A CASE REPORT ON MAGGOT INFESTATION IN RUMINANTS (CATTLE, GOAT AND SHEEP): TREATMENT EFFICACY AND COMPARATIVE ANALYSIS

A clinical report submitted as partial fulfillment of the requirements for the Doctor of Veterinary Medicine degree

A CLINICAL REPORT SUBMITTED BY

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Clinical Report submitted in accordance with the contents and style guidelines

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ABSTRACT

Myiasis, caused by dipteran fly larvae infestation in living tissues, poses a significant threat to ruminant health globally. This study investigates the treatment efficacy of various protocols for myiasis in cattle, goats, and sheep. The research, conducted over three months at Daganbhuiyan upazila veterinary hospital in the Feni district, the S.A. Quadery teaching veterinary hospital (SAQTVH), and the Hathajari upazila veterinary hospital in the Chittagong district of Bangladesh, focused on 10 affected ruminants. Diagnostic evaluation involved wound history, inspection, odor, exudation, and maggot presence. Three treatment protocols were applied and evaluated based on wound healing, using turpentine oil, povidone iodine, ivermectin, and antibiotics. A comprehensive analysis of wound area and depth reduction indicated the superior effectiveness of a treatment protocol involving turpentine oil and ivermectin, yielding a 97% healing rate in wound depth and 95% in wound area by day 18. The study showcases the superiority of this approach, removing maggots, administering ivermectin, antibiotics, antihistamines, anti-inflammatory drugs, fly repellents, and topical antibiotics. Myiasis incidents were primarily found in the vulva, shoulder, and thigh regions, consistent with previous research. The findings also confirm the commonality of myiasis in cattle and goats compared to other animal species. The study's outcome suggests the effectiveness of the proposed treatment strategy in field conditions, particularly in promoting rapid and extensive wound healing in ruminants affected by myiasis. This research serves as a valuable contribution to the understanding and management of myiasis in veterinary medicine.

Keywords: Myiasis, Dipteran fly larvae, Treatment,Ruminant.

CHAPTER I
INTRODUCTION

Myiasis, a parasitic infestation caused by dipteran larvae in living tissues of animals, poses a significant threat to ruminant health and productivity worldwide. It is also known as the infection of vertebrate animals by dipterous fly larvae, which feed for a while on the host's liquids, swallowed food, and dead or living tissue (Serra– Freire and Mello, 2006).

Different fly species have different degrees of host fidelity, which can be used to categorize myiasis. There are three recognized forms of myiasis: facultative, obligatory, and accidental (also known as pseudomyiasis). While myiasis is an uncommon occurrence for some flies, it is the only way of life for others (Jelinek *et al*, 2000; Catts and Mullen, 2002).

The families Calliphoridae, Sarcophagidae, Hypodermatidae, Oestridae, and Gasterophilidae, among others, include the flies that cause myiasis. However, in rare occasions, several additional species from the families—such as Muscidae and Psychodidae—may also cause myiasis (Serra–Freire and Mello, 2006). Particularly, the flies from the Calliphoridae, Sarcophagidae, Hypodermatidae, Oestridae, and Gasterophilidae families were the ones that induced myiasis (Zumpt, 1965).

Among the animal species cattle and goats are the most common animal species to host myiasis (46.4%), followed by humans (14.7%), dogs (15.3%), pigs (6%), horses (4%) and sheep (1%). (Berm´udez *et al*, 2007).

Certain fly in the order Diptera may lay their eggs or larvae on wounds or in the nasal, oral, vaginal, or aural cavities in cases of myiasis. The larvae detected in the wounds may be eating on the surrounding tissue, causing serious tissue damage that could lead to production loss, reproductive issues, blindness, lameness, and even death (Farkas *et al*., 1997). Ruminant skin wound contains larvae and this are contaminated with bacteria (Obanda *et al*, 2013). Based on the anatomical site, it can manifest clinically as cuticole, gastrocole, anal, genitor-urinary, nasopharyngeal, ophthalmic, cavicole, and auditory due to the eggs or larvae of a dipteran fly that lay on wounds or in the nasal, oral, genital, and aural cavities (Sherman, 2000).

The illness may result in decreased output of meat, milk, and wool. The quality of skins is also impacted by myiasis (McKelvie *et al*, 1993). Abortion, decreased milk supply, weight and fertility losses, poor hide quality, and immune system degradation are all caused by Oestridae, which have an impact on ruminant production (Otranto *et al*, 2004). The most common predisposing factors for myiasis are still thought to be wounds, soreness and laceration, breach after delivery, urine and fecal contamination, cleanliness and sanitary conditions, wetted fleece or hair, lack of aseptic surgery, bacterial skin contamination with foul odor, etc (Myiasis Wiki vet, 2011). Myiasis is a serious condition that causes a great deal of pain and suffering in sheep and goats. If left untreated, it can lead to serious pain, decreased productivity, decreased ability to reproduce, and occasionally even death (Sotiraki and Hall, 2012).

Field diagnosis is then typically determined based on the history of the wound, a detailed inspection of the wound, the presence of maggots, a distinct odor, and brownish exudation from the wound.

The standard course of treatment involves extracting the larvae from the afflicted areas, however occasionally access to these locations is restricted (Kpea and Zywocinski, 1995). Larvae in wounds have been removed with solutions of turpentine, oily drops, ethanol, chloroform, and normal saline (Hall and Smith, 1993). Applying turpentine oil, iodine tincture, or other antibacterial or vermicide medications to the wound is one of the primary treatment techniques.

This report aims to provide an overview of current treatment approaches for myiasis in ruminants, drawing upon recent scientific studies and clinical experiences to offer insights into their efficacy and limitations.

Objectives:

1. Discussion about treatment protocol of maggot infestation in ruminant.
2. This report's main goal is to conduct a thorough post treatment follow up and analysis of the effectiveness of the various treatment modalities used to treat ruminant myiasis. Examining the application of topical drugs, systemic therapies, and cutting-edge therapeutic approaches to manage larval infestations is part of this.

CHAPTER II

MATERIALS AND METHODS

2.1. Study Design

A study was carried out over the course of three months, from April to June 2023, at Daganbhuiyan upazila veterinary hospital in the Feni district, the S.A. Quadery teaching veterinary hospital (SAQTVH), and the Hatajari upazila veterinary hospital in the Chittagong district of Bangladesh. During the course of the study, cases of clinical myiasis in goats and cattle were examined.

2.2. Experimental animals

Ten myiasis affected ruminants (3 cattle,6 goat and 1sheep) brought to the Daganbhuiyan upazila veterinary hospital in the Feni district, the S.A. Quadery teaching veterinary hospital (SAQTVH), and the Hatajari upazila veterinary hospital in the Chittagong district of Bangladesh during April to June 2023 were investigated in the present study.

2.3. Diagnosis of myiasis

The wound's history, a detailed inspection of the site, a distinctive odor, brownish exudation from the wound, and the presence of maggots were all considered in the diagnosis (Blood and Henderson, 1983).

2.4. Treatment of myiasis

The affected animal was restrained, the wound area was exposed and maggots were removed with sterile forceps. Three treatment protocols were employed as furnished in Table 1. Gauze dipped in oil of turpentine oil (Group A) or povidone iodine 10% (Group B) was allowed to remain in the wound pocket for 5 minutes. The maggots came out from the wound to the surface and were removed. After removal of the maggots with forcep then the wound was dressed with povidone iodine. Then ivermectin (Vermic®) was administered at the dose rate of 0.2 mg/kg s.c. single dose. Dressing of wound on alternate day was continued until healing. In case of group C turpentine oil poured on the wound then superficial maggots removed with forceps and ivermectin (Vermic®) poured on wound at the dose rate of 0.2 mg/kg .A broad spectrum antibiotic injection (Ceftizone®) also given at the dose rate of 25mg/kg body weight i.m. once

daily for 5 days in all cases. An antihistaminic drug pheniramine maleate injection at the dose rate of 1mg/kg body weight i.m. once daily for 4 days and a Non-steroidal anti-inflammatory drugs (NSAIDs) (Injection Mel-Vet®) Meloxicam BP administered at the dose rate 0.5mg/kg body weight i.m. once daily for 3 days also administered in all group of cases.

Fly repellent Metriphonate (pulv. Ectonil-Vet®) and topical antibiotics (Sumid-Vet®Powder) Sulphanilamide Powder BP also applied in all case of myiasis.

Table 1. treatment protocol

Groups	treatment plan
A	Turpentine oil(used locally) and ivermectin *(Vermic®) at the dose rate of 0.2 mg/kg s.c. single dose then antibiotic injection **(Ceftizone®) at the dose rate of 25mg/kg body weight i.m. once daily for 5 days, A antihistaminic drug Injection ***(Astavet®) pheniramine maleate injection at the dose rate of 1mg/kg body weight i.m. once daily for 4 days and a Non-steroidal anti-inflammatory drugs (NSAIDs) Injection ****(Mel-Vet®) Meloxicam BP administered at the dose rate 0.5mg/kg body weight i.m. once daily for 3 days. Fly repellent Metriphonate *****(pulv. Ectonil-Vet®) and topical antibiotics ******(Sumid-Vet®) Sulphanilamide Powder BP (used locally).
B	Povidone iodine 10%(used locally) and ivermectin (Vermic®) at the dose rate of 0.2 mg/kg s.c. single dose then antibiotic injection (Ceftizone®) at the dose rate of 25mg/kg body weight i.m. once daily for 5 days, A antihistaminic drug (Injection Astavet®) pheniramine maleate injection at the dose rate of 1mg/kg body weight i.m. once daily for 4 days and a Non-steroidal anti-inflammatory drugs (NSAIDs) (Injection Mel-Vet®) Meloxicam BP administered at the dose rate 0.5mg/kg body weight i.m. once daily for 3 days. Fly repellent Metriphonate (pulv. Ectonil-Vet®) and topical antibiotics (Sumid-Vet®) Sulphanilamide Powder BP (used locally).
C	Turpentine oil poured on the wound then superficial maggots removed with forceps and ivermectin (Vermic®) poured on wound at the dose rate of 0.2 mg/kg. Antibiotic injection (Ceftizone®) ceftriaxone at the dose rate of 25mg/kg body weight i.m. once daily for 5 days, A antihistaminic drug Injection (Astavet®) pheniramine maleate injection at the dose rate of 1mg/kg body weight i.m. once daily for 4 days and a Non-steroidal anti-inflammatory drugs (NSAIDs) (Injection Mel-Vet®) Meloxicam BP administered at the dose rate 0.5mg/kg body weight i.m. once daily for 3 days. Fly repellent Metriphonate (pulv. Ectonil-Vet®) and topical antibiotics (Sumid-Vet®) Sulphanilamide Powder BP (used locally).

*Vermic®(Techno Drugs, Bangladesh),

**Ceftizone® (RenataLtd, Bangladesh),

***Astavet® (ACME Laboratories Ltd, Bangladesh),

****Mel-Vet® (ACME Laboratories Ltd, Bangladesh),

*****pulv. Ectonil-Vet® (Square Pharmaceuticals Limited, Bangladesh),

******Sumid-Vet® (Square Pharmaceuticals Limited, Bangladesh)

2.5. Evaluation of wound healing

Reduction of both the depth and the area of the wound served as a basis for assessing the healing progress. From day 4 to 18 day , every other day, the healing condition was observed.

Fig: Maggot infestation in testicle of sheep

Fig: Maggot infestation beneath the tail of goat

Fig: Maggot infestation in nasal and muzzle region of goat

Fig: Larvae of Dipteran fly causes myiasis in cattle

CHAPTER-III

RESULTS AND DISCUSSION

3.1. Progressive reduction of wound area

Therapeutic effect of different treatment protocols on the healing of wound area in ruminants (cattle,goat and sheep) is shown in Table 2. In case of turpentine-Ceftizone® group, 32% wound area was healed up at day 8 and 90% at day 18 of therapy. In Povidone iodine 10%- Ceftizone ® group, 10% wound area was healed at day 8 and 35% at day 18. In case of turpentine oil-Vermic® poured on group, 40% wound healing was obtained at day 8. The healing process in this group continued to progress and 95% wound area was found to be healed at day 18.

Table 2. The outcome of different treatment protocols on the healing of myiasis wound area in ruminants

Reduction of wound area at different days (%)			
Days	**Group A**	**Group B**	**Group C**
4	0	0	0
6	14.3	3.2	15.4
8	32.1	9.7	39.9
10	58.2	12.3	59.3
12	70.8	19.8	73.6
14	77.3	25.9	85.7
16	85.2	29.7	92.3
18	89.7	34.8	95

A = Turpentine oil dressing + Ceftizone®, B = Povidone iodine 10% dressing + Ceftizone® and

C = Turpentine oil and Vermic® poured on + Ceftizone®

3.2. Progressive healing of wound depth

Table 3 shows the effect of various treatments on wound depth. In turpentine-Ceftizone® group, 30% wound depth reduced at day 8 and 92% at day 18 of therapy. In case of Povidone iodine 10%- Ceftizone® group, 15% wound depth reduced at day 8 while 52% reduced at day 18. In turpentine oil- Vermic® poured on group, 38% wound depth reduced at day 8 and 97% at day 18.

Table 3. Effects of different treatment protocols on the healing of wound depth in ruminants.

Reduction of wound depth at different days (%)			
Days	**Group A**	**Group B**	**Group C**
4	0	0	0
6	18.9	8.2	17.4
8	30.2	14.8	37.9
10	59.2	21.4	61.4
12	71.7	27.5	77.9
14	79.3	37.8	86.8
16	86.2	46.3	93.2
18	91.8	51.7	96.8

A = Turpentine oil dressing + Ceftizone®, B = Povidone iodine 10% dressing + Ceftizone® and

C = Turpentine oil and Vermic® poured on wound + Ceftizone®

The therapeutic effect of three different treatment protocols on healing of myiasis wound in ruminant animals assessed on the basis of wound area and wound depth. The best result was obtained in group C where the wounds were treated with Turpentine oil poured on the wound then superficial maggots removed with forceps and ivermectin (Vermic®) poured on wound at the dose rate of 0.2 mg/kg. Antibiotic injection (Ceftizone®) ceftriaxone at the dose rate of 25mg/kg body weight i.m. once daily for 5 days, A antihistaminic drug (Injection Astavet®) pheniramine maleate injection at the dose rate of 1mg/kg body weight i.m. once daily for 4 days and a Non-steroidal anti-inflammatory drugs (NSAIDs) (Injection Mel-Vet®) Meloxicam BP administered at the dose rate 0.5mg/kg body weight i.m. once daily for 3 days. Fly repellent Metriphonate (pulv. Ectonil-Vet®) and topical antibiotics (Sumid-Vet®) Sulphanilamide Powder

BP (used locally). By day 18 of treatment, 95% and 97% of this group's wounds were healed in terms of area and depth. Agarwal and Singh (1990) reported on the effectiveness of turpentine oil in treating maggot infestation.

Applying turpentine oil to the wound aids in the removal of maggots. Turpentine oil produces an anoxic environment in the wound pocket, which causes the maggots to emerge from the pocket in three to five minutes (Bowe *et al*, 1977). Conversely, turpentine oil increases ceruloplasmin activity, which is assumed to impede inflammatory harm due to its antioxidant characteristic (DiSilvestro, 1989). According to reports, nicotine sharply increases plasma fibrinogen, which may aid in the healing of wounds (Rapaport and Zivelin, 1976).

The application of turpentine oil to the wound, followed by the removal of superficial maggots using forceps, and the application of ivermectin at a dosage rate of 0.2 mg/kg to the wound also had positive results, with the wound healing (97% wound depth and 95% wound area) occurring on day 18 of therapy.

According to Howard and Smith (1999), ivermectin is a broad range anthelmintic that works against both ectoparasites and endoparasites, including maggots. According to Campbell (1985), ivermectin is thought to block nerve impulses on the nerve ending by releasing gamma amino butyric acid (GABA), attaching to the receptors and resulting in palsy and the death of both mature and immature parasites. According to Sharma (1994), ivermectin effectively and painlessly healed granulating wounds. In naturally infected myiasis, a chemotherapeutic treatment using ivermectin at a dosage rate of 1 µg/kg s.c. in the neck area was adequate to kill or halt the growth of *Hypoderma* spp. larvae (Anon, 2000). According to Charbon and Pfister (1997), the "microdose" of ivermectin given to young animals or dry cows suffering from myiasis was effective in nearly all cases.

To inhibit bacterial infection a broad spectrum antibiotic used in maggot infestation cases. Ceftriaxone belongs to the cephalosporin family of antibiotics and is a third-generation antibiotic (Masters *et al*, 2012). It belongs to the antibiotic class known as β-lactam. By attaching to transpeptidases, also known as transamidases, penicillin-binding proteins (PBPs) that catalyze the cross-linking of the peptidoglycan polymers that make up the bacterial cell wall, ceftriaxone specifically and irreversibly inhibits the formation of bacterial cell walls (Williams *et al*,2013).

In comparison to other treatment methods outlined above, the use of antibiotics plus a 10% Povidone iodine dressing to a myiasis wound proved to be substantially less successful. Because povidone iodine easily penetrates the pores and cracks of the skin's surface, it is frequently used to disinfect the skin prior to surgical procedures. In addition to its irritating and germicidal actions on tissues, this drug lacks larvicidal properties (Arthur and Evelyn, 1970).

For further prevention of maggot infestation we used fly repellent metrifonate powder. An irreversible organophosphate acetylcholinesterase inhibitor is metrifonate, also known as trichlorfon. As an insecticide, it is employed.

3.3. Myiasis incidence

This case study of ruminant myiasis emphasizes how the host, environment, and agent work together to cause the disease's presentation. The tropical climate, which is hot and muggy, is ideal for the growth of flies, especially during the monsoon season. The same person's wound incidents were noted to have happened throughout the rainy season. According to Singh (2016), the monsoon season may be a factor in the increased rates of wound myiasis in goats and cattle. The fly was drawn to the infected wound by its foul odor, which also encouraged it to lay its eggs there.

Myiasis wounds were anatomically located in the navel area, vulva, thigh, udder, shoulder, and in between the claws. Kumar and Ruprah (1984) have observed similar findings. They clarified that myiasis might be found in the vulvar region of freshly calved cows, the navel area of newborn calves, and sores between the claws. Of the 10 myiasis wounds, 1 (10%) happened in the navel region, 3 (30%) in the vulva and shoulder regions, and 2 (20%) in the thigh. Additionally, 1 (10%) occurred at the forelimb, 1 (10%) at the flank region owing to a dog bite wound, and 1 (10%) at the nose and snout region. The vulva area had the greatest incidence of myiasis (30%), followed by the flank and shoulder regions (20% in each case). According to Joseph *et al.* (1987), newborn calves' navels remain raw after they separate from the umbilical cord and can get injured with even a small stimulation. After the flies deposit their eggs in these lesions, myiasis is created. According to Laake *et al.* (1988), cows that have experienced trauma during parturition seem to have frequent maggot infestations in the vulva and perineal regions.

In this case we found 3 cattle (30%),6 goat (60%) and 1 sheep (10%) affected with maggot infestation.According to Berm´udez *et al* (2007) among the animal species cattle and goats are the most common animal species to host myiasis (46.4%), followed by humans (14.7%), dogs (15.3%), pigs (6%), horses (4%) and sheep (1%) which is approximately similar to our findings.

CHAPTER-IV

Conclusion

It appears from the present study that treatment of myiasis wound turpentine oil poured on the wound then superficial maggots removed with forceps and ivermectin poured on wound at the dose rate of 0.2 mg/kg. Antibiotic injection ceftriaxone at the dose rate of 25mg/kg body weight i.m. once daily for 5 days, A antihistaminic drug pheniramine maleate injection at the dose rate of 1mg/kg body weight i.m. once daily for 4 days and a Non-steroidal anti-inflammatory drugs (NSAIDs) Meloxicam BP administered at the dose rate 0.5mg/kg body weight i.m. once daily for 3 days. Fly repellent Metriphonate and topical antibiotics Sulphanilamide Powder BP (used locally) is the most effective in the field condition.

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BIOGRAPHY

Muhammad Moniruzzaman, Son of Muhammad Abul Hossain and Khodeza Begum. I passed Secondary School Certificate (SSC) Examination in 2015 from Baitush Sharaf Ideal Kamil M.A Madrasah,Chattogram and then Higher Secondary Certificate (HSC) Examination in 2017 from Uttar Kattali Al-haj Mostafa-Hakim Degree College,Chattogram. I was granted admission to the Doctor of Veterinary Medicine (DVM) program at Chattogram Veterinary and Animal Sciences University for the 2017–18 academic year. I want to work with animals for the rest of my life as a veterinarian. I wish to work as a professional practitioner and a field veterinarian.