

## **EFFICACY OF COMBINATION OF AMOXICILLIN AND CLAVULANIC ACID IN THE TREATMENT OF PYODERMA IN BEETAL GOATS**

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**ABSTRACT:** The present study was conducted in forty Beetal goats presented with severe-graded pyoderma on clinical grounds. These goats were treated with amoxicillin and clavulanic acid combination and compared with the treatment regimen already practiced in field i.e. co-trimazine. For this purpose, goats were randomly divided into two groups; A (control) and B (experimental), with 20 animals in each group. Group A was treated with co-trimazine, while group B was administered intramuscularly with amoxicillin and clavulanic acid combination at the rate of 15 mg/kg body weight (BW). At seventh day of treatment, goats of both groups were evaluated for comparative efficacy of two treatment protocols through observing the clinical manifestations of disease. Complete clinical cure of the lesions or a marked improvement was set as the main criterion for evaluation of efficacy of drugs. In group B, 18 (90%) goats showed clinical cure of therapy, while cure rate in group A was 11 (55%) which showed a significant difference ( $P < 0.05$ ) in success rate of treatment protocol in group B over its counterpart (group A). The results of the study have shown that that severe cases of pyoderma in goats could be effectively treated with the combination of amoxicillin and clavulanic acid.

**Key words:** Pyoderma, amoxicillin, clavulanic acid, treatment and efficacy.

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### **INTRODUCTION**

Pyoderma is a bacterial skin disease in tropical and sub-tropical developing countries and considered among highest percentage of skin infection in goats (Foster, 2012; Smith and Sherman, 2009). In Pakistan, prevalence of pyoderma in goats has not yet been reported but common range of cases is 15% to 25% annually. Involvement of *Staphylococcus aureus* (*Staph. aureus*) and/or *Streptococcus pyogenes* (*Strept. pyogenes*) are considered to be the major source of this disease (Rehman *et al.*, 2013; Weese and Van Duijkeren, 2010 and Hay and Morris-Jones., 2010). Use of topical antibiotics could potentially reduce limited lesions (Beco *et al.*, 2013a) but parenteral administration of antibiotics is preferred in severe cases. For the treatment of choice, it should be taken into account that it should be equally effective against both agents; *Staph. aureus* and *Strept. pyogenes* (Beco *et al.*, 2013b).

Antibiotics containing Beta-lactame i.e. penicillin, amoxicillin and ampicillin are considered to be the potential candidates in the treatment of pyoderma. However, pervasiveness of  $\beta$ -lactamase producing strain gave rise to in *Staph. aureus* and *Strept. pyogenes* resistance to broad-spectrum penicillin (Hahn *et al.*, 2016). Secretion of  $\beta$ -lactamases is the common reason for development of resistance which leads to hydrolysis of the  $\beta$ -lactam ring of the antibiotic molecule (Riviere

and Papich, 2009). To challenge its vulnerability to  $\beta$ -lactamase, amoxicillin is combined with a  $\beta$ -lactamase inhibitor such as clavulanic acid. Clavulanic acid is one of the inhibitors of  $\beta$ -lactamase enzymes which induce limited intrinsic antibacterial activity, however, it enhance the capability of  $\beta$ -lactam antibiotics especially, amoxicillin regarding their antibacterial activity (Riviere and Papich, 2009). Pharmacokinetic profile of clavulanic acid was similar to amoxicillin with 1 hour half-life (Kaur *et al.*, 2011). Combination of amoxicillin and clavulanic acid has shown to be well tolerated by goats suffering with severe pyoderma (Singh *et al.*, 2013) and is active against both staphylococci and streptococci (Kaur *et al.*, 2011 and Bush and Macielag, 2010).

This study was conducted to evaluate the efficacy of amoxicillin clavulanic acid combination in the management of severe pyoderma in Beetal goats, by comparing its activity to that of co-trimazine, a combination of antibiotics that is considered a standard treatment in most cases of pyoderma.

### **MATERIALS AND METHODS**

This study was conducted at Veterinary Medical Teaching Hospital, Department of Clinical Studies, Pir Mehr Ali Shah-Arid Agriculture University, Rawalpindi, Pakistan simultaneously i.e. on-campus and at University Research Farm, Koont. A total of 40 Beetal goats of

either sex were presented at the above mentioned clinics with severe pyoderma. "Severe pyoderma" was the only inclusion criterion based on: "superficial bacterial skin infection, yellowish crusts containing pus and presence of more than ten lesions on the body". Lesions due to both primary and secondary skin disorder were considered for study.

**Study design:** To conduct experimental treatment study the 40 selected goats were divided randomly in two groups. Group A (n=20) was administered with cotrimazine i.e. Tribissen intramuscularly at a rate of 15 mg/kg body weight along with 2% topical povidone-iodine. Group B (n=20) was treated with amoxicillin and clavulanic acid combination i.e. Augmentin intramuscularly at a rate of 15 mg/kg body weight, together with an application of 2% povidone-iodine topically. Povidone-iodine was used to disinfect the surface of the lesions. The treatment was continued for seven consecutive days in both the groups.

**Evaluation of the outcomes:** The comparative efficacy of both treatment regimens was evaluated after completion of seven days treatment. The treatment considered a clinical successful when the lesions resolved completely or showed marked improvement during antibiotic therapy. The treatment regimen was declared "unsuccessful" when there was no or only slight improvement, or worsening. Such types of cases were then treated with the other drugs.

## RESULTS AND DISCUSSION

In the present study, the gender ratio was 1:1.2 (18 males, 22 females) with the age of  $18 \pm 3$  months. Yellowish crusts were present in 12/40 cases and pus was present in 28/40. Main locations of the lesions were pelvic area (8/40, 20%), hind limbs (16/40, 40%) and trunk (16/40, 40%). Secondary pyoderma was present in 26/40 of cases (65%) to eczema (10/40, 25%), pruritis (8/40, 20%) and scabies (8/40, 20%) (Table-1). The baseline severity of the disease was non-significant between both the groups. After seventh day of treatment, a significant difference ( $P < 0.05$ ) was observed in the efficacy of amoxicillin and clavulanic acid combination (group-B) and that of trimethoprim and sulphadiazine combination (group-A). Group B showed a cure rate of 95% which significantly differed from group A in which the cure rate was 55% (Table-2). A statistical difference ( $P < 0.05$ ) in the improvement of symptoms was observed within the group B at different observational time intervals, while there was non-significant difference within group A.

Many researchers have investigated the use of different antibiotics for treatment of pyoderma in different species, however, limited data was available

regarding treatment of pyoderma in goats (Bordeanu *et al.*, 2013). The present study was conducted to evaluate the comparative efficacy of two antibiotics in the amelioration of pyoderma in Beetal goats. Combination of amoxicillin with clavulanic acid resolved the skin lesions completely within seven days of treatment in 95% of the severe cases of pyoderma (Rehman *et al.*, 2013). On the other hand, co-trimazine was unable to show significant improvement in skin lesions. The results were in line with studies conducted in humans by (Eumkeb *et al.*, and 2010; Pozzi and Ben-David, 2012).

Clinically, bacterial cultures were not achievable from skin lesions of pyoderma; however, a shift in the nature of the potentially causative pathogens may require a change in the empiric antimicrobial therapy (Tannock, 2012). From the result of this study, it is suggested that combination of amoxicillin and clavulanic acid can be used safely for the treatment of severe pyoderma in Beetal goats before the availability of culture and/or antibiotic susceptibility test.

**Table-1. Percentage of different lesions and skin disorders present on the different regions on the body of the animals effected with pyoderma.**

Location of the lesions present on the animal body (n=40)	Percentage
Pelvic area	20%
Hind limbs	40%
Trunk	40%
<b>Secondary Pyoderma in effected animals (n=40)</b>	
Eczema	25%
Pruritis	20%
Scabies	20%

\* Animals with severe pyoderma were used in the study with inclusion criterion based on: superficial bacterial skin infection, yellowish crusts containing pus, presence of more than ten lesions on the body; both primary and secondary to another skin disorder.

**Table-2. Comparative efficacy of amoxicillin plus clavulanic acid (group B) and trimethoprim plus sulphadiazine (group A) in the treatment of severe pyoderma in Beetal goats**

Outcome	Group A	Group B
Successful Treatment	11	19
Unsuccessful Treatment	9	01
Total	20	20

**Conclusion:** It was concluded from the study that severe cases of pyoderma in goats could be effectively treated with amoxicillin and clavulanic acid combination and this combination of drugs can be used as a treatment of choice.

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