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Short Communication

EFFECT OF PREPARTUM LEVAMISOLE THERAPY ON POSTPARTUM UDDER HEALTH IN DAIRY COWS

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SUMMARY

The present study was conducted to assess the effect of levamisole therapy on udder health of dairy cows. Cows in the levamisole group were administered Lemasol-75®@ 2.5mg/kg b.w., S/C, once weekly at day -35, -28, -21, and -14 prior to the expected calving date while cows in control group were not given any treatment. Results revealed lower incidence of subclinical mastitis in the levamisole group compared to the control group. The somatic cell count and standard plate count levels in the levamisole group were significantly ($P<0.05$) lower as compared to those in the control group. Daily milk yield in levamisole group was significantly ($P<0.05$) higher compared to the control group. Conclusively, levamisole administration during late dry period improves the early lactation udder health of dairy cows.

Keywords: Dairy cows, Levamisole, Milk yield, Subclinical mastitis, Udder health

Bovine mastitis is the most important disease affecting the productive performance of cattle world-side contributing to huge economic losses (Kumar *et al.*, 2010). The animals with subclinical mastitis (SCM) may be treated by increasing the resistance against infections using immunopotentiating agents like levamisole (Ishikawa and Shimizu, 1982; Shimada, 1983). Keeping in view these facts and findings, the present study was designed to assess the role of levamisole therapy during late dry period in improving the early lactation udder health of dairy cows.

HF cross bred dairy cows (n=16) in 2nd to 5th parity, with a history of moderate milk yield (8kg/day) in previous lactation and expected to calve after 6 weeks, were randomly allocated one of the two groups: Group 1 (n = 8) Levamisole administered Group; cows were administered Levamisole HCL (Lemasol-75®, Pfizer Health India Ltd.) @ 2.5mg/kg b.wt. s/c in brisket region once weekly for 4 weeks i.e. at -35, -28, -21, and -14 days prior to the expected date of calving (Day 0= day of calving) in addition to the routine farm feeding (RFF); Group 2 (n = 8) Control group. Cows received only routine farm feeding (RFF).

Milk samples from the selected animals were collected in sterile vials on days 7, 14, 28 and 45 postpartum and analysed for the diagnosis of subclinical mastitis (SCM) using different cow-side and laboratory tests including Modified California Mastitis Test (MCMT), Modified White side test (MWST), Somatic Cell Count (SCC) (Schalm *et al.*, 1971) and electrical conductivity (EC) of milk was also recorded using the electronic conductivity meter (Milk checker).

In order to determine the Standard Plate Count (SPC), 1 ml of raw milk was transferred to a test tube containing 9 ml sterile normal saline solution (NSS) and thoroughly mixed to give 1:10 dilution. Serial dilutions were made by transferring 1 ml of the previous dilution in 9 ml of sterile NSS up to 1:10, 0000 dilutions. Then only 0.1 ml sample from each dilution level was transferred to the nutrient agar plate and spread evenly over the surface using L-shaped glass spreader. Plates were incubated at 37 °C for 24-48 hrs. All the plates containing 30-300 colonies were selected and colonies were counted on each plate. Colony forming units per ml is given by,

$$\text{CFU/ml} = \frac{\text{number of colonies (CFUs)}}{\text{dilution} \times \text{amount plated}}$$

Where, CFU = Colony forming unit.

Daily milk yield (Kg) of all the cows under study was recorded upto 10 months of lactation and the yield was divided into 3 parts as per the early, mid and late phases of lactation.

Standard statistical procedures were followed and the data collected was subjected to analysis of variance (ANOVA) using statistical software SPSS for Windows (version 25; Microsoft). The significance was assayed at 5% ($P<0.05$) level.

On the basis of MCMT, the incidence of SCM in levamisole group was lower as compared to that in the control group as shown in Table 1. These findings suggest the role of levamisole in the control of bovine mastitis and corroborate with those of Flesh *et al.* (1982) who observed that systemic administration of levamisole during dry period resulted in marked decrease in the incidence and severity of clinical mastitis compared to controls. Farzaneh *et al.* (2003) also revealed significant difference ($p<0.05$) in the incidence of new mastitis cases between the test (levamisole administered) and control groups

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Table 1

Incidence of subclinical mastitis (SCM) in postpartum dairy cows of control and treatment groups

Days in milk (DIM)	Control Group (n=8)		Levamisole Group (n=8)	
	Normal No. (%)	Affected with SCM No. (%)	Normal No. (%)	Affected with SCM* No. (%)
Day 7	2 (25.0)	6 (75.0)	5 (62.5)	3 (37.5)
Day 14	3 (37.5)	5 (62.5)	5 (62.5)	3 (37.5)
Day 28	3 (37.5)	5 (62.5)	8 (100)	0 (0)
Day 45	2 (25.0)	6 (75.0)	8 (100)	0 (0)

*Note: Based on MCMT

(29.3% vs. 45.8%, respectively).

The mean MCMT score of animals in levamisole group was significantly ($p<0.05$) lower as compared to that in the control group on days 7, 14, 28 and 45 postpartum (Table 2). The MWST scores were significantly ($P<0.05$) lower in levamisole group as compared to those in the control group on days 14, 28 and 45 after calving (Table 2). These findings were in accordance with those of Chisti *et al.* (1992) who reported a cure rate of 32 and 24 percent cases in cows affected with SCM by immunopotentiating agents (Vitamin E and levamisole) and the cure rate was independent of the degree of modified white test (MWT) reactivity.

The mean SCC levels in levamisole group were significantly ($P<0.05$) lower as compared to those in the control group on days 28 and 45 postpartum (Table 2). The findings of present study corroborate with those of Ishikawa and Shimizu (1982) who reported that administration of levamisole HCl orally @ 7.5 mg/kg b.wt. to dairy cows reduced the SCC and number of intramammary pathogens isolated from mammary quarters.

The mean SPC level in levamisole group was significantly ($P<0.05$) lower on days 7 and 45 after calving as compared to that in the control group (Table 2). These findings were in agreement with those of Shimada (1983) who reported that a single oral dose of levamisole @ 7.5 mg/kg body weight resulted in 50% cure of sub-clinical mastitis and the bacterial count decreased to almost zero within 11 days of treatment.

On day 28 after calving, the mean EC values in animals of control and levamisole groups differed significantly ($P<0.05$) with each other (4.95±0.22 vs. 6.34±0.51 mS/cm) as shown in Table 3. These results indicated that there was no influence of levamisole administration on electrical conductivity of bovine milk.

Table 2

Levels of various mastitis indicators in postpartum dairy cows of control and treatment groups (Mean ± S.E)

Parameters	Days in milk (DIM)	Control Group (n=8)	Levamisole Group (n=8)
MCMT	Day 7	$1.59^{ap} \pm 0.26$	$0.78^{bpq} \pm 0.25$
	Day 14	$1.34^{ap} \pm 0.31$	$0.46^{bp} \pm 0.18$
	Day 28	$1.21^{ap} \pm 0.30$	$0.37^{bp} \pm 0.14$
	Day 45	$1.12^{ap} \pm 0.23$	$0.15^{bpr} \pm 0.06$
MWST	Day 7	$1.56^{ap} \pm 0.21$	$1.06^{ap} \pm 0.31$
	Day 14	$1.34^{ap} \pm 0.32$	$0.34^{aq} \pm 0.14$
	Day 28	$1.28^{ap} \pm 0.31$	$0.40^{aq} \pm 0.18$
	Day 45	$1.15^{ap} \pm 0.24$	$0.06^{bq} \pm 0.04$
SCC($x10^5$ cells/ml)	Day 7	$25.79^{ap} \pm 4.04$	$19.90^{ap} \pm 3.87$
	Day 14	$26.58^{ap} \pm 5.14$	$15.00^{ap} \pm 2.62$
	Day 28	$25.55^{ap} \pm 6.13$	$16.48^{ap} \pm 3.68$
	Day 45	$24.54^{ap} \pm 4.69$	$11.79^{bp} \pm 4.51$
SPC($\log_{10}$cfu/ml)	Day 7	$5.16^{ap} \pm 0.03$	$5.04^{bp} \pm 0.04$
	Day 14	$5.04^{ap} \pm 0.08$	$4.99^{ap} \pm 0.04$
	Day 28	$5.12^{ap} \pm 0.02$	$5.03^{ap} \pm 0.03$
	Day 45	$5.07^{ap} \pm 0.04$	$4.93^{bp} \pm 0.02$

[a,b] Means with different superscripts within a row differ significantly at $P<0.05$

[p,q,r] Means with different superscripts within a coloumn differ significantly at $P<0.05$

This is supported by the fact that EC is not an efficient diagnostic method for detection of subclinical mastitis. These findings corroborate with those of Norberg *et al.* (2004) who concluded that the ability of EC traits to separate subclinically infected cows from healthy cows in an experiment is not satisfactory. The present findings are supported by those of Milner *et al.* (1996) who reported that the ability of EC to differentiate cases with subclinical infection from healthy ones is not precise enough. Biggadike *et al.* (2000) also reported that EC of milk can show substantial variation in the absence of mastitis due to factors such as lactation stage, age of the cow, milking interval and oestrus. Also, factors such as milk temperature, pH and fat concentration in milk have influence on the measurement of EC.

The mean milk yield of cows in levamisole group was significantly ($P<0.05$) higher as compared to that in the control group during early (6.43±0.51vs. 3.64±0.18 Kg), mid (5.77±0.47 vs. 2.81±0.17 Kg, respectively) and late phases of lactation (4.31±0.47 vs. 1.98±0.20 Kg, respectively) as shown in Table 4. Our results were in accordance with those of Block *et al.* (1987) who observed that the daily milk yield was higher by 1.24 kg ($P<0.05$) in

Table 3

Electrical conductivity (EC) of milk (mS/cm) (Mean ± S.E) in postpartum dairy cows of control and treatment groups

Days in milk (DIM)	Control Group (n=8)	Levamisole Group (n=8)
Day 7	$5.49^{ap} \pm 0.22$	$6.30^{ap} \pm 0.58$
Day 14	$5.15^{ap} \pm 0.18$	$6.03^{ap} \pm 0.33$
Day 28	$4.95^{ap} \pm 0.22$	$6.34^{bp} \pm 0.51$
Day 45	$5.35^{ap} \pm 0.27$	$5.90^{ap} \pm 0.34$

[a,b] Means with different superscripts within a row differ significantly at P<0.05

Means with [p]superscript within a coloumn don't differ significantly at P<0.05

Table 4

Milk yield (Kg) (Mean ± S.E) during various phases of lactation in dairy cows of control and treatment groups

Group	Early lactation (1-100 days)	Mid lactation (101-200 days)	Late lactation (201-300 days)
Control Group (n=8)	$3.64^{ap} \pm 0.18$	$2.81^{bp} \pm 0.17$	$1.98^{cp} \pm 0.20$
Levamisole Group (n=8)	$6.43^{aq} \pm 0.51$	$5.77^{aq} \pm 0.47$	$4.31^{bq} \pm 0.47$

[a,b] Means with different superscripts within a row differ significantly at P<0.05

[p,q,r] Means with different superscripts within a coloumn differ significantly at P<0.05

cows treated with levamisole. The increase in milk yield in treatment group might be due to the increase in glucose and T4 and T3 levels, which stimulates the protein synthesis by decrease of the proteolytic action of glucocorticoids or an increase of glucose transport to provide energy required for peptide synthesis and milk production by mammary gland. Also, it might be due to the activity enhancement of mammary immune system related to the decrease in cortisol levels. Thyroid hormones play a major role in the control of several metabolic processes including carbohydrate, fat, protein, vitamin and mineral metabolism (Guyot *et al.*, 2011).

CONCLUSION

It is concluded from the study that levamisole administration in dairy cows during late gestation reduces the incidence of postpartum subclinical mastitis in addition to significant improvement in the milk yield.

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