

# Québec/2004 Canada



23<sup>e</sup> Congrès mondial de buiatrie • Québec, Canada, 11-16 juillet 2004  
23 Congreso Mundial de Buiatria • Québec, Canada, 11-16 de Julio 2004

23<sup>rd</sup> World Buiatrics Congress • Québec, Canada, July 11-16, 2004  
23. Welt-Kongress für Buiatrik • Québec, Canada, 11.-16. Juli 2004

## **Lameness and claw lesions as influenced by stall environment and cow comfort**

Christer Bergsten\*, DVM, PhD, Ass Professor  
Swedish University of Agricultural Sciences and Swedish Dairy Association,  
PO Box 234, 532 23 Skara, Sweden

### **Introduction**

Milk production is in rapid change in many countries leading to a more intensive production, larger dairy operations, and more automated units, such milking robots. The individual cow will receive less attention and herd problems with production diseases will become more of a common problem. Claw and leg injuries resulting in lameness have become major concern to the dairy industry. Risk factors of highest importance include housing facilities, feeding, genetics and management. Flooring quality and management are of utter importance for claw health both physically and hygienically. Indirectly, cow comfort, cow traffic and animal behaviour influence the exposure of the claws for the floor, and improvement of these factors is a bottle neck for future animal health and well being as well as for profitable milk production. Claw lesions and lameness are more prevalent in free stall systems than among tethered cows because the floors are often hard concrete that are more or less manure-contaminated and the cows must compete with each other to reach feed, rest and getting milked.

### **Claw conformation and development of claw lesions**

The major weight bearing area of the claw should be the wall. Despite this, the majority of the most important claw lesions occur in the sole of the outer rear claws. When the outer claws in the rear feet increase in size and the sole is flattened, due to suboptimal flooring, the counter-pressure between the rear part of the claw bone and the ground may cause traumatic damage to the sole corium. A yielding ground surface will give less counter-pressure and reduce the risk of lesions. Furthermore, metabolic changes related to laminitis, and hormonal changes at calving<sup>12</sup> weaken the bone-to-claw-capsule adhesion and could be contributing factors in the development of traumatic sole lesions. It is likely that different types of sole lesions are of the same origin<sup>11</sup> and differences in their appearance are related to the interaction between each cow's anatomy, behaviour and different aspects of her housing conditions.

### **Bare-foot marathon on concrete**

The flooring of the dairy facility is of outstanding importance for claw health. Concrete is a cheap, strong material for constructions and easy to clean, but does it give the optimal conditions for the cows' feet and legs? Manske<sup>10</sup> found that lameness and claw horn lesions (sole ulcers, double soles, white line lesions, dermatitis and heel horn erosion) were significantly associated with loose housing systems, concrete floors and poor hygiene.

Although the traditional, old type of rubber mats used in tie stalls were rather hard, they resulted in an improved claw health (less sole ulcers and less sole haemorrhages), when compared to concrete stalls<sup>2,3</sup>. It is not always obvious whether this is a direct effect from standing on softer flooring or an indirect effect from standing less time due to more comfortable bedding. A German study in a free stall barn stall, has shown that installation of soft slatted rubber mats significantly improved the claw health and the animals' ability to perform natural behaviour in comparison with cows kept on crude concrete slatted floors<sup>1</sup>. Even if concrete may not be the best for cows' feet, we must remember that the cow can adapt to different environments. Spring calving heifers with a four months pre-calving accommodation period to concrete had significantly lower post-calving sole lesion scores than autumn calving heifers that came directly from pasture to concrete stalls prior to calving<sup>3</sup>. Thus bringing non-accustomed heifers from pasture or soft straw yards to concrete floors can result in lameness problems.

### **Preference for comfortable flooring**

In the ongoing EU-project LAMECOW, we have made two preference tests. A preference for rubber flooring, both when the animals were tested for standing in the holding pen before milking and when they were walking back to their free stalls after milking, could be demonstrated.

Furthermore, we have analyzed the locomotion comfort on different surfaces/floors by analysing cow track-ways<sup>14,15</sup> (measurements of foot prints along a 10 m lane). When a cow walked on five different surfaces, one after another, she walked most natural on firm sand. The most marked deviance from normal cows was on slippery, slatted concrete. When slatted or solid rubber mats were applied on top of the concrete floors, the locomotion was significantly improved. Moreover, healthy cows were compared to cows with mild or moderate lameness. Mild to moderate lameness resulted in bigger step asymmetry, and moderate lameness to a slower walk, as well as shortened stride and step length compared to healthy cows<sup>13</sup>. Interactions were seen between lameness and floor type. Decreased step angle (wider posture) and asymmetry in lame cows were most pronounced on slatted concrete and least on sand. Rubber mats on solid and slatted concrete floorings improved the gait parameters relatively more for lame cows than for healthy ones. Thus, yielding rubber mats improved the gait in dairy cows in comparison to concrete flooring, and made locomotion more similar to a natural ground condition (compressed sand).

### **Comfortable stalls are both soft and spacious**

“Cow comfort” includes lying comfort as well as comfort when the cow is standing and walking. Lying comfort is very important for the foot health, because if animals are not lying down their feet will be exposed to environmental challenges, which may result in claw lesions and lameness<sup>8</sup>. The lying comfort can be divided into three important features: space for lying down and rising, comfort of the bed, and hygiene. In tie stalls (stanchions) and in free stalls (cubicles) the freedom is more or less restricted. For example, if the neck-rail is installed too low or too much backwards in the stall, there is an increased risk that animals refuse the stalls or stand half in. This may result in increased loading and manure contamination of the rear feet, leading to claw lesions and lameness. It is not possible to have individually tailored stalls,

and thus it is appropriate to keep a herd with animals that do not differ too much in size. Mixing Jerseys with Holsteins may therefore not be a very good idea.

Not too long time ago, most animals were lying on concrete with small amounts of bedding. Cermac <sup>5</sup> showed that the lying time was shortest (7 hours) on crude concrete and was prolonged on traditional rubber mats (10 hours) and longest on mattresses (14 hours) (comparable to pasture resting time). Today, we have been more aware of the impact on health and well being of soft bedding and many different materials have been developed and promoted. Still, the best bedding comfort, with least hock injuries, is obtained with deep-bedding. Straw, saw dust, shavings and dried recycled manure are common organic materials but are hygienically sensitive. Sand is considered the best bedding material also from a hygienic point of view and is popular in North America, where Cook <sup>6</sup> found it beneficial for the herd claw health. Some new bedding-types cause abrasions of the hock or other protruding parts of the body <sup>9</sup>. The lesions can not only be blamed on the mat/mattress but also imperfections in the space for the cow in the stall and possibly on too much humidity. A layer of litter aids to absorb moisture and to reduce abrasions and should never be disregarded.

### **Hygiene of stall and floors**

Poor hygiene is a big problem in tie stalls as the cow is both eating and lying in the same stall and the claws are often standing in manure. In many countries, electric cow-trainers are used as an aid to promote the cow to defecate in the gutter instead of in the stall. Cow-trainers were used in a study to demonstrate the importance of stall hygiene on the incidence of infectious claw diseases <sup>4</sup>. Electrical cow-trainers were used in one of two rows of animals and all animals' feet were healthy when housed at the start of the study. After four months exposure, the claws were trimmed and foot lesions recorded. It was found that despite frequent manure cleansing of the "non-trainer side" the "trainer-side" was much cleaner and all cows had healthy claws while all cows on the "dirty" side had severe heel horn erosions. The Swedish animal welfare legislation now forbids electric cow trainers. To improve the hygienic conditions in tie stalls a new a rubber slatted flooring system has been developed. The rear solid part of the stall is replaced by rubber slats above a manure canal. The solid part (1.50 m) of the stall is covered by a traditional rubber mat. When comparing claw lesions, the control group (tied on traditional solid rubber flooring) developed significantly more interdigital dermatitis and heel horn erosions than those tied on the rubber slatted floors <sup>7</sup>. The animals on rubber slatted flooring also had a significantly cleaner stall environment and cleaner body parts (including claws). Today rubber slatted flooring is also installed in the rear part of free stalls not least to improve cleanliness of the udder.

### **Improvements of feeding area**

Elevated (~0.8 x 1.6 m) feed stalls with individual dividers and equipped with rubber mats promote optimal eating comfort. This type of stalls has been used for more than ten years in Swedish dairies with good experiences. Feed stalls allow the cow better integrity when feeding and alleys can be scraped without disturbing the animals. The rubber mats reduce exposure of claws to concrete and thus reduce the risk for traumatic claw lesions. The elevated stall makes the cow to stand out of dirt and reduces risk for infectious claw diseases. The animals' behaviour was video recorded in the LAMECOW study. It was found that more cows were feeding after milking in the feed stalls and there were about six times more displacements

caused by other cows and/or scrapers in the traditional concrete slatted feeding alley than in the feed stalls.

### **Summary**

Claw lesions result from excessive exposure to flooring which may be hard, abrasive and unhygienic, particularly if the animals' feet are not accustomed to the flooring. Similarly, leg lesions, most often hock and carpal inflammations result from excessive exposure to hard, abrasive bedding surfaces, which the animal has not been accustomed to. The problem is exacerbated if the stall is space-limited inhibiting natural rising and laying down behaviour. With more high-producing cows these factors can not be compromised and in new dairy operations it has to be planned for "Cow Comfort 24 hours". Ongoing research in the EU study LAMECOW aims to assess best practice husbandry systems to reduce the incidence of lameness and improve animal welfare.

### **Abstract**

Une surface de plancher trop dur, abrasive et malpropre peut être à l'origine de lésions aux onglons surtout si les animaux n'y sont pas habitués. L'inflammation périarticulaire du jarret et du carpe peuvent aussi être causée par une surface de plancher inadéquate. Les signes cliniques seront plus sérieux si les cubicules sont de dimensions inadéquates nuisibles au couché et levé de l'animal. Avec des vaches de plus en plus performantes, ces facteurs ne doivent pas compromettre leur production. On doit donc viser un confort de la vache pendant 24 heures. Des études sur les boîtes des vaches sont en cours en Europe pour évaluer les conditions d'élevage optimum afin de diminuer l'incidence des boîtes et améliorer le bien-être des animaux.

### **References**

1. Benz B. Elastic flooring materials for concrete slatted floors in free stall houses. Inst Agric Engineering. Stuttgart: Univ Hohenheim, 2002.
2. Bergsten C. Haemorrhages of the sole horn of dairy cows as a retrospective indicator of laminitis: an epidemiological study. *Acta vet scand* 1994; 35:55-66.
3. Bergsten C, Frank B. Sole haemorrhages in tied primiparous cows as an indicator of periparturient laminitis: Effects of diet, flooring and season. *Acta vet scand* 1996; 37:383-394.
4. Bergsten C, Pettersson B. The cleanliness of cows tied in stalls and the health of their hooves as influenced by the use of electric trainers. *Prev Vet Med* 1992; 13:229-238.
5. Cermak J. Cow comfort and lameness - design of cubicles. *Bov Pract* 1988; 23:79-83.
6. Cook NB. Prevalence of lameness among dairy cattle in Wisconsin as a function of housing type and stall surface. *J Am Vet Med Assoc* 2003; 223:1324-1328.
7. Hultgren J, Bergsten C. Effects of a rubber-slatted flooring system on cleanliness and foot health in tied dairy cows. *Prev Vet Med* 2001; 52:75-89.
8. Leonard FC, O'Connell J, O'Farrell K. Effect of different housing conditions on behaviour and foot lesions in Friesian heifers. *Vet Rec* 1994; 134:490-494.
9. Livesey CT, Marsh C, Metcalf JA, et al. Hock injuries in cattle kept in straw yards or cubicles with rubber mats or mattresses. *Vet Rec* 2002; 150:677-679.

10. Manske T. Hoof lesions and lameness in Swedish dairy cattle; prevalence, risk factors, effects of claw trimming and consequences for productivity. *Animal Environment and Health*. Skara: Swedish Univ Agr (SLU), 2002.
11. Manske T, Hultgren J, Bergsten C. Prevalence and interrelationships of hoof lesions and lameness in Swedish dairy cows. *Prev Vet Med* 2002; 54:247-263.
12. Tarlton JF, Holah DE, Evans KM, et al. Biomechanical and histopathological changes in the support structures of bovine hooves around the time of first calving. *Vet J* 2002; 163:196-204.
13. Telezhenko E, Bergsten C. Locomotion of healthy and lame cows on different floors. *EAAP* 2003: 215.
14. Telezhenko E, Bergsten C, Manske T. Cow locomotion on slatted and solid floors assessed by trackway analysis. *12th International Symposium on Lameness in Ruminants* 2002: 417-420.
15. Telezhenko E, Bergsten C, Manske T. Using rubber mats in a loose housing system for improvement of cow locomotion. *EAAP* 2002: 106.