



PREVALENCE AND THERAPEUTIC RESPONSE OF BOVINE DERMATOPHILOSIS IN DINAJPUR DISTRICT OF BANGLADESH

MSB Juli¹, MS Islam², MR Islam¹, MT Rahman³, MR Islam⁴, MF Hoque¹, MT Islam^{5*} and MA Rahman³

¹Department of Medicine, Surgery and Obstetrics, Hajee Mohammad Danesh Science and Technology University, Dinajpur-5200, Bangladesh

²Department of Microbiology and Public Health, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur-1706, Bangladesh

³Department of Surgery and Radiology, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur-1706, Bangladesh

⁴Department of Animal Science and Nutrition, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur-1706, Bangladesh

⁵Department of Pathobiology, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur-1706, Bangladesh

*Correspondence: Md. Taimur Islam, Department of Pathobiology, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur-1706, Bangladesh, E-mail: taimurpbl@bsmrau.edu.bd

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ABSTRACT

The present study was undertaken on a total of 320 cattle to determine the prevalence and effective therapeutic protocol of bovine dermatophilosis in the Dinajpur district during the period from June 2016 to July 2017. The disease was diagnosed by visual inspection of the body surface and confirmed by identification of the causal agent in the laboratory from collected crusts, skin scraping of the patients. A total of 48 affected cattle were allocated into four different treatment groups, named as Group-A: treated with procaine penicillin and benzylpenicillin, Group-B: treated with combined procaine penicillin, benzylpenicillin and streptomycin sulfate, Group-C: treated with oxytetracycline and Group-D: untreated and considered as control. Higher prevalence was recorded in young (20.83%), indigenous (16.21%) and rural household (14.55%) cattle. The summer season had a significant ($p < 0.05$) influence on the prevalence (18.33%) of bovine dermatophilosis. Treatment with combined procaine penicillin, benzylpenicillin and streptomycin sulfate @ 1ml/20 kg body weight IM once daily for 7 days was found to be more effective than the others. It was concluded that dermatophilosis is a highly prevalent disease in Dinajpur and combined procaine penicillin, benzylpenicillin and streptomycin sulfate may be practiced in field conditions for better treatment.

Keywords: Dermatophilosis; prevalence; cattle; therapeutic response

Introduction

Dermatophilosis is a skin disease in the form of acute, subacute or chronic infection that affects a varied range of domestic and wildlife (Awad *et al.* 2008). The causal agent of dermatophilosis is a gram-positive bacteria named *Dermatophilus congolensis*. Dermatophilosis known as cutaneous streptothrichosis in cattle, horses and goats is one of the important diseases of the skin that degrades the quality of the skin. It can occur in animals of all ages but young are more susceptible. It is a condition that exhibits as the development of crusty scabs in the skin containing the microorganism (Aliye *et al.* 2020). Livestock contributed approximately 1.66% in the gross domestic product (GDP) of Bangladesh (BER 2016). It meets about 44% demand for animal protein, elevates poverty, grows employment opportunities and contributes to women empowerment. Hides and skins are the valuable wealth for Bangladesh to earn foreign currency. According to the data of the Export Promotion Bureau (EPB), Bangladesh exported leather, leather goods and leather footwear and

earned \$1.01 billion, the second foreign currency earner after the apparel goods, in the fiscal year 2018-19 (Ovi, 2019). Processed leather exports are declining day by day due to lots of constraints. Degradation in the quality of hides and skins is one of the important reasons and is mainly caused by different types of skin diseases.

Until now, the therapeutic response of dermatophilosis is a matter of concern because of the recurrence of the disease. Many therapeutic trials of dermatophilosis have been conducted but none is effective up to the mark (Ogwu *et al.* 1981). Although the prevalence and therapeutic responses of dermatophilosis have been studied in countries of the world and some areas of Bangladesh but many other areas of Bangladesh remain unexplored (Adetunji *et al.* 2000; Chatikobo *et al.* 2004, Loria *et al.* 2004, Nath *et al.* 2014). Hence, this study was conducted owing to the following objectives: 1) to measure the prevalence of bovine dermatophilosis in Dinajpur district, and 2) to study the therapeutic response of bovine dermatophilosis.

Materials and methods

Experimental area, duration and animals : The study was conducted in the veterinary teaching hospital (VTH) at Hajee Mohammad Danesh Science and Technology University (HSTU) and Upazila Veterinary Hospital, Dinajpur Sadar, Dinajpur district of Bangladesh from June 2016 to July 2017. The animals presented from the surrounding rural areas to VTH and Upazilla veterinary hospital at Dinajpur Sadar, Dinajpur district for diagnosis and treatment purposes were primarily considered as the experimental animals.

Experimental design : A total of 320 cattle heads were examined in this study. Among them, 135 males and 185 females and the age ranging from one month to twelve years of age. Epidemiological data having the information of age, sex, breed, season, rearing system, owner complaint and treatment history were recorded. Body condition score (BCS), behavior posture, gait, superficial skin wound, salivation, nasal discharge, locomotive disturbance of the patient were also observed by distant visual inspection. The close visual examination followed by palpation and parting of the entire body hair was performed for the proper diagnosis. To study the therapeutic response, 48 affected cattle were allocated into four different treatment groups named groups A, B, C and D. All the data were recorded

systematically, analyzed statistically with Chi-Square and 't' test for significance using Statistical Package for Social Science (SPSS).

Clinical examination : Temperature, pulse and the rate of respiration were recorded from the individuals. The location of the affected area, lesions, conditions and concurrent infection/complications of the cutaneous lesions were also documented (Figure 1).

Sample collection, culture and isolation and identification of the organism : Skin scabs, crusts, plucked hair and direct smear from freshly separated scabs were collected under aseptic precaution from 35 samples (Carter and Chengappa, 1993). The samples were put into sterile test tubes immediately and carried to the laboratory for inoculation into culture media. The specimens were inoculated into petri dishes containing nutrient agar, nutrient broth and blood agar chronologically and incubated at 37°C for 24 hours. Following incubation, growth characteristics were noted. The organisms were identified as stated by Gordon (1964). Bacterial strains were isolated and identified depending on morphological and staining characteristics, hemolytic activities on blood agar media and biochemical profile (Figure 2).

A smear of bacteria on a glass slide was prepared from the bacterial colony and Gram's staining was performed



Figure 1. Skin lesions of Dermatophilosis affected cattle

and observed under a microscope. The biochemical test for *Dermatophilus congolensis* was performed by a test of carbohydrate fermentation with the basic sugars (dextrose, lactose, maltose, mannitol and sucrose) and catalase test (Figure 3) according to Gordon (1964).

Therapeutic trial: A total of 48 affected cattle were allocated into four different treatment groups where Group-A: treated with procaine penicillin

and benzylpenicillin (Pronapen 40[®], Renata Limited, Bangladesh) injection @ 1ml /10 kg body weight (vial content mixed with 10 ml of distilled water) IM once daily for seven days, Group-B: treated with combined procaine penicillin, benzylpenicillin and streptomycin sulfate (Streptopen 2.5 gm[®], Renata Limited, Bangladesh) @ 1ml /20kg bodyweight (vial content mixed with 08 ml of distilled water) IM once daily for seven days, Group-C: treated with oxytetracycline (Renamycin 100[®], 10 ml vial,

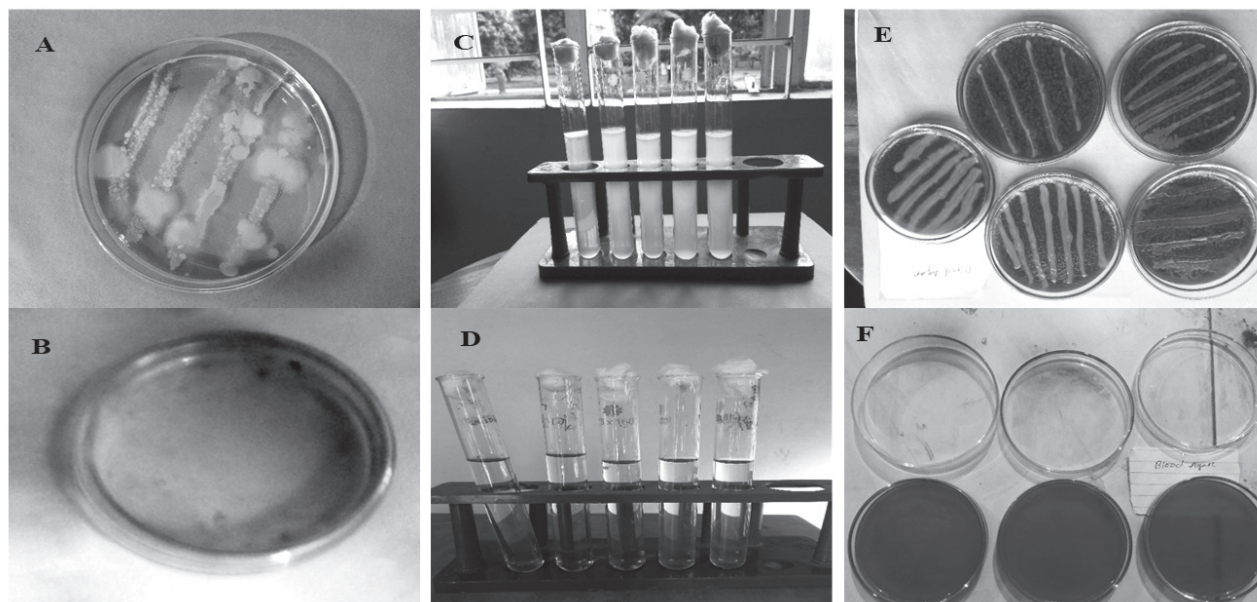


Figure 2. Culture of *Dermatophilus spp* - on nutrient agar media showing control (A) and yellowish colonies (B); on nutrient broth agar showing turbidity (C) and control (D); on Blood agar showing hemolysis (E) and control (F)

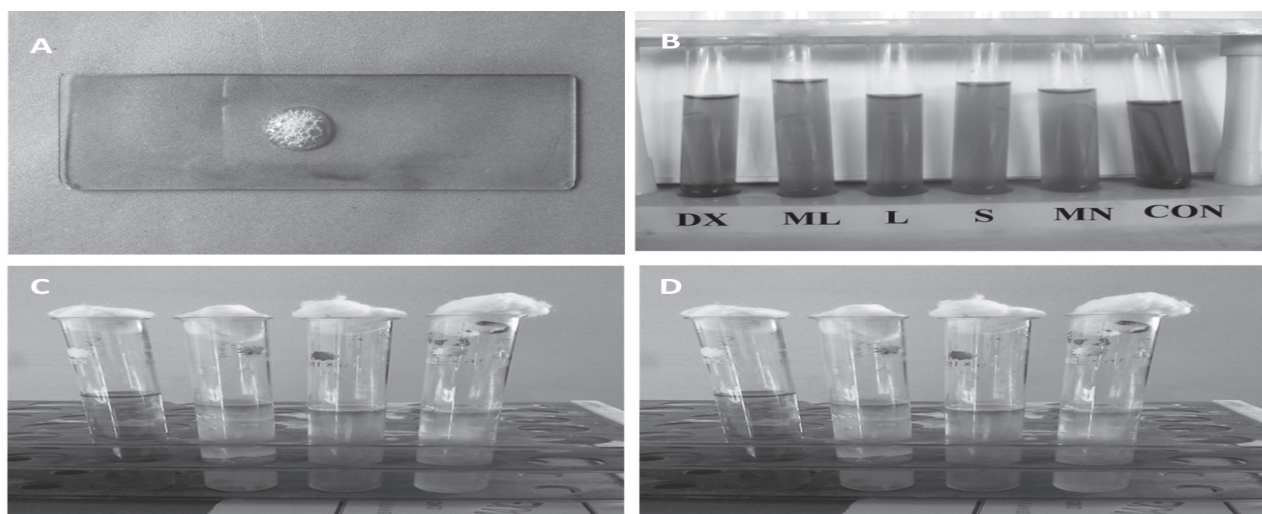


Figure 3. Biochemical properties of *Dermatophilus spp* A. Catalase (positive) with gas bubble formation. B. Fermentative activity with five basic sugars (DX= Dextrose, ML= Maltose, L= lactose, S= Sucrose, M=Mannitol, C = Control) with the production of acid or gas. Change of medium color reddish to yellowish. C. Indole test showing positive results with a red color layer (left) and control (right) D. Motility Indole Urease test causing positive (Left) and control (Right)

Renata Limited, Bangladesh) @ 1ml /10 kg body weight IM once daily for seven days, and Group-D: was untreated and considered as control. After treatment, scabs were collected weekly from each animal for eight weeks for the detection of the organism by microscopical examination and by culture on bovine blood agar (5%). Besides, frequent inspections were made to determine how long the lesions are healed and the new growth of hair.

Results

The diagnostic procedure was based on the clinical lesion, colonial morphology and biochemical test. We found the cattle with generalized yellowish-brown, crusty-scaly skin lesions and the cattle were reluctant to graze. Colonial characteristics were circular, small smooth, convex. The organism was Gram-positive and motile. It produced acid from dextrose but not from lactose, maltose, mannitol and sucrose. The organism was indole and MIU positive.

In the present study, the prevalence of dermatophilosis was 15.00% (Table 1). In different age groups, the highest prevalence of 20.83% was observed between 1 month

to 1 year of age. Whereas, the age group >8 years to 12 years were the least affected. The prevalence among the age groups did not significantly differ. The prevalence in the indigenous breed was 16.21% whereas it was 3.33% in crossbreed (Table 2). In response to seasons, the prevalence significantly ($P<0.05$) differed and the rates were 18.33, 5.45 and 4.00% in summer, rainy and winter seasons, respectively (Table 3). Among the patients, 275 cattle were taken from rural households and the other 45 from the intensive dairy farms. In the case of rural household cattle, the prevalence was 16.36% whereas, in the intensive dairy farm was 6.67% (Table 4). Only one case was reported as dead during the study period in the cattle of the intensive dairy farm.

Efficacy trials of the above-mentioned antimicrobial drugs were compared with the control group based on complete recovery from clinical signs and healing of skin lesions. The fastest healing of the skin lesions of dermatophilosis was observed in the combined therapy with procaine penicillin, benzylpenicillin and streptomycin sulfate @ 1ml/20 kg body weight IM once daily for 7 days between

Table 1. Prevalence of dermatophilosis at the different age group of cattle

Age	Animal examined	Animal infected	Apparent prevalence (%)	χ^2	P-value
>1 month- 1 year	48	10	20.83	3.819	0.576 (NS)
>1 year- 2 year	72	13	18.06		
>2 year- 4 year	63	10	15.87		
>4 year- 6 year	42	5	11.90		
>6 year- 8 year	60	7	16.67		
>8 year- 12 year	35	3	8.57		
Total	320	48	15.00		

NS= Non-Significant

Table 2. Prevalence of dermatophilosis in breeds of cattle

Name of breed	Animal examined	Animal infected	Apparent prevalence (%)	χ^2	P-value
Indigenous	290	47	16.21	3.534	0.06 (NS)
Crossbreed	30	1	3.33		

NS= Non-Significant

Table 3: Prevalence of dermatophilosis in cattle concerning seasons

Name of breed	Animal examined	Animal infected	Apparent prevalence (%)	χ^2	P-value
Summer	240	44	18.33	8.34	0.015*
Rainy	55	3	5.45		
Winter	25	1	4.00		

*= Significant at 5% level of significance

Table 4. Mortality of dermatophilosis under farm and rural condition

Management system	Animal examined	Animal infected	Apparent prevalence (%)	Mortality	Mortality rate (%)
Rural household farm	275	45	16.36	1	2.22
Intensive dairy farm	45	3	6.67	0	0.00

Table 5. Relative effects of different treatment regimes in bovine dermatophilosis

Group	Drugs	Animal treated	Positively responds	Positive response (%)	Response to treatment	Died
A	Procaine penicillin and benzylpenicillin	15	13	86.67	++	0
B	Procaine penicillin, benzylpenicillin and streptomycin sulfate	15	14	93.33	+++	0
C	Oxytetracycline	15	10	66.67	+	0
D	Untreated (Control)	3	0	0	-	1

8 to 12 days. While the lesions of the cattle of the control group did not heal even after 28 days. Injection of procaine penicillin and benzylpenicillin @1ml/10 kg body weight IM once daily for 7 days healed the skin lesions between 12 to 15 days. On the other hand, the lesions of affected animals treated with oxytetracycline healed between 14 to 16 days (Table 5).

Discussion

In this study, the prevalence of dermatophilosis was observed 15.0%, which is more or less close to the findings of Nath *et al.* (2010) and Nooruddin and Khaleque (1986) where prevalence was 13.55% and 13.51%, respectively. A similar finding of the disease (13.4%) was recorded in Botswana by Kumi-Diaka *et al.* (1980). The prevalence of dermatophilosis varies with species, age, breed, season and management condition (Roberts 1963). Young cattle of age 1 month to 1 year (20.83%) were more susceptible which correlates with the observations of Nath *et al.* (2010). The reason for increased susceptibility to the young animal was not clarified. There was a higher prevalence in indigenous cattle (16.21%) than crossbreed (3.33%). The prevalence of the disease based on the season is few. Disease prevalence is highly correlated with the weather. The weather cycle of Bangladesh is divided into six seasons depending on the temperature, rainfall and others. In the present study, the prevalence of dermatophilosis was observed based on season and found significantly higher in the summer season (18.33%) than the rainy (5.45%) and winter season (4.0%) respectively. A similar finding was reported by Nooruddin and Khaleque (1986). In the present study, a significant effect of the cattle management

system, the prevalence of dermatophilosis was recorded. This effect correlates with the observations of Nath *et al.* (2010) and Nooruddin and Khaleque (1986).

The death of only one calf was recorded in this study, due to generalized skin lesions. Mortality was limited only in young cattle. This finding supports the observation of Malfroy (1938) who reported the disease was spread all over the body and caused serious losses by injury to the hides or by illness and death of affected animals. Profuse discharge, alopecia, the coalescence of various lesions affecting the skin was observed in this study support the findings of Nooruddin and Khaleque (1986).

The isolated bacterial colonies were found very small (0.5 to 1 mm), grayish-white, raised and rough. The colonies became yellowish and produced β -hemolysis with further incubation (Ellis 1991, Masters *et al.* 1997). In the sugar fermentation test, the isolated bacteria were fermented dextrose only and produced acid which is also supported by the statement of Gordon (1964) and Ellis (1991). In this study, catalase, indole and MIU test were found positive which fulfills the statements of Silva *et al.* (2003) and Merchant and Packer (1967).

The combined Procaine penicillin, benzylpenicillin and streptomycin sulfate @ 1 ml/20kg body-weight IM for 7 days cured the disease within 8-12 days which supports the finding of Roberts (1963). The healing results of the control group ensured the dermatophilosis as a self-limiting disease. However, the results of the treatment groups suggested that it can be cured quickly with proper treatment and management.

Conclusion

In conclusion, the findings of this study revealed that dermatophilosis was a highly prevalent disease of cattle in Dinajpur district and calves are most susceptible to it. Though it is a self-limiting disease, proper antibiotic treatment hastens the recovery process and reduces economic loss. The therapeutic response of this study suggests that combined therapy with procaine penicillin, benzylpenicillin and Streptomycin sulfate may be practiced in field conditions for the treatment of dermatophilosis. These findings may help the planners and the veterinary practitioners who are working on the prevention and control of diseases, and also may contribute to combating the highly prevalent disease like dermatophilosis in Dinajpur.

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