EFFECT OF DIFFERENT FLOORING SYSTEMS ON THE CLAW HORN GROWTH AND WEAR IN DAIRY COWS

E. Telezhenko*[1], C. Bergsten[1,2], M. Magnusson[3], M. Ventorp[3], J. Hultgren[1], C. Nilsson[3].

[1]Swedish University of Agricultural Sciences, Department of Animal Environment and Health, Skara, Sweden, 2Swedish Dairy Association, Skara, Sweden, 3Department of Agricultural Biosystems and Technology, Alnarp, Sweden

Introduction

Claw health problems in dairy cows become more common with increased use of loose housing systems compared to tie systems (Bergsten and Herlin, 1996). Claw disorders are believed to be the main cause of lameness (Murray et al., 1996) and are therefore an issue for both animals' sustainable function within the management system and for animal welfare. Claw capsule development might have an influence on susceptibility for claw disorders (Distl et al., 1990). The majority of claw horn problems are associated with the use of poor concrete floors in cow passageways. There is a tendency for the use of more wear and/or more slip resistant alternative materials for floor constructions but a too abrasive floor can cause lesions due to over wear. .

The aim of the study was to investigate the rates of claw horn growth and wear in dairy cows kept in five different flooring systems but otherwise under identical management conditions.

Material and methods

The rate of growth and wear of the hind foot claws were studied in 120 Swedish Holsteins of different parities and calving dates during one housing season. Five different flooring systems were studied and feeding and management were identical.

The flooring systems were solid acid resistant mastic asphalt with and without feed-stalls; continuous elastic rubber mats (KURA-P ™™, Gummiwerk Kraiburg Elastik GmbH) with and without feed-stalls and slatted concrete floor without feed-stalls. The feed-stalls were equipped with solid rubber mats. All the solid floors were scraped eleven times per day.

Claw wall growth and wear were measured over a 4-month period after calving, by measuring the distal displacement of a mark which had been burn on the dorsal wall of lateral claw of the left rear leg (Fig. 1).

A general linear model procedure was used to analyze the data (JMP, Version 5, SAS Inst.). The model included lactation number, flooring system and their interaction. Lactation

stage (days in milk) was used as a covariate. The Tukey HSD test was applied for multiple comparisons of least squares means.

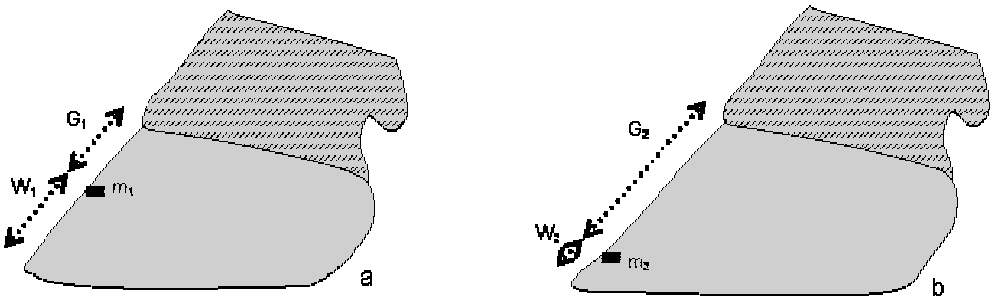

Figure 1. Measurements of the claw horn growth and wear rate; a – the claw at the first examination, b – after 4 months. Growth = G_2 - G_1 .Wear = W_1 - W_2

Results

The claws grew most rapidly in cows kept on the asphalt floor without feed-stalls (significantly different from all other groups, $P<0.05$). There were no significant differences in claw growth between cows kept on the rubber flooring and slatted concrete floor.

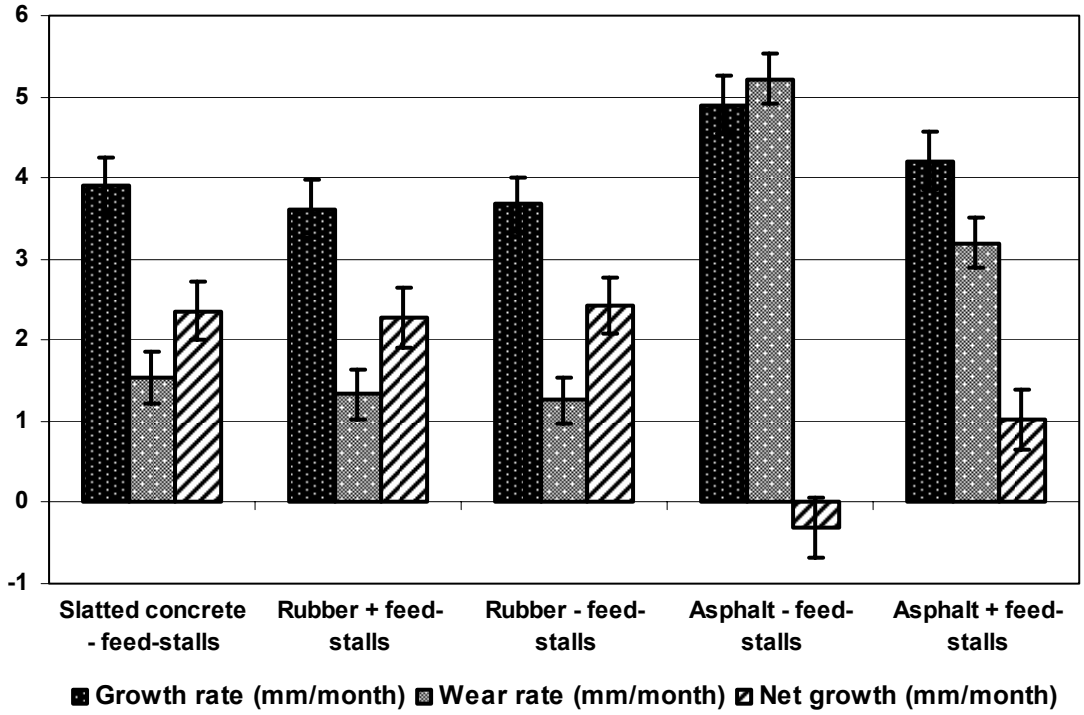

Figure 2. Rate of growth and wear of the claws of the left hind limb in mm per 30 days during the period of 4 months after calving (LSM and SEM)

The highest wear of the dorsal wall was also found on the asphalt flooring without feed-stalls which differed significantly ($P<0.05$) from the wear of all the other groups (Fig. 2). Cows on asphalt flooring with feed-stalls had less claw wear compared to those on asphalt floor without feed-stalls ($P<0.05$). The feed-stalls had no effect on claw growth and wear in cows on rubber mats.

The cows kept on the rubber mats had the least wear of dorsal wall, but it did not differ significantly from that on slatted concrete floor. The net growth of dorsal wall was highest in cows kept on rubber mats and it was negative in cows kept on asphalt floor without feed-stalls.

Discussion

The growth and wear rate of the claws were significantly affected by the flooring type. Animals standing on the asphalt floor when eating had a greater wear and growth of the claw horn than in animals when feed stalls were used. The highest wear rate on the asphalt floor without feed-stalls was associated with the highest growth rate of the claw horn. Positive association between claw horn growth and wear was found by Vokey et al. (2001) and may be interpreted as claw growth is affected by wear (Hahn et al., 1986). In the optimal claw environment, the rates of claw horn growth and wear are more or less equal and the shape is nearly unaffected over time (Vermunt and Greenough, 1995).

Using feed-stalls reduced wear and growth rate on the asphalt floor. Additional wear during eating can be explained by a posture adopted by the animals, standing in front of feed bunk. When animals are trying to reach the food they put more load on the anterior part of the claw and on the asphalt they wore more of the dorsal wall than they did on the rubber mats inside the feed-stalls. It seems that older, rather worn concrete slats, does not contribute much to claw horn wear. Therefore no significant differences in claw horn growth and wear between slatted concrete flooring and rubber flooring were found. The absence of significant differences in the rates of claw growth and wear between concrete floors and rubber mats was also shown in previous studies (Benz, 2002; Vokey et al., 2001) .

Despite that the exposure of the claws to the very abrasive surfaces might result in zero net growth of the claws, it can not alone replace the regular functional claw trimming. Since the sole wear occurs most rapidly along the abaxial margin of the bearing surface of the claw (Tranter and Morris, 1992) the mid-sole area will soon be in a contact with the floor and overloading of the central area might cause trauma of the corium.

Conclusions

It was concluded that asphalt floors caused the greatest wear of the rear claws which in its turn promoted the more rapid growth rate of the horn. Rubber mats on the walking areas and eating places reduced claw horn wear and growth. The claw horn growth and wear on the aged concrete slatted floor did not differ from that on the rubber mats.

Acknowledgments

This work was carried out as part of the "LAMECOW" project funded through the EC Framework V programme, and by the Swedish Farmers' Foundation for Agricultural Research.

References

1. *Benz, B., 2002. Elastic flooring materials for concrete slatted floors in free stall houses. PhD. Univ Hohenheim, Stuttgart.*
2. *Bergsten, C., Herlin, A.H., 1996, Sole haemorrhages and heel horn erosion in dairy cows: the influence of housing system on their prevalence and severity. Acta Vet Scand 37, 395-408.*
3. *Distl, O., Koorn, D.S., McDaniel, B.T., Peterse, D., Politiek, R.D., Reurink, A., 1990, Claw traits in cattle breeding programs: Report of the E.A.A.P. working group "claw quality in cattle". Livest Prod Sci 25, 1-13.*
4. *Hahn, M.V., McDaniel, B.T., Wilk, J., 1986, Rates of hoof growth and wear in Holstein cattle. J Dairy Sci 69, 2148-2156.*
5. *Murray, R.D., Downham, D.Y., Clarkson, M.J., Faull, W.B., Hughes, J.W., Manson, F.J., Merritt, J.B., Russell, W.B., Sutherst, J.E., Ward, W.R., 1996, Epidemiology of lameness in dairy cattle: Description and analysis of foot lesions. Vet. Rec. 138, 586-591.*
6. *Tranter, W.P., Morris, R.S., 1992, Hoof Growth and Wear in Pasture-Fed Dairy-Cattle. N.Z. vet. J. 40, 89-96.*
7. *Vermunt, J.J., Greenough, P.R., 1995, Structural Characteristics of the Bovine Claw - Horn Growth and Wear, Horn Hardness and Claw Conformation. Brit. Vet. J. 151, 157-180.*
8. *Vokey, F., Guard, C., Erb, H., Galton, D., 2001, Effects of alley and stall surfaces on indices of claw and leg health in dairy cattle housed in a free stall barn. J. Dairy Sci. 84, 2686-2699.*