Therapeutic management of clinical mastitis in cows

Sandhya Morwal, AP Singh and Deepika Goklaney

Abstract
The present study evaluated the efficacy of parental antibiotics and immunomodulator therapy for treatment of clinical mastitis in cattle. Total 24 cattle diagnosed for clinical mastitis and animals were classified in to four groups comprising of 6 animals in each group, for different therapeutic regimen viz. Group I, Group II, Group III and Group IV. Each group treated with antibiotics for 5-7 days respectively along with supportive medicines. the results indicated that the recovery rate from mastitis in buffaloes after 5 to 7 days of treatment were 100% in group I, II, III group and IV having 83.33%.

Keywords: Cattle, mastitis, antibiotic treatment

Introduction
Mastitis is an economically important disease and causes of culling of dairy cows globally. The hidden organism in the udder may flare up to produce clinical mastitis \[13\]. According to \[14\] mastitis is the most frequently encountered disease leading to reduced milk yield, increased treatment costs and culling rates and in severe cases leads to death. Mastitis is caused by various factors such as bacteria, fungi, mycoplasma, yeast along with stress reduced resistance, shape of udder and teats, inheritance of animal, environment including milking and feeding system \[3\]. Prevention and treatment of mastitis is the main concern of the dairy industry. Current practices of mastitis control are based on proper milking, hygiene, reduced exposure to environmental pathogen and dry cow antibiotic therapy \[6\]. Treatment of mastitis should be based on bacteriological diagnosis and take national and international guidelines on prudent use of antimicrobials into account. In acute mastitis, where bacteriological diagnosis is not available, treatment should be initiated based on herd data and personal experience. Rapid bacteriological diagnosis would facilitate the proper selection of the antimicrobial \[12\]. The present study deals with treatment of clinical mastitis in cows with antibiotics and supportive therapy.

Materials and methods
In the present study samples were collected from 24 cows suffering from clinical mastitis. The samples were collected from affected quarters aseptically for cultural and sensitivity examination by using standard procedure as per \[5\].These animals were classified in to four groups comprising of 6 animals in each group, for different therapeutic regimen viz. Group I, Group II, Group III and Group IV.
**Table 1: Different therapeutic regimens for treatment of clinical mastitis in cow**

<table>
<thead>
<tr>
<th>S. no</th>
<th>Groups</th>
<th>Therapeutic agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I</td>
<td>Injection Amoxycillin sodium + Sulfactum sodium 3 g (Injection Powermox 3.0 g), manufactured by Biotech Veterinary Pharmaceuticals Pvt. Ltd.) @ 10 mg/kg b.w.t, i.m. b.o.d, daily for 5 days.</td>
</tr>
<tr>
<td>2.</td>
<td>II</td>
<td>Injection Meloxicam @ 30 ml/300 kg b.w.t. (Injection Biogesic, manufactured by Biotech Veterinary Pharmaceuticals Pvt. Ltd., each ml contain 5 mg Meloxicam) o.i.d for 5 days.</td>
</tr>
<tr>
<td>3.</td>
<td>III</td>
<td>Injection of Vitamin E and Selenium, administered @ 1 ml/50 kg body wt. (Injection Repronol, manufactured by Cadila Pharmaceuticals Ltd. Each ml contain Tochoferol 50 mg as dl-α-tocopherol acetate, benzyl alcohol 2%. Selenium as sodium selenite 1.5 mg).</td>
</tr>
<tr>
<td>4.</td>
<td>IV</td>
<td>Intramammary infusion of Ampicillin Sodium 75 mg + Cloxacillin sodium 200 mg b.i.d for 5 days (Tilox 5 gm intramammary infusion, manufactured by Vetoquinol).</td>
</tr>
</tbody>
</table>

**Results and discussion**

Total 24 clinically mastitis positive cows were randomly divided into 4 groups, having 6 animals in each group i.e. Group I (8 quarters), Group II (8 quarters), Group III (8 quarters) and Group IV (6 quarters), respectively.

**Cultural examination**

The cultural isolation of organisms involving 30 clinical mastitic milk samples was carried out. On the basis of Gram staining, 14 quarters (46.66%) showed Gram positive, 4 quarters (13.33%) showed Gram negative organisms and rest 6 quarters (20.00%) showed mixed infection. From rest, 6 quarters (20.00%), no bacterial organism was isolated in spite of cows showing clinical manifestation of mastitis. Possibly the reason may be the microorganism belonged either to anaerobic class or Mycoplasma species. In group I and II no bacterial growth was seen in two quarters whereas in group III and IV no growth of bacteria was found in one quarter.

<table>
<thead>
<tr>
<th>S. No</th>
<th>Bacteria isolated</th>
<th>No. of infected quarters (18)</th>
<th>Per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Staphylococcus spp.</td>
<td>8</td>
<td>44.44</td>
</tr>
<tr>
<td>2.</td>
<td>E. coli</td>
<td>4</td>
<td>22.22</td>
</tr>
<tr>
<td>3.</td>
<td>Streptococcus spp.</td>
<td>3</td>
<td>16.66</td>
</tr>
<tr>
<td>4.</td>
<td>Bacillus spp.</td>
<td>2</td>
<td>11.11</td>
</tr>
<tr>
<td>5.</td>
<td>Corynebacterium spp.</td>
<td>1</td>
<td>05.50</td>
</tr>
</tbody>
</table>
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The *Staphylococcus* spp. was the most frequent organism, accounting for 8 of the total [18] isolates (44.44%) followed by *Streptococcus* spp. 3 (16.66%), *E. coli* 4 (22.22%), *Bacillus* spp. 2 (11.11%), *Corynebacterium* spp. 1 (05.50%), respectively (Table 2 and Fig. 1).

Mixed infection was recorded in 6 quarters. The organism isolated in mixed infection was *Staphylococcus* spp. and *Streptococcus* spp., this combination was recorded in 3 (50%) quarters. In another 2 (33.33%) quarters *Staphylococcus* spp. and *E. coli* was recorded. One (16.66%) quarter showed the presence of *E. coli* and *Streptococcus* spp.

**Table 3: Comparative efficacy of different therapeutic regimen in cows of different groups suffering from clinical mastitis (n=24)**

<table>
<thead>
<tr>
<th>S. No</th>
<th>Groups</th>
<th>No of animals</th>
<th>Organism isolated (Pre treatment)</th>
<th>Organism isolated (Post treatment)</th>
<th>% Efficacy of drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Gram +ve</td>
<td>Gram -ve</td>
<td>Mixed</td>
</tr>
<tr>
<td>1.</td>
<td>Group I</td>
<td>6</td>
<td>3</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2.</td>
<td>Group II</td>
<td>6</td>
<td>3</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>3.</td>
<td>Group III</td>
<td>6</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>4.</td>
<td>Group IV</td>
<td>6</td>
<td>4</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

**Group I**: (Amoxycillin sodium + Sulbactum sodium) the efficacy of this group was calculated and found to be 100 per cent. Almost similar results have been reported by [23, 13, 7, 10]. Supplementation of vitamin E has beneficial effect on both cellular and humoral immunity of ruminants resulting in decreased incidence of mastitis and other disease.

**Group II**: (Ceftriaxone-Tazobactum and Colistin sulfate and Cloxacillin Sodium) was used to treat the six cases of bovine mastitis along with Tolfenamic acid. There was a dramatic improvement in the udder health and milk quality in all cases by the 5th day of treatment. The present efficacy of this group was calculated and found to be 100.00 per cent. Almost similar results have been reported by [23, 15, 2, 11]. The combination was found very effective against Gram-negative bacteria also.

**Group III**: Cefoperazone sodium was used to treat the six cases of bovine mastitis along with Ketopropane (anti-inflammatory, analgesic and antipyretic) along with Cefoperazone sodium intramammary infusion. The cases were recovered in 5 days. The present efficacy of this group was calculated and found to be 100 per cent. Almost similar results have been reported by [22, 19]. When Cefoperazone was administered intramammary twice a day the clinical cure was good but bacteriological cure was not good due to its inability to penetrate deep into the mammary tissue and encapsulation of the pathogen.

**Fig 1**: Overall prevalence of various micro-organisms (Single infection) in clinical mastitic cows (n=24)
Group IV: (Amoxycillin sodium and Potassium Clavulanate) was used to treat the six cases of bovine mastitis along with Phenyl Butazzone having anti inflammatory, anti pyretic and analgesic activity. The cases were recovered in 5 days. The present efficacy of this group was calculated and found to be 83.33 per cent. Turutoglu et al. (2006) showed a 100 percent activity of amoxycillin/clavulanic acid to Staphylococcus spp. isolates. Amoxycillin and clavulanic acid is a beta lactamase inhibitor [19]. Reported that zinc deficiency in ruminants results in weakening of skin and other stratified epithelia (i.e. Keratinocytes). Because mammary gland is essentially a skin gland and the importance of keratin lining of the streak canal in prevention of infection is well known, speculation that Zinc supplementation may enhance resistance to mastitis is tempting. Zinc is also known to be associated with enzyme involved in the phagocytic oxidative burst [15], in cellular maturation and functioning of B and T lymphocytes and macrophages. As such Zinc boost immune function in general, supplementation of Zinc methionine resulted in increase milk production and decrease in somatic cell count. However [19], reported beneficial effects of a Zinc-chelate on rate of new, naturally occurring intramammary infection also generally Zinc-chelates are supplemented because they are more bioavailable to the ruminant compared with inorganic zinc [19]. Reported a relation between copper and immune function has been shown by decreased resistance to infection in animals that were copper deficient. Vitamin E supplementation of diet increased intracellular killing of Staphylococcus spp. and E. coli by bovine blood neutrophils. The recommended and legal upper limit for selenium concentration in dairy cow ration is 0.3 ppm which corresponds to an approximate intake of 3 mg/day for dry and 6 mg/day of Se for lactating cow. It has clearly demonstrated that diets of the dairy animals can influence the resistance to intramammary infection [8]. The change in the sensitivity pattern of different organisms to different chemotherapy agents in different areas may probably due to the type of chemotherapeutic agent commonly used there. Ampicillin and penicillin drugs have proved to be inefficient in therapy because of the development of resistant strains of bacteria against them due to their prolonged, improper and indiscriminate use in the field. The refractiveness of certain bacterial isolates to a particular antibiotic may be due to indiscriminate use of antibiotic therapy and involvement of large number of pathogenic bacteria [17].

Conclusion
The present study has shown that mastitis, particularly clinical type, and revealed Staphylococcus, E. coli, Streptococcus, Corynebacterium, and Bacillus bacteria is an important cause of mastitis. The present study has also revealed that S. aureus is an important cause of clinical mastitis. Mastitis is usually spread from cow to cow at milking if the milking hygiene is not good enough. The mastitis situation could be improved by improving milking procedures and hygiene. Antibiotic therapy with Supplementation of vitamin E has beneficial effect on both cellular and humoral immunity of ruminants resulting in decreased incidence of mastitis and other disease. Zinc supplementation may enhance resistance to mastitis in cows.

References
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