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# A Survey of Teat End Hyperkeratosis Prevalence in the Tabriz Dairy Herds

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**Abstract:** Teat end hyperkeratosis is a very important problem which affects cows in the farms of Iran and many other countries. This disease mainly caused by the over milking and defects in the milking machine. In a survey focusing on the 4 large dairy Holstein herds at around of Tabriz (north-west of Iran), prevalence of teat end hyperkeratosis, was evaluated. In the herds of A (n = 300) and B (n = 160), cows were milked 3 times/day. In the herds of C (n = 162) and D (n = 190) cows were milked 2 times/day. Prevalence of the teat end hyperkeratosis in the herds of A and B were recorded as 63.38%. In the herds of B and C this prevalence was 24.86%. Also, according to the Wilson's grading schedule the grades of 2 and 3 of hyperkeratosis more prevalent between the cows with 3 times milking/day, than cows with 2 times milking/day. Statistical analyses indicated significant differences between the herds of A and B (3 times milking/day) and herds of C and D (2 times milking/day). In conclusion, according to our results, significant relationship exists between the cow's teat end hyperkeratosis and milking frequency/day.

**Key words:** Hyperkeratosis, holstein, milking, cow, teat

## INTRODUCTION

Milk production in the dairy farms is the basic economic source, which guaranties the life span of these farms. For this reason udder of the cow is the most important organ, which may be attacked by environmental or infectious pathogens. In this case, the main entrance for pathogens is the teat end orifice. Naturally, teat end have many defensive mechanisms, including sphincter and keratinized epidermis, which later one, is extended into the teat canal (Craven and Williams, 2004). After every milking, keratinized epidermis excretes some keratin which in turn closes the sphincter orifice by forming a keratinized plaque (Radostis and Otto, 2000). Hyper stimulation of the teat end by over milking, defects in milking machine and unsuitable teat dippers utilization, lead to teat end hyperkeratosis (Shearn and Hillerton, 2002). On the other hand, keratin projection from the teat sphincter, will be result in colonization of pathogens such as *Fusobacterium necroforum* and finally lead to diseases such as black spot and acute mastitis (Neijenhuis *et al*., 2001).

The objective of this research was evaluation of teat end hyperkeratosis prevalence in the Tabriz dairy herds and indication of its probable relationship with milking frequency/day.

## MATERIALS AND METHODS

This research was carried out on May 2007 in the 4 large dairy herds (A, B, C and D) of Tabriz suburb (north-west of Iran) with the Mediterranean climate and 2000 m altitude above sea level. The herds were as following:

- Herd A, included of 300 dairy Holstein cows, with mean milk production of 32Kg/day/cow and 3 times milking/day (8 am and 14, 22 pm).
- Herd B, was included of 160 dairy Holstein cows, with mean milk production of 30 kg/day/cow and 3 times milking/day (5 am and 13, 21 pm).
- Herd C, was included of 162 dairy Holstein cows with, mean milk production of 28 kg/day/cow and 2 times milking/day (8 am and 16 pm).
- Herd D, was included of 190 dairy Holstein cows with mean milk production of 31 kg/day/cow and 2 times milking/day (7 am and 17 pm).

Nutrition of herds was the same and consisted of hay, corn, cottonseed, concentrates and mineral supplements. In all of the herds, milking procedure was performed by West Valia Company milking machines. Before milking, teats of the cows were washed and dried

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by special papers and then, were inspected very carefully and categorized according to Wilson's grading schedule. According to this schedule, grade 1, is the normal teat end and grade 4 is the teat end with maximum hyperkeratosis.

Finally, collected data were analyzed by soft ware of SPSS version 13 and statistical method of chi-square and Mann-Whitney tests.

## RESULTS

Overall rate of teat end hyperkeratosis in the 4 groups (a total number of 807 cows) was 46.84% (Fig. 1).

But in detail, the rate of teat end hyperkeratosis in the groups of 2 time's milking/day/cows was 24.86% and in the groups of 3 time's milking/day/cows was 63.68% (Fig. 2 and 3).

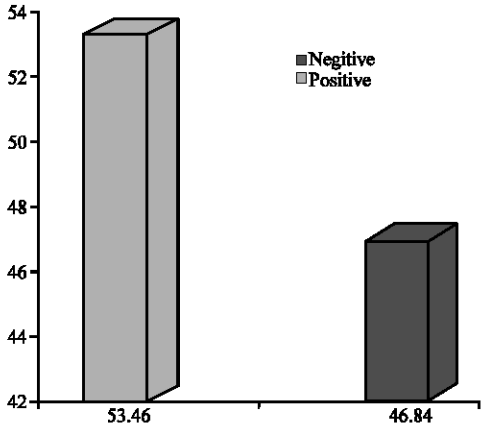


Fig. 1: Overall rate of teat end hyperkeratosis prevalence in the herds (A, B, C and D)

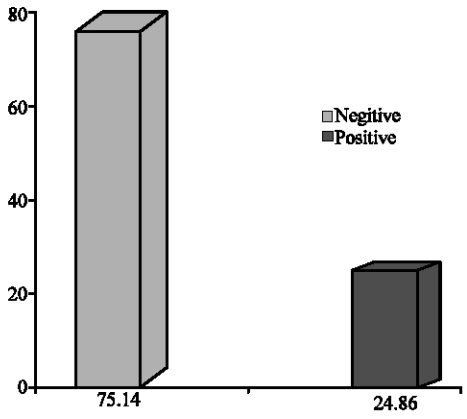


Fig. 2: Prevalence of teat end hyperkeratosis in the herds with 2 times milking/day (C and D)

The rates of teat end hyperkeratosis in the two groups analyzed by Crosstab and Chi-square tests. The difference between two groups of cows (3 times milking/day vs. 2 times milking/day) was highly significant ($p<0.01$) (Table 1 and 2).

On the other hand, according to the Wilson's grading schedule, the rates of grade 2 teat end hyperkeratosis were more prevalent than of grades 3 and 4, in the herds (Fig. 4).

By using the Mann-Whitney U test for all of the quarters, it was revealed that, the intensity of teat end hyperkeratosis in the 3 times milking/day cows is more than of 2 times milking/day cows ($p<0.01$) (Table3).

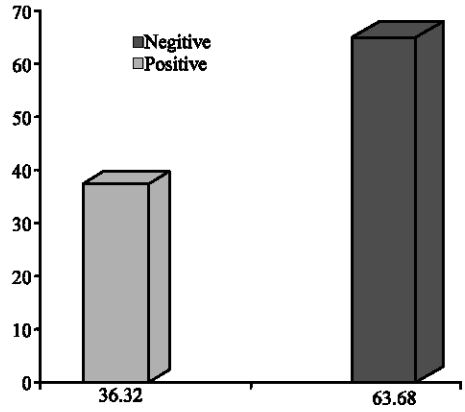


Fig. 3: Prevalence of teat end hyperkeratosis in the herds with 3 times milking/day (A and B)

Table 1: Comparing the rates of teat end hyperkeratosis between the herds with 2 and 3 times milking/day by crosstab tests

| | Crosstab | | |
|---|---|---|---|
| | Milking | | |
| | 3 | 2 | Total |
| **Disease** | | | |
| Negative count | 248 | 181 | 429 |
| Expected conunt | 296.1 | 132.9 | 429.0 |
| Percent within disease | 57.8 | 42.2 | 100.0 |
| Percent within milking | 44.5 | 72.4 | 53.2 |
| Percent of total | 30.7 | 22.4 | 53.2 |
| Positive count | 309 | 69 | 378 |
| Expected conunt | 260.9 | 117.1 | 378.0 |
| Percent within disease | 81.7 | 18.3 | 100.0 |
| Percent within milking | 55.5 | 27.6 | 46.8 |
| Percent of total | 38.3 | 50.6 | 46.8 |
| Total count | 557 | 250 | 807 |
| Expected conunt | 557.0 | 250.0 | 807.0 |
| Percent within disease | 69.0 | 31.0 | 100.0 |
| Percent within milking | 100.0 | 100.0 | 100.0 |
| Percent of total | 69.0 | 31.0 | 100.0 |

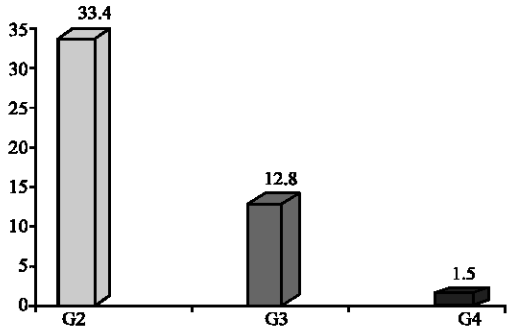


Fig. 4: Prevalence of grades 2, 3 and 4 in the herds (A, B, C and D)

Table 2: Comparing the rates of teat end hyperkeratosis between the herds with 2 and 3 times milking/day by chi-square tests (p<0.01)

| | Chi-square tests | | | | |
|---|---|---|---|---|---|
| | Value | df | Asymp. Sig.(2-sided) | Exact Sig. (2-sided) | Exact Sig. (1-sided) |
| Pearson Chi-Square | 53.848[b] | 1 | 0.000 | | |
| Continuity Correction[a] | 52.735 | 1 | 0.000 | | |
| Likelihood Ratio | 55.474 | 1 | 0.000 | | |
| Fisher's Exact Test Linear -by-LinearAssociation | 53.782 | 1 | 0.000 | 0.000 | 0.000 |
| N of Valid Cases | 807 | 1 | 0.000 | | |

a.Computed only for a 2×2 table; b.0 cells (.0%) have expected count less than 5. The minimum expected conunt is 117.10

Table 3: Comparing intensity of the hyperkeratosis in the herds with 2 and 3 times/day by Mann- Whitney U tests (p<0.01)

| | Ranks | | |
|---|---|---|---|
| Milking | N | Mean rank | Sum of ranks |
| Rcr 3 | 456 | 444.02 | 202471.50 |
| 2 | 350 | 350.71 | 122749.50 |
| Total | 506 | | |
| Rca 3 | 457 | 454.99 | 207930.50 |
| 2 | 349 | 336.08 | 117290.50 |
| Total | 806 | | |
| Lcr 3 | 456 | 444.13 | 202525.00 |
| 2 | 349 | 349.26 | 121890.00 |
| Total | 805 | | |
| Lca3 | 456 | 440.46 | 200852.00 |
| 2 | 350 | 355.34 | 124369.00 |
| Total | 806 | | |

| Test statistics[a] | Rcr[1] | Rca[2] | Lcr[3] | Lca[4] |
|---|---|---|---|---|
| Mann-Whitney U | 61324.500 | 56215.500 | 60815.000 | 62944.000 |
| Wilcoxon W | 122749.5 | 117290.5 | 121890.0 | 124369.0 |
| Z | -7.533 | -9.233 | -7.763 | -6.975 |
| Asymp. Sig. (2-tailed) | .000 | .000 | .000 | .000 |

a. Grouping Variable: milking; 1. Right cranial quarter; 2. Right caudal quarter; 3. Left cranial quarter; 4. Left caudal quarter

## DISCUSSION

Teat end hyperkeratosis is a very important complication in the dairy herds of Iran and many other countries. A study categorized the forms of teat end hyperkeratosis into 4 grades, which grade 1 was the normal teat end and grade 4 was the teat end with the maximum hyperkeratosis. Gleeson *et al.* (2004) in a study reported that, the rate of teat end hyperkeratosis in the Irish Holstein dairy herds is 31.4% and the rates of grades 2, 3 and 4 hyperkeratosis are 20, 5.5 and 0.5%, respectively.

Kirk (2003) reported that, the rate of teat end hyperkeratosis in the dairy farms of California is 23.8% and the rates of grades 2, 3 and 4 are 24, 4.4 and 0.25%, respectively.

In contrast with the above mentioned data, our results showed high rate teat end hyperkeratosis prevalence in the Tabriz dairy herds, especially in the herds with 3 times milking/day.

Also, the rates of grades 2, 3 and 4 teat end hyperkeratosis more prevalent than of other countries (Mein *et al.*, 2001).These differences partly are related to the utilization of non-standard milking machines and non-standard teat dippers. But the most important factor in this case, is the milking frequency/day (Fig. 4).

The following factors could be affecting the rate of teat end hyperkeratosis in a herd:

- Teat shape: convex teat ends are more susceptible to the hyperkeratosis than flat teat ends.
- Incidence of teat end hyperkeratosis is more prevalent in the cold seasons (winter and spring), than warm seasons.
- Defect in the milking machine function, directly lead to hyperkeratosis.
- Hyper sensitivity to the teat dippers could be cause hyperkeratosis.
- Increases in the cow age.
- High milk production (Andrews *et al.*, 1992; Blowey and Edmondson, 1995).

## CONCLUSION

In conclusion according to our results, milking frequency/day has a direct effect on the rate of teat end hyperkeratosis in the herds. In other word, Increase in the milking frequency/day lead to increase in the teat end hyperkeratosis and consequent diseases such as black spot and mastitis in the herd.

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