

## Teat lesions and their relationship to intramammary infections on small-scale dairy farms in Kiambu district in Kenya

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### ABSTRACT

Mammary gland quarters of 139 lactating dairy cows from small-scale dairy herds were examined visually and by palpation for teat lesions and by California mastitis test (CMT) and bacterial culture for subclinical mastitis. Teat lesions were observed in 97 teats. These included teat chaps (39.2 %), teat papillomas (23.7 %), teat erosions (22.7 %), teat fistulae (5.1 %), inverted teats (5.1 %) and blocked teats (4.2 %). According to the CMT, the prevalence of subclinical mastitis was 33.4 % in all the mammary gland quarters, 71.0 % in quarters with teat lesions and 24.5 % in quarters without teat lesions. There was a significant ( $P < 0.01$ ) association between teat lesions and the prevalence of subclinical mastitis. The mammary gland quarters with teat lesions were 7.2 times more likely to have a positive CMT ( $P < 0.01$ ) and 5.6 times more likely to have bacterial organisms ( $P < 0.01$ ) isolated from them than those without any teat lesions. The bacterial organisms most frequently isolated from the CMT-positive milk samples from both the mammary gland quarters with teat lesions and those without teat lesions were *Staphylococcus aureus* (50.0 %), *Streptococcus* spp. (34.8 %) and *Arcanobacterium pyogenes* (6.2 %).

**Key words:** intramammary infections, Kenya, Kiambu district, teat lesions.

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### INTRODUCTION

In Kenya, and especially in Kiambu District, there are many small-scale farms that practise mixed farming, which includes keeping of dairy animals and growing of food and cash crops. However, dairy farming is the most important component in terms of improving the socioeconomic status of the farmers<sup>9</sup>. Most of the farmers own an average of 2–6 acres of land and keep between 1 and 30 dairy animals, mainly Friesians and Aryshires and their crosses<sup>7</sup>. Seventy percent of the animals are zero-grazed while the other 30 % graze on pastures<sup>7</sup>. These small-scale farms form the backbone of the dairy industry in this area as they provide 75–90 % of all the milk sold<sup>12</sup>. The marketing of the milk from these farms is mainly through cooperative societies. The cooperative societies, in addition to marketing the milk, also provide credit facilities, either in cash or in feed supplements to the farmers.

Subclinical mastitis is a common disease in most of these small-scale dairy farms, with a prevalence rate of 25.5–34.8 %<sup>10,11,13</sup>. There are many risk factors that predis-

pose to high prevalence of subclinical mastitis on these farms. These include host, microbial agents and environmental risk factors<sup>14,15</sup>. Teat lesions are among the host risk factors that could contribute to the prevalence of the subclinical mastitis<sup>3,6,15</sup>. The aim of this study was to elucidate the relationship between non-infectious teat lesions and subclinical mastitis on small-scale dairy farms in Kiambu District in Kenya and to identify the involved microbial organisms.

### MATERIALS AND METHODS

This investigation was carried out on 16 small-scale dairy farms in the Kiambu District of Kenya. One hundred and thirty-nine lactating dairy cows of different age groups, in different lactation stages and of various breeds, were used for the collection of data. The mammary glands of the cows were examined by visual observation for lesions, by deep palpation for consistency and stripping of the quarters for milkability. The milk from all the quarters except 4 that had blocked teat canals was tested for mastitis by California mastitis test (CMT) and graded from 0 (negative), 1 (trace) to 4<sup>15</sup>. Milk samples from all CMT-positive quarters was aseptically collected into sterile universal bottles and taken to the labora-

tory for bacterial culture. The milk was streaked on blood agar and McConkey agar plates and incubated aerobically at 37 °C for 48 hours. The bacterial isolation was carried out according to standard methods<sup>8</sup>, whereby the readings were taken after 18, 36 and 48 hours. The relationships between the teat lesions, CMT score and bacterial isolates were determined using Chi-square tests.

### RESULTS

Teat lesions observed were teat chaps (38), teat papillomas (23), teat erosions (22), teat fistulas (5), inverted teat tips (5) and blocked teat canals (4) (Table 1). Sixty-three (11.3 %) of the mammary gland quarters were non-functional (atrophied or fibrotic). The prevalence of subclinical mastitis in all the quarters was 33.9 % (166/489) and 22.9 % (112/489) according to CMT and bacterial isolation, respectively. Of the milk samples from the mammary gland quarters with teat lesions (blocked teats not included), 71 % (66/93) were CMT-positive, and bacterial growth occurred in 51.6 % (48/93). Of the mammary gland quarters without teat lesions, 25.3 % (100/396) were CMT-positive and bacterial growth occurred in 16.2 % (64/396). There was a significant ( $P < 0.01$ ) association between teat lesions, CMT results and bacterial isolation. The quarters with teat lesions were 7.2 times [(66/27)/(100/296)] more likely to be CMT-positive and 5.6 times [(48/45)/(64/332)] more likely to yield bacteria than those that did not have teat lesions.

The bacterial organisms isolated from the quarters with and without teat lesions were *Staphylococcus aureus* (56/112), *Streptococcus* spp. (39/112), *Arcanobacterium pyogenes* (7/112) *Escherichia coli* (6/112) and *Klebsiella* spp. (4/112) (Table 2).

Negative bacterial culture from the CMT-positive quarters occurred in 27.3 % (18/66) and in 36 % (36/100) of the quarters with teat lesions and quarters without teat lesions, respectively.

### DISCUSSION

Teat chaps were the most commonly encountered lesions. Teat chapping is generally initiated by activities associated with milking such as udder preparation,

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Table 1: The relationship between teat/udder lesions and California mastitis test score.

Type of lesion	California mastitis test score					Total
	0	1	2	3	4	
Teat chaps	15	10	5	6	2	38
Teat papillomas	3	10	6	2	2	23
Teat erosion	3	4	8	4	3	22
Teat fistulas	2	0	0	2	1	5
Inverted teat end	4	0	0	1	0	5
Quarters without lesions	296	46	23	19	12	396
Total	323	70	42	34	20	489

the milking process and the post-milking teat dipping<sup>6,14</sup>. The primary significance of the teat chaps is that they are readily colonised by staphylococci and *Streptococcus dysgalactia*<sup>15</sup>. The second-most prevalent lesions were teat papilloma and teat erosions. These lesions are quite common in cattle and in case of papillomas, the prevalence may be as high as 25 %<sup>15</sup>. Ordinarily teat papillomas cause little harm, but may interfere with milking. There was a low prevalence of teat fistulas and blocked teat canals, suggesting that injuries involving the deep tissues of the teats were uncommon in these herds.

The significant ( $P < 0.01$ ) association between teat lesions and subclinical mastitis indicates that teat lesions contributed substantially to the prevalence of subclinical mastitis in the herds studied. Teat lesions can render milking less effective, leaving residual milk in the quarters that encourages bacterial growth. Teat lesions have been shown to be readily colonised by bacterial organisms, especially *Staphylococcus* spp. and *Streptococcus* spp., and thus serve as reservoirs of infection<sup>3,6</sup>. Transfer of infectious organisms between quarters of the same cow and transmission from cow to cow is facilitated by udder preparation cloths, hands of the milker and milking machine components. Thus, whenever teat lesions are present, emphasis on milking hygiene procedures is critical to prevent new infections.

The prevalence of subclinical mastitis in

mammary gland quarters without teat lesions of 25.3 % and 16.2 % according to CMT and bacterial growth respectively was high for these dairy herds. In relatively healthy herds the prevalence of subclinical mastitis should be less than 5 % infected quarters (bacterial isolation) and less than 15 % CMT positive quarters<sup>14</sup>. The high prevalence of subclinical mastitis in these herds could reflect inadequate mastitis control and prevention by practices such as udder washing with a suitable disinfectant before milking, post-milking teat dipping and dry cow therapy. The lack of adequate mastitis control and prevention is also reflected in the high prevalence (11.3 %) of non-functional mammary gland quarters.

The high prevalence of *Staphylococcus aureus* and *Streptococcus* spp. was similar to other studies of herd prevalence of microorganisms isolated in this area<sup>10,11,13</sup>. Although these microorganisms readily colonise teat lesions, teat skin and teat orifices, their incidence in herds can be greatly reduced by good milking hygiene<sup>2,5,14</sup>. No bacterial organisms were isolated in 27.3 % and 33.3 % of the CMT-positive samples from quarters with teat lesions and quarters without teat lesions respectively. It is usual for some mammary gland quarters to be positive for mastitis on CMT and negative on bacterial culture<sup>1,14</sup>, since somatic cell counts can be increased by factors other than intramammary infections.

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Table 2: Bacteria isolated from CMT-positive mammary gland quarters of dairy cows with and without lesions.

Type of lesion	n <sup>a</sup>	Bacterial spp. isolated from the mammary gland quarters					Total
		<i>Streptococcus</i> spp.	<i>Staphylococcus aureus</i>	<i>Escherichia coli</i>	<i>Klebsiella</i> spp.	<i>Arcanobacterium pyogenes</i>	
Teat chaps	23	8	10	0	1	2	21
Teat papilloma	20	5	5	0	0	1	11
Teat erosion	19	4	5	1	0	2	12
Teat fistulas	3	0	2	0	1	0	3
Inverted teat end	1	1	0	0	0	0	1
Quarters without lesions	100	21	34	5	2	2	64
Total	166	39 (34.8) <sup>b</sup>	56 (50.0)	6 (5.4)	4 (3.6)	7 (6.2)	112

<sup>a</sup>Number of quarters with positive CMT.

<sup>b</sup>Figures in brackets are the percentage of total bacterial isolates.