-being (Muhammad *et al.*, 2021).

One of the most persistent and economically damaging ectoparasites affecting goats is *Bovicola caprae* (Gurlt, 1843), a species of chewing lice from the family *Bovicolidae*, suborder *Ischnocera*, order *Phthiraptera* (Price & Graham, 1997). Although non-blood-feeding, *B. caprae* infestations cause intense pruritus, skin irritation, scratching, and self-inflicted trauma, which significantly disrupt feeding and resting behaviours (Muhammad *et al.*, 2021). Chronic infestations often lead to a rough coat, weight loss, decreased milk production, and secondary skin infections (Insyari'ati *et al.*, 2024). These clinical signs contribute to reduced feed efficiency, lower productivity, and general discomfort – factors that collectively impair animal welfare and farm profitability.

In Bulgaria, bovicolosis remains a widespread yet underreported ectoparasitic infection in goat herds. Recent investigations have confirmed a high prevalence of *B. caprae* across multiple regions of the country. A 2023 survey on ectoparasites in goats identified *B. caprae* as one of the most frequently encountered lice species, with infestation rates exceeding 65% in some herds (Nizamov, 2023) and underscored the urgent need for effective and sustainable control strategies tailored to local epidemiological conditions.

Macrocyclic lactones (MLs) are a class of endectocides widely employed in veterinary medicine to control both internal and external parasites in livestock.

This group includes compounds such as ivermectin, doramectin, eprinomectin, and moxidectin. MLs primarily exert their parasiticidal effects by enhancing chloride ion permeability through glutamate-gated and γ -aminobutyric acid-gated chloride channels in the nervous system of parasites, resulting in neuromuscular paralysis and death (Wolstenholme & Rogers, 2005).

While MLs are highly effective against a broad spectrum of nematodes and blood-feeding ectoparasites, their activity against chewing lice – particularly *B. caprae* – has shown inconsistent results. Efficacy varies depending on the specific compound, the route of administration, and the lice species involved (Ajith *et al.*, 2019). Moreover, biting lice are often not completely eliminated from cattle following subcutaneous ML administration (Logan *et al.*, 1993). For this reason, MLs are generally not recommended as primary treatment for biting lice, although some commercial formulations are marketed in certain countries for their control.

The differences in feeding behaviour between lice species are thought to influence their various susceptibility to macrocyclic lactones. Following subcutaneous administration, MLs attain high and sustained concentrations in the bloodstream (Lanusse *et al.*, 1997), which makes them particularly effective against blood-feeding lice such as *Linognathus stenopsis*. In one study, doramectin (Dectomax™) administered subcutaneously at a dose of 1 mL/50 kg body weight achieved 100% efficacy against *L. stenopsis* by the 7th day post-treatment (Pal *et al.*, 2001). Similarly, Prelezov *et al.* (2022) evaluated the efficacy of a single subcutaneous dose of ivermectin (0.2 mg/kg) and a spot-on treatment with eprinomectin (1 mg/kg) against *L. stenopsis*. Ivermectin resulted in

a 92.70% reduction in lice counts, while eprinomectin demonstrated complete (100%) efficacy.

Doramectin (Dectomax™), a synthetic avermectin derivative, has been widely used for ectoparasite control in cattle and sheep. However, its use in goats, especially against chewing lice like *B. caprae*, is not well-documented, and the available literature remains limited. Additional studies are needed to evaluate its potential in this context.

Given the economic importance of goats in Bulgaria and the substantial productivity losses associated with lice infestations, there is a pressing need for updated, evidence-based control strategies targeting *Bovicola caprae*. This study's goal was to assess the efficacy of subcutaneous doramectin (Dectomax™) application in naturally infested goats of the Bulgarian White Dairy breed. By evaluating changes in infestation intensity following the treatment, this research aimed to propose improved parasite management protocols under Bulgarian goat farming conditions.

MATERIALS AND METHODS

The study was conducted on a herd owned by the Biofarm of Trakia University, Stara Zagora, Bulgaria, consisting of 24 Bulgarian White Dairy goats. The animals were reared exclusively for scientific purposes and were not used for milk production. Twenty goats (10 experimental and 10 control) were enrolled in the study. All were females aged between 1 and 5 years. The animals were heavily infested with the biting louse species *Bovicola caprae*. The intensity of infestation was determined using the method described by Brown *et al.* (2005). Lice were counted in seven predefined body areas (neck, bris-

ket, shoulder, flank, abdomen, groin, and thigh) using square counting frames measuring 10 cm² each. The total number of lice counted was multiplied by 100 to estimate the infestation intensity for each animal.

The study was conducted over a period of one month, from March 22, 2019, to April 22, 2019. On day 0, animals in Group A (n=10) were treated subcutaneously with doramectin (Dectomax™) at a dose of 0.2 mg/kg body weight. On the same day animals in Group B (n=10) were subcutaneously injected with physiological saline in an equivalent volume.

The efficacy of the treatment was evaluated on post-treatment days 3, 14, and 30. Treatment effectiveness was evaluated using an established method. The percentage reduction in infestation was determined according to the formula described by Garg *et al.* (1998), calculating the proportional change in parasite counts in both treated and control groups before and after treatment:

$$\text{Percentage reduction} = [1 - (Ta/Ca \times Cb/Tb)] \times 100$$

where: Ta=infestation level in the treated group after treatment; Tb=infestation level in the treated group before treatment; Ca=infestation level in the control group after treatment; Cb=infestation level in the control group before treatment.

RESULTS

The mean lice (*Bovicola caprae*) counts recorded across the seven examined body regions during the study period are presented in Table 1. Animals in Group A exhibited a marked reduction in lice numbers as early as day 3 post-treatment, with an efficacy of 93.6%, which remained nearly constant throughout day 30, reach-

Table 1. Mean *Bovicola caprae* lice count in different body regions of goats

Body region	Day 0	Day 3	Day 14	Day 30
<i>Group A – Doramectin-treated group (n=10)</i>				
Neck	5.7	0.6	0.5	0.9
Shoulder	7.7	0.8	1.1	1.1
Brisket	4.4	0.6	0.6	0.3
Groin	8.5	0.3	1.0	0.3
Flank	8.5	0.5	0.6	0.0
Thigh	9.8	0.5	0.3	0.1
Abdomen	7.7	0.0	0.0	0.5
Total count	52.3	3.3	4.1	3.1
Percentage reduction	–	93.76%	92.52%	94.29%
Reduction efficacy	–	93.69%	92.44%	94.23%
<i>Group B – Control group (n=10)</i>				
Neck	6.2	6.4	7.2	7.0
Shoulder	7.5	7.8	8.0	8.2
Brisket	5.0	4.8	5.3	4.7
Groin	7.9	8.2	8.4	8.1
Flank	8.4	8.3	8.2	7.9
Thigh	8.9	9.1	9.2	9.5
Abdomen	7.8	7.7	7.9	8.3
Total count	51.7	52.3	54.2	53.7

ing 94.2%. This sustained effectiveness was observed despite the co-habitation of treated animals with the untreated control group, indicating the high anti-*B. caprae* efficacy of subcutaneously administered doramectin.

Furthermore, the number of lice in goats from Group B (control group) increased progressively over the course of the study, further emphasising the effectiveness of the doramectin treatment.

DISCUSSION

The present study demonstrated the high efficacy of subcutaneously administered

doramectin against biting lice in goats as early as the third post-treatment day. These findings are consistent with pharmacokinetic data, demonstrating that following a single subcutaneous administration at a dose of 0.2 mg/kg, doramectin reaches maximum plasma concentration approximately 1.71 days post-injection (Escudero *et al.*, 1999).

Previous research on the efficacy of macrocyclic lactones administered via different routes against biting lice in animals has yielded variable results. In Bulgaria, Nedelchev (1985) reported an 89.7% efficacy of ivermectin (Ivomec™) against chewing lice infested cattle by post-treatment day 60. In goats infested

with *Bovicola caprae*, Yadav *et al.* (2004) observed 100% efficacy of moxidectin applied as a pour-on formulation (1 mL per 10 kg body weight) as early as day 4 post-treatment. Similarly, the subcutaneous administration of ivermectin at a dose of 0.2 mg/kg achieved complete efficacy by day 7. Ajith *et al.* (2019) reported that a single subcutaneous injection of ivermectin (200 µg/kg) in goats naturally infested with the same louse species led to 100% elimination of lice by day 21, with no evidence of re-infestation during the observation period. In a more recent study, Prelezov *et al.* (2022) found that while ivermectin resulted in a 73.05% reduction in *B. caprae* populations, eprinomectin achieved complete (100%) efficacy following a single treatment. While eprinomectin offers advantages such as ease of administration, absence of a milk withdrawal period, and high efficacy, doramectin remains a practical alternative, particularly in non-lactating animals or when eprinomectin is not available.

These different outcomes may be attributed to several factors, including the route of administration of the specific macrocyclic lactone. For example, pour-on formulations may provide faster or more localised efficacy compared to injectable products, depending on the drug's ability to diffuse through the skin and hair coat and its degree of direct contact with the parasite.

Importantly, the feeding behaviour of biting lice also plays a crucial role. *Bovicola caprae*, for instance, feeds by scraping skin debris rather than ingesting blood, which limits their exposure to systemically circulating compounds. Consequently, the formulation and route of administration become especially important determinants of therapeutic success.

In some cases, the observed variation in treatment efficacy may reflect emerging resistance or reduced susceptibility of lice populations to certain macrocyclic lactones due to prior exposure. However, confirmed resistance in biting lice has so far only been documented against pyrethroids, primarily in cattle and horses infested with chewing lice (Ellse *et al.*, 2012; Sands *et al.*, 2015). With regard to macrocyclic lactones, evidence of resistance is presented for the human body louse (*Pediculus humanus humanus*), where the proposed mechanism involves reduced expression of the neuronal protein complexin, which plays a critical role in the regulation of neurotransmitter release (Amanzougaghene *et al.*, 2018).

Additionally, multiple resistance to macrocyclic lactones has been reported in *Psoroptes ovis*, the causative agent of sheep scab (Sturgess-Osborne *et al.*, 2019), further highlighting the potential for resistance development in ectoparasitic arthropods under selective drug pressure.

CONCLUSIONS

The results of this study clearly demonstrated that subcutaneously administered doramectin (Dectomax™) at a dose of 0.2 mg/kg was highly effective against *Bovicola caprae* infestations in goats. A significant reduction in lice counts was observed as early as three days post-treatment, with sustained efficacy exceeding 94% up to the 30th day. These outcomes are particularly notable given the cohabitation of treated and untreated animals, which did not compromise the effectiveness of the treatment.

Given the limited number of licensed treatments available for chewing lice in goats and the often inconsistent efficacy

of macrocyclic lactones against non-blood-feeding ectoparasites, the findings of this study provide valuable evidence in support of doramectin as a viable and reliable option for managing *B. caprae* infestations. The high efficacy, ease of administration, and prolonged activity make doramectin a practical tool in integrated parasite control programmes, particularly in regions like Bulgaria where goat farming is a key component of rural livelihoods.

Further investigations involving larger sample sizes, different breeds, and seasonal variations are warranted to confirm these findings under broader field conditions and to monitor potential development of resistance.

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Correspondence:

Nikola S. Nizamov PhD,
Department of Veterinary Microbiology,
Infectious and Parasitic Diseases,
Faculty of Veterinary Medicine,
Trakia University,
6000 Stara Zagora, Bulgaria,
e-mail: nikola_nizamov@abv.bg