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Antibiogram-guided ceftriaxone–tazobactam therapy for acute mastitis in Murrah buffaloes

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Abstract

Acute mastitis remains a major production-limiting disease in dairy buffaloes, particularly during early lactation. The present clinical study evaluated the therapeutic efficacy of a combination of Ceftriaxone and Tazobactam along with multivitamin supplementation in recently calved Murrah buffaloes. Nine clinical cases were subjected to bacteriological examination and antibiogram assay prior to treatment. Ceftriaxone exhibited the highest zone of inhibition (32 mm) against isolated pathogens and was selected for therapy. Animals were treated intramuscularly for five consecutive days. Significant reduction in Somatic Cell Count (SCC) and Total Bacterial Count (TBC) was observed by day 7 and day 16 post-treatment. Complete clinical recovery and improvement in milk quality were recorded, with no recurrence up to 21 days post-therapy. The findings support the use of Ceftriaxone–Tazobactam combination therapy guided by antibiogram testing for effective management of acute mastitis in buffaloes.

Keywords: Acute mastitis, Murrah buffalo, somatic cell count, total bacterial count, ceftriaxone–tazobactam

Introduction

Mastitis continues to be recognized as one of the most economically devastating diseases affecting dairy animals worldwide, exerting profound impacts on milk yield, milk composition, animal welfare, and farm profitability. In buffalo-based dairy systems, particularly in regions where buffalo milk constitutes a major component of total milk production, mastitis assumes even greater significance. The disease results not only in quantitative losses due to decreased milk output but also in qualitative deterioration marked by elevated somatic cell counts, increased bacterial load, altered physicochemical properties, and reduced processing suitability. Additional economic burdens arise from treatment costs, discarded milk, premature culling, and long-term impairment of udder health.

Asian water buffaloes possess tremendous genetic potential for milk production, with elite breeds yielding up to 5000 liters per average lactation (Das *et al.*, 2008) ^[1]. The strategic promotion of buffalo husbandry by organizations such as the Food and Agriculture Organization further underscores their importance in global dairy sustainability. Safeguarding udder health in high-producing buffaloes, therefore, becomes a critical determinant of both economic viability and food security.

Mastitis is defined as inflammation of the mammary parenchyma regardless of etiology (Radostits *et al.*, 2007) ^[2]. Although multifactorial in origin, bacterial pathogens remain the primary causative agents. The periparturient and early lactation periods are particularly critical due to physiological stress, metabolic adjustments, and transient immunosuppression, which predispose animals to intramammary infections. Recently calved buffaloes, therefore, represent a high-risk category requiring vigilant monitoring and timely intervention.

Preventive strategies such as post-milking teat dipping constitute a cornerstone of mastitis control programs. Chlorhexidine-based teat dips (0.35–0.5%) are widely accepted for their broad-spectrum germicidal activity against major mastitis pathogens including *Staphylococcus*

aureus and streptococci. By disinfecting the teat surface and providing a protective barrier while the teat canal remains open after milking, teat dipping significantly reduces new intramammary infections and overall disease incidence.

Despite preventive efforts, therapeutic management remains essential in clinical mastitis. Rational antimicrobial therapy demands careful selection of agents based on pathogen identification and antimicrobial susceptibility testing in accordance with Clinical and Laboratory Standards Institute (CLSI) guidelines. Targeted therapy directed toward the specific etiological agent enhances bacteriological cure rates and mitigates the risk of antimicrobial resistance (Constable *et al.*, 2008) [3]. Recent global reports have highlighted increasing antimicrobial resistance among mastitis pathogens, reinforcing the need for evidence-based, precision-guided treatment approaches (Sharifi *et al.*, 2023; Haq *et al.*, 2024) [4, 5].

Ceftriaxone, a third-generation cephalosporin with broad-spectrum bactericidal activity, combined with Tazobactam, an irreversible β -lactamase inhibitor, offers a potent therapeutic option against β -lactamase-producing organisms. The synergistic action of this combination may enhance efficacy against both Gram-positive and Gram-negative pathogens commonly implicated in mastitis. Additionally, supportive therapy with antioxidant vitamins—particularly Vitamin E—has been associated with improved immune competence and reduced severity of mastitis.

In this context, the present investigation was undertaken to evaluate the therapeutic efficacy of Ceftriaxone–Tazobactam (Ceftriaxone + Tazo) in combination with multivitamins (Intavita H, Intas Pharma, Ahmedabad) in recently calved Murrah buffaloes affected with acute mastitis, using clinicopathological and microbiological parameters as indicators of treatment success.

Materials and Methods

For the present clinical investigation, nine recently calved Murrah buffaloes in their second and third lactation suffering from acute mastitis were selected from an organized dairy farm in Bareilly, Uttar Pradesh. All animals were maintained under similar management and feeding conditions. A thorough clinical examination was performed in each case, including assessment of rectal temperature, udder consistency, local inflammatory changes, pain response, and alterations in milk appearance. Based on clinical diagnosis, the affected animals were designated as Group A, while clinically healthy buffaloes maintained under the same farm conditions served as Group B for comparative evaluation of milk quality parameters.

Milk samples were collected aseptically from all four quarters after proper teat sanitation. Sampling was carried out on day 0 (pre-treatment), day 7, and day 16 of the study period. Somatic Cell Count (SCC) was estimated according to the method described by Schalm *et al.* (1971) [6], while Total Bacterial Count (TBC) was determined following the procedures outlined by Balows *et al.* (1992) [7]. For antimicrobial susceptibility testing, pre-treatment milk samples from mastitic buffaloes were preserved at -20°C and later subjected to antibiogram assay using the disc diffusion method as described by Bauer *et al.* (1966) [8].

For bacteriological examination, 10 μl of each milk sample was inoculated onto 5% bovine blood agar plates and incubated under aerobic conditions. Distinct colonies were subsequently subcultured onto selective media for purification and identification. The isolates were characterized based on colony morphology, hemolytic patterns, Gram's staining reaction, and standard biochemical tests in accordance with

Balows *et al.* (1992) [7]. As part of routine mastitis control measures, post-milking teat dipping was performed using 0.5% chlorhexidine solution applied via dip cup to all four teats immediately after milking, ensuring coverage of the teat surface while the teat canal remained open.

All buffaloes diagnosed with acute mastitis were treated with a combination of Ceftriaxone sodium (4.0 g) and Tazobactam sodium (500 mg) (Intacef-Tazo, Intas Pharma, Ahmedabad) administered intramuscularly for five consecutive days. In addition, each animal received a single intramuscular injection of multivitamin preparation (Intavita H, Intas Pharma, Ahmedabad) at a dose rate of 10 ml per animal, containing Vitamin A (250, 000 IU), Vitamin D₃ (25, 000 IU), Vitamin E acetate (100 IU), and Biotin (12.5 μg). Therapeutic efficacy was assessed on the basis of clinical improvement, reduction in SCC and TBC values recorded on day 7 and day 16 post-treatment, and absence of recurrence up to 21 days. The data generated were subjected to statistical analysis using two-way analysis of variance (ANOVA) followed by Duncan's Multiple Range Test at a 5% level of significance as described by Snedecor and Cochran (1994) [9].

Results and Discussion

Clinical and Microbiological Findings

All nine affected buffaloes exhibited classical clinical signs of acute mastitis, including udder swelling, pain upon palpation, increased local temperature, and visible alterations in milk consistency such as clots and watery secretions. These findings clearly indicated active intramammary infection and inflammatory response.

On day 0, infected buffaloes (Group A) showed markedly elevated SCC ($24.47 \pm 2.07 \times 10^5$ cells/ml) and TBC ($4.95 \pm 1.37 \times 10^5$ cfu/ml), significantly higher than healthy controls (SCC: $2.90 \pm 0.14 \times 10^5$ cells/ml; TBC: $0.36 \pm 1.52 \times 10^5$ cfu/ml). These elevated values reflect severe inflammatory response and bacterial proliferation within the mammary gland. Elevated SCC is a well-established biomarker of intramammary infection and correlates with decreased milk quality, reduced shelf life, and impaired processing characteristics.

Bacteriological examination revealed isolation of coagulase-negative *Staphylococcus aureus* (2), *Staphylococcus aureus* (1), *Streptococcus agalactiae* (1), *Streptococcus uberis* (3), and coliform bacilli (2). These pathogens are widely reported as predominant mastitis-causing organisms in dairy herds globally.

Antibiotic sensitivity testing demonstrated the highest zone of inhibition for Ceftriaxone (32 mm), followed by ciprofloxacin (29 mm), enrofloxacin (28.5 mm), gentamicin (26 mm), chlortetracycline (24 mm), and ampicillin (23.5 mm). The superior sensitivity pattern justified the selection of Ceftriaxone for therapeutic intervention. Chlorhexidine (0.5%) further supported infection control by eliminating surface pathogens during milking.

Therapeutic Response

Following treatment, a progressive and statistically significant decline in SCC and TBC was observed. By day 7, SCC decreased by 73% and TBC by 77%, indicating rapid bacteriological clearance and reduction in inflammatory response. By day 16, reductions reached 84.8% (SCC) and 91.2% (TBC), approaching values observed in healthy controls.

The pronounced improvement by day 16 suggests sustained antimicrobial activity and effective pathogen elimination. Complete clinical recovery in all treated buffaloes and absence of recurrence up to 21 days further confirm

therapeutic success. These findings align with earlier observations that bacteriological cure may vary depending on antimicrobial susceptibility (Sol *et al.*, 2000) ^[10]. However, antibiogram-guided therapy enhances precision and improves treatment outcomes. Increasing antimicrobial resistance among mastitis pathogens has been highlighted in recent global surveillance studies (Sharifi *et al.*, 2023; Haq *et al.*, 2024) ^[11, 12]. In this study, Ceftriaxone demonstrated superior sensitivity, whereas tetracycline showed comparatively lower efficacy. Ceftriaxone’s broad-spectrum bactericidal action combined with Tazobactam’s β -lactamase inhibition likely enhanced its effectiveness against resistant strains. Although concerns

persist regarding β -lactam resistance, combination therapy mitigates enzymatic degradation and enhances therapeutic spectrum. Systemic therapy is particularly recommended in severe coliform mastitis and *S. aureus* infections (Barkema *et al.*, 2006) ^[13]. The adjunct administration of multivitamins, especially Vitamin E, may have strengthened immune responsiveness and reduced oxidative stress within mammary tissues. Vitamin E supplementation has been associated with decreased severity and duration of mastitis (Hemingway, 1999) ^[14]. The synergistic effect of antimicrobial and supportive therapy likely contributed to rapid clinical recovery and normalization of milk parameters.

Table 1: Pre and post-treatment comparison of Milk Parameters in Mastitic buffaloes

Milk quality parameters n=18	Groups	Days of observation (mean±SE)		
		0 day	7 th day PT	16 th day PT
CMT point score	A	3.21±0.34 ^{ax}	1.1±0.23 ^{bx}	0.21±0.02 ^c
	B	0.24±0.04 ^y	0.26±0.02 ^y	0.22±0.04
SCC (x10 ⁵ cells/ml)	A	24.47±2.07 ^{ax}	6.54±0.57 ^{bx}	3.64±0.63 ^c
	B	2.90±0.14 ^y	2.78±0.18 ^y	3.04±0.30
TBC (x10 ⁵ cfu/ml)	A	4.95± 1.37 ^{ax}	1.09± 1.11 ^{bx}	0.43± 1.16 ^{cx}
	B	0.36± 1.52 ^{ay}	0.37± 1.52 ^{ay}	0.36± 1.51 ^{ax}

Values are mean ± SE. Values in a row with different superscripts differ significantly (*p* < 0.05)

Conclusion

Antibiogram-guided antimicrobial therapy represents a rational and effective strategy for mastitis management. The present study demonstrates that Ceftriaxone–Tazobactam combination therapy, supported by multivitamin supplementation, ensures significant reduction in somatic cell and bacterial counts, complete clinical recovery, and improved milk quality in recently calved Murrah buffaloes. This therapeutic regimen may be recommended for effective management of acute mastitis under field conditions.

Conflict of Interest

Not available

Financial Support

Not available

References

1. Das AK, Sharma D, Kumar N. Buffalo genetic resources in India and their conservation. Buffalo Bulletin. 2008;27(4):265-268.

2. Radostits OM, Gay CC, Hinchcliff KW, Constable PD. Veterinary medicine. 10th ed. Philadelphia (USA): Saunders Elsevier; 2007. p. 673.

3. Constable P, Pyorala S, Smith G. Guidelines for antimicrobial use in cattle. In: Guardabassi L, Jensen LB, Kruse H, editors. Guide to antimicrobial use in animals. Oxford (UK): Blackwell Publishing Ltd.; 2008. p. 143-160.

4. Sharifi A, Sobhani K, Mahmoudi P. A systematic review and meta-analysis revealed a high-level antibiotic resistance of bovine mastitis *Staphylococcus aureus* in Iran. Research in Veterinary Science. 2023;161:23-30.

5. Haq IU, Kamal M, Swelum AA, Khan S, De Los Ríos-Escalante PR, Usman T. Alarming multidrug resistance in *Staphylococcus aureus* isolated from raw milk of cows with subclinical mastitis: Antibiotic resistance patterns and occurrence of selected resistance genes. PLoS One. 2024;19(5):e0301200.

6. Schalm OW, Carroll EJ, Jain NC. Bovine mastitis. 1st ed. Philadelphia: Lea and Febiger; 1971. p. 94-127.

7. Balows A, Hausler WJ Jr, Herrmann KL, Isenberg HD,

Shadomy HJ. Manual of clinical microbiology. 5th ed. Washington (DC): American Society for Microbiology; 1992.

8. Bauer AW, Kirby WMM, Sherris JC, Turk M. Antibiotic susceptibility testing by standardized single disc method. American Journal of Clinical Pathology. 1966;45:493-496.

9. Snedecor GW, Cochran WG. Statistical methods. 8th ed. Ames (IA): Iowa State University Press; 1994. p. 217.

10. Sol J, Sampimon OC, Barkema HW, Schukken YH. Factors associated with cure after therapy of clinical mastitis caused by *Staphylococcus aureus*. Journal of Dairy Science. 2000;83:278-284.

11. Sharifi S, Moradi M, Hosseini S. Global trends in antimicrobial resistance among mastitis-causing bacteria: A systematic review. Veterinary Microbiology. 2023;279:109684.

12. Haq I, Rahman S, Ahmad T. Antimicrobial resistance patterns in bovine mastitis pathogens: Emerging challenges and therapeutic strategies. Journal of Dairy Research. 2024;91(1):45-56.

13. Barkema H, Schukken YH, Zadoks RN. Invited review: The role of cow, pathogen, and treatment regimen in the therapeutic success of bovine *Staphylococcus aureus* mastitis. Journal of Dairy Science. 2006;89:1877-1895.

14. Hemingway RG. The influences of dietary selenium and vitamin E intakes on milk defense responses to mastitis. Journal of Dairy Science. 1999;76:2795-2803.

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