

EFFICACY OF OXYTETRACYCLINE, AMOXICILLIN, SULFAMETHOXAZOLE AND TRIMETHOPRIM, AND TYLOSIN FOR THE TREATMENT OF BACTERIAL DISEASES IN CATTLE AND GOATS

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ABSTRACT

A single blind clinical trial was carried out in Satkhira district where dairy operations by Community-based Dairy Veterinary Foundation, Bangladesh Agricultural University, Mymensingh were running. A total of 80 cattle and goats affected with different bacterial diseases were used for treatment with oxytetracycline, amoxicillin, combined preparation of sulfamethoxazole and trimethoprim, and tylosin. Diagnosis of diseases was based on clinical history and signs. Haemorrhagic septicemia (HS) affected cattle aged between 3 and 6 were treated with oxytetracycline (Tetravet-100, Acme, Bangladesh; DUFA-OTC 20% LA, DutchFarm, Holland). Amoxicillin (Amoxicillin trihydrate, Jickstar Pharma Inc., Philippines; Moxilin Vet LA, The ACME Laboratories Ltd., Bangladesh) was used in the treatment of calf pneumonia. Foot rot in cows, arthritis in calf and goat were treated with sulphamethoxazole and trimethoprim (Politrim-Vet, The ACME Laboratories Ltd., Bangladesh). Bronchopneumonia in non-lactating cows and goats were treated with tylosin (Tylovet (Acme)). The efficacy of oxytetracycline, amoxicillin, sulfamethoxazole and trimethoprim, and tylosin for the treatment of haemorrhagic septicemia, calf pneumonia, foot rot and bronchopneumonia were evaluated on the basis of recovery rate. Treatment of haemorrhagic septicemia with both antibiotics showed 100% recovery rate. The duration of complete recovery in Tetravet-100 treated group was 4-6 days with median of 5 days. In the DUFA-OTC 20% LA treated group it was 3-5 days with median of 4 days. Moxilin Vet® (Acme) and Amoxicillin trihydrate® (Jickstar Pharma) were evaluated against calf pneumonia in cattle. Cent percent cattle were cured with both the antibiotics, Moxilin Vet® (Acme) and Amoxicillin trihydrate® (Jickstar Pharma). For both antibiotics, the median days of complete recovery was 5. Of 5 foot rot affected cows treated with a combined preparation of sulfamethoxazole and trimethoprim (Politrim-Vet®, Acme), 4 (80%) recovered within 4-5 days of treatment. However, treatment of arthritis affected calf and goat with same preparation showed 90% and 100% recovery rate, respectively. Treatment of bronchopneumonia cases with tylosin (Tylovet®, Acme) resulted in 80% recovery in non-lactating cows and 90% in goats and it took 4-5 days for recovery with a median of 4 days.

Keywords: Haemorrhagic septicemia, pneumonia, arthritis, foot rot, oxytetracycline, amoxicillin, tylosin

INTRODUCTION

Haemorrhagic septicemia (HS), a bacterial disease caused by *Pasturella multocida*, is an important infectious disease of large ruminants in Bangladesh (Debnath *et al.*, 1990; Ahmed, 1996). All ages and types of cattle can be affected but the highest morbidity and mortality occur when beef calves are congregated in feedlots (Yates, 1982). The clinical signs are characterized by coughing, fever, depression, weight loss and death (Hjerpe, 1983). The disease could be effectively treated by the wide range of antibiotics either oxytetracycline or streptomycin (Kedrak and Borkowska-Opacka, 2001). However, penicillin and ampicillin are also widely used (Abeynayake *et al.*, 1993; Kedrak and Borkowska-Opacka, 2001). De Alwis (1995) was found intramuscular administration of streptomycin or oxytetracycline convenient and effective in the treatment of HS. Alongside, antibiotic-resistance is a common feature, and resistance to penicillin is particularly common because widespread use of this antibiotic has created intense selective pressure favoring penicillin resistant organisms (Zimmerman and Hirsh, 1980; Hjerpe, 1983).

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Pneumonia in pre-weaned calves is a multi-factorial disease involving a well-known group of viruses and bacteria, as well as calf-related and environmental risk factors (Ridpath, 2010). Early signs of calf pneumonia include elevated respiratory rate, fever, serous nasal discharge and at the most mild depression or inappetence (Lorenz *et al.*, 2011). Since early treatment is the most important factor that prevents treatment failure, recognition at this stage would be preferable. Antibiotic treatment of bacterial pneumonia must be sufficient in duration and, most crucially, early enough to prevent lesions forming that may resist both therapy and regeneration of normal lung parenchyma (Woolums *et al.*, 2009). The emphasis should be on early treatment and first treatment success in cases of calf pneumonia since the outcome for those animals that fail to respond successfully to first treatment is poor. Typically, one third to two thirds of animals that do not respond to initial therapy are permanently affected or lost (Sweiger and Nichols, 2010). Amoxicillin, ceftiofur, oxytetracycline, sulfadimethoxine are the common antibiotics used for the treatment of pneumonia and bronchopneumonia globally. Unlike ampicillin, the bioavailability of amoxicillin is comparatively higher in different body tissues (Sawant *et al.*, 2005).

Arthritis is a common cause of lameness in ruminants and frequently occurred cases. Usually, ruminants affected with arthritis are treated with a combined preparation of penicillin and streptomycin, sulfonamides, ceftiofur (Radostits *et al.*, 2006). Foot rot is a highly contagious disease affecting the interdigital (between the toes) tissue of ruminants. It is one of the most common causes of lameness in cattle and can result in serious economic loss. Once present in a herd, foot rot can be very difficult to control (Griffin, 1998). Foot rot is usually treated with an antimicrobial product. Penicillin, tetracycline, and other antibacterial medicines are often used to treat normal cases of foot rot. One antibiotic treatment is usually adequate if administered on the first day of disease. Recovery is generally observed in three to four days. If treatment is not initiated until later in the disease process, multiple treatments may be necessary. Penicillin and oxytetracycline are effective antibiotics if started early in the disease process and given at the recommended dosage. Sulfonamides (either intravenously or as a bolus) work well too (Griffin, 1998).

In Bangladesh, antimicrobials are used for the treatment of bacterial diseases at field level without having confirmatory diagnosis and knowing antibiotic sensitivity results, and the field veterinarians experience a wide range of efficacy of different antibiotics. Most of the research reports on antibiotic efficacy are based on laboratory setting, i.e. *in vitro* condition. This paper reports the clinical efficacy of some common antimicrobials such as oxytetracycline, amoxicillin, potentiated sulfonamides (Sulphamethoxazole and Trimethoprim) and tylosin to treat a number of bacterial diseases in cattle and goats at field setting based on presumptive diagnosis.

MATERIALS AND METHODS

A single blind clinical trial was carried out for a period of one year, from September 2011 to August 2012 in Satkhira district where dairy operations by Community-based Dairy Veterinary Foundation, Bangladesh Agricultural University, Mymensingh were running. A total of 80 cattle and goats affected with different bacterial diseases were used for treatment with oxytetracycline, amoxicillin, combined preparation of sulfamethoxazole and trimethoprim and tylosin (Table 1).

Table 1. Clinical cases and number of animals allocated

Diseases	No. of animals
Haemorrhagic septicemia in cattle	20
Calf pneumonia	20
Foot rot in cows	5
Arthritis in calf	10
Arthritis in goat	5
Bronchopneumonia	
Non-lactating cows	10
Goats	10

Drugs used

Amoxicillin trihydrate: Amoxicillin trihydrate (150mg/ml), 100 ml vial, Jickstar Pharma Inc., Philippines, Moxilin Vet LA (150mg/ml), The ACME Laboratories Ltd., Bangladesh; Oxytetracycline hydrochloride: Tetravet-100 (100mg/ml), 10 ml vial, The ACME Laboratories Ltd., Bangladesh, DUFA-OTC 20% LA (200mg/ml), 100 ml vial, DutchFarm, Holland; Sulphamethoxazole and Trimethoprim: Poltrim-Vet (Sulphamethoxazole 200mg and Trimethoprim 40mg/ml), 100 ml vial, The ACME Laboratories Ltd., Bangladesh; Tylosin: Tylovet (200mg/ml), 10 ml vial, The ACME Laboratories Ltd., Dhaka, Bangladesh.

Presumptive diagnosis of diseases

The haemorrhagic septicemia was diagnosed on the basis of clinical signs, which included high temperature, salivation, swelling of the throat and difficulty in breathing. The clinical cases with increased respiratory rate, respiratory distress with abnormal lung sounds, fever, serous nasal discharge and at the most mild depression or inappetence were diagnosed as calf pneumonia/bronchopneumonia (Lorenz *et al.*, 2011). Foot rot was typically diagnosed by the distinctive lesions and odor. Any interdigital fissures and cracks with a characteristic odor was treated as foot rot. Arthritis was diagnosed by swollen joint which were painful and warm to touch and lameness of varying degrees of severity.

Treatment protocol

Haemorrhagic septicemia affected cattle

Twenty affected cattle aged between 3 and 6 years were systematically selected, of which ten were treated with Tetravet-100 (Acme, Bangladesh) @ 1 ml/10 kg body weight IM once daily for 5 days while other ten received two doses of DUFA-OTC 20% LA (DutchFarm, Holland) @ 1 ml/10 kg body weight IM at 48 hours interval. In addition, all the cattle received ketoprofen (Keto-A Vet, Acme) @ 3 ml/100 kg body weight IM once daily for 3 days.

Calf pneumonia

Twenty affected calf aged between 4 and 10 months, were systematically selected, of which ten received two doses of Moxilin Vet LA (Acme) @ 1 ml/10 kg body weight IM at 48 hours interval while other ten were treated with Amoxicillin trihydrate (Jickstar Pharma, Inc., Philippines) @ 1 ml/15 kg body weight IM once daily for 5 days. In addition, all the calves received chlorpheniramine maleate (Asta Vet, Acme) @ 1 ml/25 kg body weight IM once daily for 5 days.

Foot rot in cows, arthritis in calf and goat

A total of 5 foot rot affected cows of 4-5 years old, and 10 arthritis affected calves (10-12 months old) were treated with Poltrim-Vet (Acme) @ 1 ml/15 kg body weight IM once daily for 5 days. Five goats affected with arthritis were also treated with Poltrim-Vet @ 1 ml/10 kg body weight IM once daily for 5 days. In addition, all the cattle and goats received ketoprofen (Keto-A Vet, Acme) @ 3 ml/100 kg body weight IM once daily for 3 days.

Bronchopneumonia in non-lactating cows and goats

Ten non-lactating cows and ten goats affected with bronchopneumonia were treated with Tylovet (Acme) @ 1ml/10 kg body weight once daily for 5 days. In addition, all the cows and goats received chlorpheniramine maleate (Asta Vet, Acme) @ 1 ml/25 kg body weight IM once daily for 5 days.

RESULTS AND DISCUSSION

The efficacy of oxytetracycline, amoxicillin, sulfamethoxazole and trimethoprim, and tylosin for the treatment of haemorrhagic septicemia, calf pneumonia, foot rot and bronchopneumonia were evaluated on the basis of recovery rate.

The animals affected with haemorrhagic septicemia were treated with two commercially available antibiotic preparations (Tetravet®, Acme) and (DUFA-OTC 20% LA, DutchFarm). Treatment of haemorrhagic septicemia with both antibiotics showed 100% recovery rate (Table 2). The duration of complete recovery in Tetravet-100 treated group was 4-6 days with median of 5 days. In the DUFA-OTC 20% LA treated group it was 3-5 days with median of 4 days.

Moxilin Vet® (Acme) and Amoxicillin trihydrate® (Jickstar Pharma) were evaluated against calf pneumonia in cattle. Cent percent cattle were cured with both the antibiotics (Table 2). For both antibiotics, the median days of complete recovery was 5.

Table 2. Duration (days) and recovery rate of animals affected with different bacterial diseases following treatment with oxytetracycline, amoxicillin, sulfamethoxazole and trimethoprim, and tylosin

Name of diseases	Name of drugs	No. of animals treated	No. of animals recovered	Duration (days) of complete recovery (median days)	Recovery rate (%)
Haemorrhagic septicemia in cattle	Tetravet-100 (Acme)	10	10	4-6 (5)	100
	DUFA-OTC 20% LA (DutchFarm)	10	10	3-5 (4)	100
Calf pneumonia	Moxilin Vet LA (Acme)	10	10	4-7 (5)	100
	Amoxicillin Trihydrate (Jickstar Pharma Inc)	10	10	3-7 (5)	100
Foot rot in cows	Politrim-Vet (Acme)	5	4	5-6 (5)	80
Arthritis in calf		10	9	5-7 (6)	90
Arthritis in goat		5	5	4-7 (5)	100
Bronchopneumonia	Tylovet (Acme)				
Non-lactating cows		10	8	4-5 (4)	80
Goats		10	9	4-5 (4)	90

Of 5 foot rot affected cows treated with a combined preparation of sulfamethoxazole and trimethoprim (Politrim-Vet®, Acme), 4 (80%) recovered within 4-5 days of treatment. However, treatment of arthritis affected calf and goat with same preparation showed 90% and 100% recovery rate, respectively.

A single preparation of tylosin (Tylovet®, Acme) was used for the treatment of bronchopneumonia in non-lactating cows and goats. The result showed that 80% non-lactating cows and 90% goats were recovered after treatment and it took 4-5 days for recovery with a median of 4 days (Table 2).

We have evaluated some antimicrobials against some important diseases of cattle and goat under field condition. A limitation of our study is that the confirmatory diagnosis of diseases was not done rather we performed presumptive diagnosis. In Bangladesh, use of antimicrobials in the treatment of animal diseases is mainly based on the presumptive diagnosis of diseases. Therefore, clinical evaluation of antimicrobials under field setting in this study provided some useful information for the field veterinarians.

In the treatment of haemorrhagic septicemia, several antimicrobials are used effectively like oxytetracycline, potentiated sulfonamides (Benkirane and De Alwis, 2002). Here, we found 100% efficacy with the treatment of oxytetracycline in case of haemorrhagic septicemia, which is in agreement with the earlier report of (Keita *et al.*, 2007; Shivachandra *et al.*, 2011) who also reported higher efficacy of level of oxytetracycline.

Amoxicillin is widely used in veterinary practice (Radostits *et al.*, 2006). In cattle, this antibiotic is indicated in the treatment of many bacterial diseases such as pneumonia, diarrhea, mastitis and even foot rot (Braun *et al.*, 1987; Radostits *et al.*, 2006). It is effective in the treatment of calf pneumonia caused by *P. hemolytica*, *P. multocida* (Benkirane and De Alwis, 2002). Here, Moxilin Vet® (Acme) and Amoxicillin trihydrate® (Jickstar Pharma), both the preparations were very effective in the treatment of calf pneumonia.

In case of arthritis and foot rot treatment, several antimicrobials have been reported to be effective like potentiated sulfonamides, oxytetracycline, and ceftiofur (Kausche and Robb, 2002). Among them the efficacy level of potentiated sulfonamides and ceftiofur is high (Griffin, 1998), which supports the present finding in which 80-100% efficacy was found with the treatment of potentiated sulfonamides (Politrim-Vet, Acme) in the treatment of foot rot and arthritis.

Tylosin, an antibiotic of the macrolide class, is indicated in the treatment of a wide range of diseases in cattle and goats caused by Gram-positive organisms and a limited range of Gram-negative organisms. Its use in the treatment of bronchopneumonia is also suggested by many authors (Radostits *et al.*, 2006; Prescott and Dowling, 2013). Here, in this study the efficacy of tylosin (Tylovet, Acme) in the treatment of bronchopneumonia in non-lactating cows and goats was 80-90%, which is consistent with the earlier reports (Stamm and Cobbs, 1980).

REFERENCES

1. Abeynayake P, Wijewardana TG and Thalagoda SA (1993). Antimicrobial susceptibility of *Pasteurella multocida* isolates. In: *ACIAR PROCEEDINGS*, pp 193-193: Australian Centre For International Agricultural Research.
2. Ahmed S (1996). Status of some bacterial diseases of animals in Bangladesh. *Asian Livest* 21: 112-114.
3. Benkirane A and De Alwis M (2002). Haemorrhagic septicaemia, its significance, prevention and control in Asia. *Veterinarni MedicinaPraha* 47: 234-240.
4. Braun R, Bates D, Shearer J, Tran T and el Keiey M (1987). Efficacy of amoxicillin trihydrate for the treatment of experimentally induced foot rot in cattle. *American Journal of Veterinary Research* 48: 1751-1754.
5. De Alwis M (1995). Haemorrhagic septicaemia (*Pasteurella multocida* serotype B: 2 and E: 2 infection) in cattle and buffaloes. In: *Haemophilus, Actinobacillus and Pasteurella*, edn: Springer. pp. 9-24.
6. Debnath N, Sil B, Selim S, Prodhon M and Howlader M (1990). A retrospective study of calf mortality and morbidity on smallholder traditional farms in Bangladesh. *Preventive Veterinary Medicine* 9: 1-7.
7. Griffin DD (1998). Feedlot Diseases. *Veterinary Clinics for North America: Food Animal Practice* 14: 199-231.
8. Hjerpe C (1983). Clinical management of respiratory disease in feedlot cattle. *Veterinary Clinics for North America (USA)*.
9. Kausche FM and Robb EJ (2002). A comprehensive review of ceftiofur sodium and hydrochloride formulations for treatment of acute bovine foot rot. *Veterinary Therapeutics: Research in Applied Veterinary Medicine* 4: 83-93.
10. Kedrak A and Borkowska-Opacka B (2001). Phenotypic characteristics of *Pasteurella multocida* strains isolated from cattle affected with haemorrhagic septicaemia. *Bulletin of the Veterinary Institute in Pulawy* 45: 171-176.
11. Keita A, Pommier P, Pagot E, Couper A and Cromie L (2007). A combination oxytetracycline/flunixin treatment of respiratory infections in cattle. *Revue Médicine Vétérinaire* 158: 86-91.
12. Lorenz I, Earley B, Gilmore J, Hogan I, Kennedy E and More SJ (2011). Calf health from birth to weaning. III. housing and management of calf pneumonia. *Irish Veterinary Journal* 64: 1.
13. Prescott JF and Dowling PM (2013). *Antimicrobial therapy in veterinary medicine*. edn. John Wiley & Sons.
14. Radostits OM, Gay CC, Hinchcliff KW and Constable PD (2006). *Veterinary Medicine*. 10th edn. WB Saunders: Philadelphia, USA.
15. Ridpath J (2010). The contribution of infections with bovine viral diarrhoea viruses to bovine respiratory disease. *Veterinary Clinics for North America: Food Animal Practice* 26: 335-348.
16. Sawant A, Sordillo L and Jayarao B (2005). A survey on antibiotic usage in dairy herds in Pennsylvania. *Journal of Dairy Science* 88: 2991-2999.
17. Shivachandra S, Viswas K and Kumar A (2011). A review of hemorrhagic septicemia in cattle and buffalo. *Animal Health Research Reviews* 12: 67-82.
18. Stamm AM and Cobbs CG (1980). Group C streptococcal pneumonia: report of a fatal case and review of the literature. *Review of Infectious Diseases* 2: 889-898.
19. Sweiger SH and Nichols MD (2010). Control methods for bovine respiratory disease in stocker cattle. *Veterinary Clinics of North America: Food Animal Practice* 26: 261-271.
20. Woolums A, Ames T and Baker J (2009). The bronchopneumonias (respiratory disease complex of cattle, sheep, and goats). *Large Animal Internal Medicine* 4: 602-643.
21. Yates W (1982). A review of infectious bovine rhinotracheitis, shipping fever pneumonia and viral-bacterial synergism in respiratory disease of cattle. *Canadian Journal of Comparative Medicine* 46: 225.
22. Zimmerman M and Hirsh D (1980). Demonstration of an R plasmid in a strain of *Pasteurella haemolytica* isolated from feedlot cattle. *American Journal of Veterinary Research* 41: 166-169.