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SHORT COMMUNICATION

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Evaluation of treatment protocols for warts in dairy cattle with emphasis on efficacy and safety

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The study evaluated the effectiveness of different treatment regimens for bovine warts in dairy cattle under field conditions in the Dharmapuri region of Tamil Nadu. A total of 24 affected cattle were randomly allocated into four treatment groups: lithium antimony thiomalate (T1), autohemotherapy (T2), homeopathic medicine (T3), and combination therapy (T4). The highest wart regression was observed in group T4 (95.8±1.6%), followed by T1 (92.4±2.1%). Recovery was also fastest in T4, with complete regression achieved in 34±1.5 days, compared with the longest recovery period in T3 (49±2.6 days). Wart recurrence was lowest in T4 (6.2±1.1%) and highest in T3 (21.4±2.3%). The highest lymphocyte count was recorded in T4 (38±1.6%), suggesting an enhanced immune response. In addition, the greatest increase in milk yield was observed in T4 (21.6±2.5%). Overall, the findings demonstrate that combination therapy, followed by lithium antimony thiomalate, is effective and safe for the management of bovine warts under field conditions.

Keywords: Autoimmunization, Bovine papillomatosis, Cattle, Lithium antimony thiomalate

Bovine papillomatosis or warts, is a contagious viral infection caused by bovine papillomavirus (BPV). It is characterized by the formation of benign growths on the skin and mucous membranes (Campo, 2006). Bovine papillomatosis is commonly found in cattle and affects body areas such as the head, neck, udder and teats. It causes discomfort and interferes with milking and can also lead to secondary infections (Kale *et al*., 2019; Mir *et al*., 2025). The mode of transmission of BPV includes direct contact, equipment, and management practices such as milking and tagging, especially under poor hygienic and adverse environmental conditions (Yildirim *et al*., 2023). It causes considerable economic losses in cattle through reduced milk yield, difficulties in milking, damage to tissue in the udder, and mastitis. In addition, some cattle with bovine papillomatosis may be removed from productive activities, thus reducing their value (Kale *et al*., 2019; Saied, 2021).

Several methods have been used to treat bovine warts in cattle, which include surgical removal, cryotherapy, cauterization, and ligation among others. Nonetheless, these methods have a number of drawbacks, such as lesion recurrence, need for skilled labour, increased cost, and their inability to be carried out under field conditions (Mir *et al*., 2025). In addition, these methods mainly target the removal of the existing warts but are incapable of eliminating the viral disease (Reeves and Yates, 2020).

In recent times, there is a trend towards immunomodulatory and alternative therapeutic options like lithium antimony thiomalate, autogenous vaccines, ivermectin, and herbal and homeopathic remedies. These therapeutic options are used to boost the host's immune system and induce regression of papillomas (Namgyel *et al*., 2021; Yildirim *et al*., 2023). Lithium antimony thiomalate is said to produce rapid recovery with fewer relapses because of its immunostimulatory properties. Investigations have revealed that the regression of the wart is related to epithelial changes, lymphocyte infiltration, and increased immune activity (Saied, 2021). The present study was conducted in 24 dairy cattle belonging to different breeds, ages, and sex, which were clinically diagnosed with cutaneous papillomatosis.

The selected animals were randomly distributed into four groups of six animals each. In group T1, the animals were subjected to lithium antimony thiomalate (LAT) administered (0.5 mg/kg body weight) once a week for four consecutive weeks. In group T2, the animals were subjected to the autohaemotherapy (AH) with 60 mL of blood drawn from the same animal; 30 mL of blood was administered intramuscularly and remaining 30 mL was administered subcutaneously in both sides of the neck. In group T3, the animals were subjected to the homeopathic drug *Thuja occidentalis* given 20 drops orally once daily and topically over the wart twice a day for four weeks. Whereas, in group T4, a combination therapy consisting of LAT, AH and homeopathy was given in the same dosage and schedule as mentioned in the individual treatment groups.

All the animals were kept under existing conditions of management and feeding without making any significant changes, and were observed for a period of 90 days. The clinical parameters studied were the number of warts, size of the lesions (in mm), percentage regression, time taken for healing (in days), and recurrence rate (%). Regression of the lesions was determined by measuring the size and number of lesions before and after treatment. Recurrence was considered if the occurrence of lesions was observed in the animals that had once recovered. Representative samples of the warts were subjected to histopathological examination. To study the immunological response, blood samples were drawn from the jugular vein before and after treatment. Serum was separated, and antibody titers against bovine papillomavirus were measured, in addition to studying haematological parameters like lymphocyte count. The cost of treatment per animal, increase in milk yield (%),

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Table 1: Clinical efficacy of treatment protocols.

Parameters	Groups			
	T1	T2	T3	T4
Wart regression (%)	92.4±2.1[a]	85.6±2.8[b]	71.2±3.4[c]	95.8±1.6[a]
Days to recovery	36±1.8[c]	42±2.1[b]	49±2.6[a]	34±1.5[c]
Reduction in wart size (mm)	13.2±1.4[a]	11.8±1.6[b]	9.6±1.9[c]	14.1±1.2[a]
Complete recovery (%)	83.3[a]	66.7[b]	50.0[c]	100[a]

Means bearing different superscripts (a, b, c) differ significantly (P<0.05).

Table 2: Safety, recurrence and immunological parameters in animals of different groups.

Parameters	Groups			
	T1	T2	T3	T4
Recurrence rate (%)	9.5±1.2[c]	14.2±1.6[b]	21.4±2.3[a]	6.2±1.1[c]
Adverse reactions (%)	0	0	0	0
Lymphocyte count (%)	32±2.1[b]	35±1.8[a]	28±2.4[c]	38±1.6[a]

Means bearing different superscripts (a, b, c) differ significantly (P<0.05).

Table 3: Economic and field applicability in animals treated with different protocols.

Parameters	Groups			
	T1	T2	T3	T4
Cost per animal (Rs.)	850[b]	950[a]	600[c]	1100[a]
Milk yield improvement (%)	18.5±2.2[b]	16.2±2.0[b]	10.4±1.8[c]	21.6±2.5[a]
Farmer acceptability (%)	82[b]	78[b]	85[a]	90[a]
Ease of application score	8.2[a]	7.5[b]	9.1[a]	7.0[b]

Means bearing different superscripts (a, b, c) differ significantly (P<0.05).

acceptability by farmers, and ease of application were also studied. The data were analyzed statistically using one-way analysis of variance (ANOVA) and presented as mean±SE.

The results indicated that T1 and T4 showed significantly higher wart regression and faster recovery compared to other groups. The rapid healing observed in these groups may be attributed to enhanced immune response and inhibition of epithelial proliferation. Autohaemotherapy (T2) showed moderate efficacy; however, Kale *et al.* (2019) reported complete regression following immune stimulation (Shruti *et al*., 2021). A comparatively lower performance was seen in homeopathic group (T3); however, Mir *et al.* (2025) have reported gradual regression of warts over a longer duration. The superior performance of combination therapy supported the findings of Yildirim *et al*. (2023), emphasizing the advantage of integrated treatment approaches. Homeopathic and herbal therapies possess supportive immunomodulatory effects in papillomatosis management (Sofowora *et al*., 2013; Mossinger *et al*., 2016).

Safety, recurrence and immunological parameters are presented in table 2. The lowest recurrence rate was observed in T4 and T1 groups, which indicated the effectiveness of immunomodulatory treatments in preventing recurrance of warts. Namgyel *et al*. (2021) reported reduced recurrence in lithium-treated animals. The increase in lymphocyte count observed in T2 and T4 groups reflected enhanced cellular immune response (Saied, 2021). The absence of adverse reactions across all groups indicated that all the treatment protocols are safe under field conditions (Yildirim *et al*., 2023).

Economic and field applicability of the treatment protocols are presented in table 3. The combination therapy (T4) involved higher cost, but it resulted in maximum improvement in milk yield and productivity, thereby providing better economic returns. Similar findings were reported by Kale *et al.* (2019). The higher farmer acceptability was observed in the homeopathic group (T3), might be due to its ease of application and lower cost (Mir *et al*., 2025). However, the higher productivity and lower recurrence observed in T1 and T4 groups suggested that scientifically validated treatments offer better long-term benefits. Similar observations were made by Saied (2021).

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