

Comparative therapeutic efficacy of subclinical mastitis in goats

S.C. Halmandge, H.A. Upendra, Vivek R. Kasaraliker and P.T. Ramesh

Department of Veterinary Medicine, Veterinary College, KVAFSU, Bidar, Karnataka

Abstract

Subclinical mastitis (SCM) is defined as inflammation of udder without any inflammatory changes either in the animal or udder or the milk and hence could be diagnosed by laboratory examination only. Treatment of SCM in goats plays a major role in milk yield. The present study was taken up to compare the therapeutic efficacy in the treatment of SCM in goats. Forty goats which were positive for SCM, randomly allocated into five treatment groups of eight animals each – Group I (control), Group II (enrofloxacin), Group III (enrofloxacin + vitamin E and selenium combination), Group IV (enrofloxacin + trisodium citrate) and Group V (enrofloxacin + organic selenium) were used for the study. Response to treatment using somatic cell count (SCC) was studied upto 30 days. Mean SCC on different days of post treatment within each treatment group revealed significant decrease from zero day. As compared to all the four treatment groups, mean SCC was lowest in the group treated with vitamin E and selenium combination and organic selenium. Further, when SCC of more than 5 lakh/ml was considered positive for SCM, it was observed that Group II, Group III, Group IV and Group V resulted in mean SCC less than 5 lakh/ml up to 7th, 30th, 21st and 30th day post treatment respectively. This indicated that vitamin E and selenium combination and organic selenium along with enrofloxacin, were more efficacious and beneficial in the treatment of SCM in goats.

Key words: Goats, Subclinical mastitis, Treatment, Enrofloxacin

Goats play an important role in the nutrition and income of people worldwide, these animals serve primarily as source of meat, but also provide milk and skin (Hansen and Perry, 1994). Goat milk differs from cow milk in having better digestibility, alkalinity, buffering capacity and certain therapeutic values in medicine and human nutrition. Mastitis, the inflammation of udder, constitutes one of the important and expensive diseases of dairy industry. Subclinical mastitis (SCM) is difficult to detect due to the absence of any visible indications in the mammary gland and in milk (Mohammadian, 2011). SCM is important due to the fact that it is 15 to 40 times more prevalent than the clinical form, is of long duration, difficult to detect, adversely affects milk quality and production of dairy animals and constitutes a reservoir of microorganisms that can infect other animals within the herd due to its contagious nature (Schultz *et al.* 1978). Treatment of SCM in goats plays a major role in milk production. The present study was taken up to study the comparative therapeutic efficacy in subclinical mastitis in goats.

Material and Methods

Forty apparently healthy goats which were positive for SCM based on somatic cell count (SCC)

were randomly allocated into five groups namely Group I, Group II, Group III, Group IV and Group V with each group comprising of eight animals and were used for the study. The following treatment regimens were followed for different groups. Group I: Goats in this group were maintained as positive control. Group II: Goats in this group were administered with enrofloxacin @ 5 mg/kg b.wt. i/m for 5 days. Group III: Goats in this group were administered with enrofloxacin @ 5 mg/kg b.wt. i/m for 5 days along with vitamin E and selenium combination (E CARE Se®) @ 1 ml/25 kg b.wt. i/m on zero, 3rd and 7th day. Group IV: Goats in this group were administered with enrofloxacin @ 5 mg/kg b.wt. i/m along with trisodium citrate @ 30 mg/kg b.wt. orally for 5 days. Group V: Goats in this group were administered with enrofloxacin @ 5 mg/kg b.wt. i/m along with organic selenium @ 0.3 mg/animal orally for 5 days. Milk samples from all the forty goats belonging to different groups were collected on zero, 7th, 14th, 21st and 30th day post treatment and were subjected to SCC. Freshly collected milk samples were used for SCC estimation by Direct Microscopic Somatic Cell Count method. The procedure described by Prescott and Breed cited by Schalm *et al.* (1971) was followed. The SCC value of 5,00,000 cells/ml of milk and above was taken as criteria to declare the milk / animal as subclinically mastitic (Contreras *et al.*, 1996).

*Corresponding author: sandeepvet@yahoo.co.in

Results and Discussion

The mean \pm SE of SCC of each group on different days of post treatment was given in Table 1. The mean SCC of Group II (enrofloxacin alone), Group III (enrofloxacin + vitamin E and selenium combination), Group IV (enrofloxacin + trisodium citrate) and Group V (enrofloxacin + organic selenium) differed significantly from Group I (control) on 7th, 14th, 21st and 30th day post treatment and were statistically lower in Groups II, III, IV and V. At the same time statistically there was no significant difference between Groups II, III, IV and V during this period. In Group II, post treatment mean SCC decreased from a base value of 16.69 to a lowest value of 4.88 lakh/ml on 7th day post treatment. In Group III, there was a drop in the post treatment mean SCC from a base value of 15.44 lakh/ml and the lowest mean SCC of 2.97 lakh/ml was recorded on 30th day post treatment. In Group IV, there was a drop in the post treatment mean SCC from a base value of 18.59 lakh/ml and the lowest mean SCC of 4.94 lakh/ml was recorded on 21st day post treatment. In Group V, there was a definite drop in the post treatment mean SCC from a base value of 13.81 lakh/ml and the lowest mean SCC of 4.03 lakh/ml was recorded on 30th day post treatment.

The mean SCC on different days of post treatment within each treatment group revealed significant decrease from the base value viz., zero day, in all the four treatment groups, whereas the control group mean SCC did not reveal any significant difference. This indicated that all the four treatments when compared to the control group, resulted in significant reduction of mean SCC from 7th day post treatment to till the end of the study i.e., 30th day. When SCC of more than 5 lakh/ml was considered positive for SCM in goats, the result of this study exhibited that treatment with enrofloxacin + vitamin E and selenium combination (Group III) and enrofloxacin + organic selenium (Group V) reduced SCC to less than

5 lakh/ml from 7th day post treatment and continued to be so till the end of study. However, in treatment with enrofloxacin alone (Group II) and enrofloxacin + trisodium citrate (Group IV), SCC was lower than 5 lakh/ml only on 7th and 21st day post treatment respectively. This indicated that enrofloxacin + vitamin E and selenium combination and enrofloxacin + organic selenium were found to be the best treatment regimen in treating SCM in goats.

The observation of reduced mean SCC following treatment during lactation period is in agreement with the observation made by earlier workers namely Ziv and Storper (1985) and Owens *et al.* (1997). Treatment of SCM with enrofloxacin alone resulted in significant reduction in mean SCC. This indicates enrofloxacin may be the antibacterial of choice in the treatment of SCM in goats. This observation is in agreement with the findings of Ramprabu and Rajeshwar (2006), Suresh *et al.* (2010) and Rajeev *et al.* (2010). Marin *et al.* (2010) and Prabavathy (2013) reported the invitro sensitivity pattern of enrofloxacin was highly sensitive to isolates of caprine mastitis, thus providing additional support to conclude that enrofloxacin is an antibacterial of choice in treatment of SCM in goats. Treatment of SCM with enrofloxacin + trisodium citrate resulted in significant reduction in mean SCC. Trisodium citrate alters the milk pH making it unfavourable for growth of bacteria (Jena and Gupta, 2016) and this may be reason for reduced SCC in Trisodium citrate treated group. When vitamin E and selenium combination and organic selenium were administered individually along with parenteral enrofloxacin, these two treatment regimens resulted in lowered mean SCC and their effect was noticed for prolonged period as compared to group treated with enrofloxacin alone. This indicated that enrofloxacin in combination with vitamin E and selenium combination or organic selenium is beneficial in the treatment of SCM in goats. The beneficial therapeutic effect of vitamin E and

Table 1. Mean \pm SE of somatic cell count in different treatment groups of subclinical mastitis affected goats

Post treatment days	Group I (Control)	Group II (E)	Group III (E+VES)	Group IV (E+TC)	Group V (E+OS)
Zero	14.31 \pm 2.25 ^{ab}	16.69 \pm 2.34 ^{ab}	15.44 \pm 2.63 ^{ab}	18.59 \pm 2.12 ^a	13.81 \pm 1.85 ^{ab}
7 th	13.78 \pm 2.23 ^{ab}	4.88 \pm 0.72 ^c	4.09 \pm 0.46 ^c	5.31 \pm 0.67 ^c	4.56 \pm 0.37 ^c
14 th	14.22 \pm 2.59 ^{ab}	6.00 \pm 0.65 ^c	3.25 \pm 0.62 ^c	6.13 \pm 0.61 ^c	4.41 \pm 0.37 ^c
21 st	13.16 \pm 2.10 ^b	6.94 \pm 1.38 ^c	3.69 \pm 0.42 ^c	4.94 \pm 0.40 ^c	4.09 \pm 0.43 ^c
30 th	15.09 \pm 2.6 ^{ab}	7.84 \pm 2.04 ^c	2.97 \pm 0.58 ^c	5.47 \pm 0.39 ^c	4.03 \pm 0.43 ^c

Means bearing different superscript differ significantly ($p \leq 0.05$)

selenium combination and organic selenium observed in the present study derives support from the findings of Chetan Kumar *et al.* (2014) and Sripad *et al.* (2016) who have reported that vitamin E and selenium is beneficial in treatment of SCM in cows. The beneficial effects of administration of vitamin E and selenium combination in treatment of SCM could be attributed to the antioxidant property, increased glutathione peroxidase activity, increased conversion of T4 to active T3 form of Thyroxine as indicated by Mahan (2001). Further, administration of vitamin E and selenium combination and organic selenium resulted in reduction of mean SCC up to 30th day post treatment as compared to 21st day post treatment in goats treated with trisodium citrate, indicating vitamin E and selenium combination and organic selenium has better therapeutic effect in the treatment of SCM in goats as compared to trisodium citrate. Vitamin E and selenium combination and organic selenium supplementation along with antibacterial resulted in reduction in SCC. Vitamin E and selenium reported to improve the bactericidal activity of neutrophils (NRC, 1989 and Hogan *et al.*, 1990) and has a role in enhancing the resistance of mammary gland to infection (Weiss *et al.*, 1990). Vitamin E and selenium also play a role in boosting the immune response thus, improving general health status of animals (Finley *et al.*, 2001 and Klein *et al.*, 2003). In addition, vitamin E and selenium induces self-cure of SCM and decreases the prevalence of SCM by recruiting phagocytes to the infected milk compartment of the udder and induces an unspecified bactericidal activity in milk lactoserum (Ali Vehmas *et al.*, 1997). Vitamin E and selenium also restrict the growth of mastitis causing pathogens, lowers SCC in milk and results in high milk quality (Jan *et al.*, 2005). In view of these properties, vitamin E and selenium combination and organic selenium as a supportive therapy seems to be beneficial in the treatment of SCM in goats. Based on the results of the present study, it is safe to conclude that treatment regimens of enrofloxacin + vitamin E and selenium combination, enrofloxacin + organic selenium, enrofloxacin + trisodium citrate and enrofloxacin alone can be the preferred therapeutic regimens in that order for the treatment of SCM in goats.

References

- Ali-Vehmas, T., Vikerpuur, M., Fang, W. and Sandholm, M., 1997. Giving selenium supplements to dairy cows strengthens the inflammatory response to intramammary infection and induces a growth-suppressing effect on mastitis pathogens in whey. *J. Vet. Med.*, **44**(9-10): 559-71
- Chetan-Kumar, G.K. and Bhat, M.N., 2014. Studies on efficacy of meloxicam, vitamin E and selenium in conjunction with antibiotics in the treatment of bovine mastitis. *Indian J. Anim. Res.*, **48**(5): 513-15
- Contreras, A., Sierra, A. D., Con Ales, B. J. C. Sanchez, B. A. and Marco, J., 1996. Physiological threshold of somatic cell count and California Mastitis Test for diagnosis of caprine subclinical mastitis. *Small Rumin. Res.*, **21**: 259-63.
- Finley, J.W., Ip, C., Lisk, D.J., Davis, K.J., Hintze and Whanger, P.D., 2001. Cancer protective properties of high selenium broccoli. *J. Agric. Food Chem.*, **49**: 2679-83
- Hansen, J. and Perry, B., 1994. The epidemiology, diagnosis and control of helminth parasites of ruminants. ILCA, Addis Ababa, pp: 171, <http://www.fao.org/Wairdocs/IIRI/x5492E/x5492E00.htm>
- Hogan, J.S., Smith, K.L., Weiss, W.P., Todhunter, D.A. and Shockey, W.L., 1990. Relationships among vitamin E, selenium and bovine blood neutrophils. *J. Dairy Sci.*, **73**: 2372
- Jan, S., Tien, H., Bjorn, Akesson and Jacob, H. N., 2005. Dietary supplementation with organic selenium (Sel-Plex®) alters oxidation in raw and pasteurized milk. Alltech's 21st Annual Symposium, pp: 249-57
- Jena, P.K. and Gupta, A.R., 2016. Successful management of mastitis in goat using antibacterial, antioxidant and milk buffer. 34th Annual convention of ISVM and National Symposium, Ludhiana. pp: 33
- Klein, E.A., Thompson, S.M., Lippman, P.J., Goodman, D., Albanes, P.R., Taylor and Coltman., 2003. The selenium and vitamin E cancer prevention trial. *Urolog. Semin. Orig. Invest.*, **21**: 59-65
- Mahan, D.C., 2001. Selenium Metabolism in animals : What role does selenium yeast have?. Alltech's 17th Annual Symposium, pp: 257 -266
- Marin, P., Escudero, E., Fernandez-Varon, E., Carceles, C.M., Corrales, J.C., Gomez-Martin, A. and Martinez, I., 2010. Fluoroquinolone susceptibility of Staphylococcus aureus strains isolated from caprine clinical mastitis in southeast Spain. *J. Dairy Sci.*, **93**: 5243-45
- Mohammadian, B., 2011. The effect of subclinical mastitis on lactate dehydrogenase in dairy cows. *Int. J. Anim. Vet. Adv.*, **3**(3): 161- 63.
- NRC, 1989. Nutrient requirements of Dairy Cattle, 6th revised edn., National Academy Press. Washington, DC, pp: 268
- Owens, W.E., Ray, C.H., Watts, J.L. and Yancey, R.J., 1997. Comparison of success of antibiotic therapy during lactation and results of antimicrobial susceptibility tests for bovine mastitis. *J. Dairy. Sci.*, **80**: 313-17
- Prabavathy, A.A., 2013. Studies on incidence of mastitis and composition of mastitic milk of goats. PhD Thesis submitted to Karnataka Veterinary Animal and Fisheries Sciences University, Bidar.

- Rajeev, N.K., Isloor, S., Das, P.K. and Rathnamma, D., 2010. A dendrogram based analysis of antibiogram of *S.aureus* and *E.coli* isolates from bovine mastitis. *Indian. Vet. J.*, **87**(2): 107-10
- Ramprabhu, R. and Rajeswar, J.J., 2006. Comparative efficacy of different indirect tests in the diagnosis of subclinical mastitis in dairy cows. *Indian Vet. J.*, **83**(8): 903-04
- Schalm, O. W., Carroll, E. J. and Jain, N. C., 1971. Bovine mastitis. Philadelphia, Lea and Febiger.
- Schultz, L.H., Broom, R.W., Jasper, D.E., Berger, R.W. M., Natwke, R.P., Philpot, W. N., Smith, J.W. and Thompson, P. D., 1978. Current Concepts of Bovine Mastitis. 2nd edn., NMC, Washington DC, USA, pp: 6–9.
- Sripad, K., Upendra, H.A. and Yathiraj, S., 2016. Efficacy of organic and inorganic selenium in treatment of bovine subclinical mastitis. *IOSR J. Agri. Vet. Sci.*, **9**(4): 31-35
- Suresh, R.V., Srinivasan, S.R., Gowri, B. and Krishna, M.M., 2010. Clinical efficacy of long acting enrofloxacin in bovine subclinical mastitis - a report of six cases. *Intas Polivet*, **11**(1): 31-33
- Weiss, W.P., Morgan, K.L., Smith. and Hobler., 1990. Relationship among selenium, vitamin E and mammary gland health in commercial dairy herds. *J. Dairy Sci.*, **73**: 381
- Ziv, G. and Storper.M., 1985. Intramuscular treatment of subclinical staphylococcal mastitis in lactating cows with Penicillin G, Methicillin and their esters. *J. Vet. Pharmacol. Ther.*, **8**: 276-83.

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