The effect of hoof trimming on dairy cows´ behaviour, locomotion and production

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Sammanfattning

I dagsläget utvecklas mjölkproduktionen mot större gårdar med lösdriftshysningssystem, vilket ställer höga krav på kornas förmåga att hantera sin omgivning. En utmaning i besättningarna är att upprätthålla god klövhälsa. Några vanliga klövhälsoproblem är klövröta, klövsulesår, digital dermatit och sulblödningar, vilka påverkas av bland annat miljön runt klövarna och underlaget som korna vitsas på. Underlaget avgör hur stort slitaget blir på klöven och hur den slits. Ett alltför stort slitage resulterar i en tunnare sula och klöven blir då mer känslig för trauma från ett hårt underlag. Ett för litet slitage å andra sidan, kan ge för högt lokalt tryck vilket också kan ge klövskador. För att komma tillrätta med klövskador, förvuxna klövar och störda rörelsemönster så görs rutinmässiga klövverkningar. Man rekommenderar klövvård två gånger per år men det varierar mellan allt från verkningar vid behov till verkningar tre gånger per år. Meningen med klövverkning är flerfaldig. Dels att fördela trycket från kroppsvikten på klöven så att den starkaste delen på klöven (väggen) bär upp det mesta av trycket. Dels att upptäcka och behandla klövskador innan de ger upphov till hälta. Detta uppnår klövverkaren genom att verka klöven till en korrekt vinkel och längd samt skålar ur sulan i hålfoten. Klövverkning har många positiva effekter på klövhälsan, men det har framkommit att hälta till följd av klövverkningen kan vara ett problem. Därför är detta i behov av utredning och den här studien har fokuserat på att undersöka om hälta efter verkning är ett problem och vad som kan orsaka detta. För att undersöka detta gjordes beteendestudier på tre gårdar, där kornas rörelseförmåga studerades innan och efter verkning, samt noterades faktorer under verkningen som kunde ha inverkan på rörelserna. Det har visat sig att antalet potentiella faktorer till hälta efter verkning är många, varav flertalet kan bero på hanteringen av korna i verkningsprocessen. Bidragande faktorer kan vara hala golv som orsakar halkningar och resulterar i sträckningar samt att hanteringen av klövarna vid fastsättningen i verkstolen orsakar stötskador eller brytningsskador. Studien visade att många, men inte alla, kor som led av klövåkommor och blev behandlade för dessa uppvisade hälta och även ett fåtal kor som inte led av någon klövåkomma uppvisade ett sämre rörelsemönster efter verkningen. Den statistiska analysen visade att rörelsemönstret blev signifikant påverkat av verkningsprocessen. Det återstår att fastställa vilken eller vilka av de ovan nämnda faktorerna under verkningsprocessen som orsakar det försämrade rörelsemönstret. Speciellt den svullnad över leden som uppträdde dagen efter verkningen är av stort intresse att undersöka ytterligare då den skulle kunna orsakas av brytningen på leden vid fastsättningen av framklövarna i verkstolen. Det fanns tendenser till att ett försämrat rörelsemönster i samband med verkning påverkade mjölkproduktionen vilket bör undersökas ytterligare.

Abstract

The Swedish dairy production today consists of big farms and different housing systems are in use. These systems put demands on the cows' ability to cope with the environment and one challenge is the claw health in the herds. Some claw lesions that are frequently observed are foot rot, hemorrhages, digital dermatitis and sole ulcers, which can be caused by, for example, the claws' environment and the flooring type used. The flooring type decides how great the wear is and how the wear pattern will be. Too great wear results in a thinner more sensitive sole while a too small wear causes overgrowth, which increases the pressure on local spots. Both of these wear patterns results in an increased risk of claw lesions and to decrease this risk, routine claw trimming is performed. The number of trimmings a year varies from trimming when needed up to three times a year (recommendations state twice a year). The purpose of the trimming is to redirect the pressure to the claw's wall, which is the strongest part. This is achieved by trimming the claw to a correct angle and by dishing out some of the medial sole. Claw trimming have many proved positive effects, but a possible problem with lameness caused by the trimming process has also been noticed. This was considered in need of an investigation and this study has focused on the trimming process, what factors that could be causing the lameness and if there really is a problem. This was achieved by studying cows locomotion on three farms before and after trimming, the trimming was also observed to notice factors that could affect the locomotion. The possible factors involved in affecting the cows' locomotion after trimming are many and are at a high proportion connected to the handling of the cows during the trimming. Some of these factors were found to be slippery floors which caused strains as well as crush or break injuries caused by the restraining of the claws in the trimming chutes. The lameness was found to be, in many cases, a product from treated claw lesions, however not all cows that were treated for claw lesions became lame and cows that were not affected with claw lesions also suffered from a decreased locomotion after the trimming. The locomotion was found to be significantly affected by the trimming and it remains to investigate which factors are causing this One factor of particular interest for further research is break injuries due to the restraining of the front claws to the trimming chutes, which was observed as a swelling at the joint after the trimming. A significant connection between poor locomotion and decreased milk yield could not be found but there was a tendency towards this and a greater data set is needed to establish this.

Introduction

Some of the claw trimmers located in the west of Sweden have noticed that lameness in dairy cows associated to the claw trimming process could be a problem. This issue was brought up and claw trimmers connected to the Swedish claw trimmer association and Swedish dairy association became interested in finding out if this could be a problem, what would be causing this lameness and how to prevent this from occurring.

The Swedish Dairy Association is working with health and production of dairy cows and are able to do this thanks to the Swedish cow control and claw health recordings. The records of claw health are accessible online for both the claw trimmers and the farmers with the purpose to make it possible for them to evaluate their work towards better claw health. The records of claw health are done by the claw trimmers on field, of which many are members of the Swedish claw trimmer association which is a non-profit organization with the purpose to make it possible for claw trimmers to meet and share experience and also try different trimming chutes and variant of tools. They are easy available on the web with information on new educations, different claws lesions, contact information to different claw trimmers and summaries of conferences, making it possible to know what was brought up even if you were not able to be present (Örtenberg, 2009). Lameness is best described as a behaviour expression for leg and claw illness that is based on that the animal experiences pain which can be observed as disturbed locomotion. A disturbed locomotion makes it difficult for an affected cow to handle slippery floors, small cubicles and to make its way at the feeding area (Metz & Wierenga, 1987; Peterse, 1987). Lameness is the first indication on bad welfare for the cow before it escalate and affects the cows ability to locomote to feeding and resting areas and thereby affects the general health and production which indicates that the welfare is heavily neglected (Jensen, 1993).

Objectives

The purpose of this study was to investigate if the lameness that appears in connection to claw trimming are a problem and how widespread it is in the country by use of a questionnaire and observations on farms. Furthermore, factors during the trimming process that could influence the locomotion and how the production and behaviour are affected were studied by observing locomotion before, during and after trimming.

Hypothesis

The trimming processes are assumed to affect the cows' locomotion.

Literature review

Methods and tools of claw trimming

To understand the purpose of the dairy cow claws and their importance for the cows' health on the farm it can be a good thing to be aware of its anatomy and how it works to optimize their environment and the claw care. The claw consists of a medial and lateral claw that is covered of three different horn types; wall, sole and heal bulb, which are created from skin with the purpose to protect from for example wetness and mechanical damage, figure 1 (Andersson, 1995). The horn has been measured to grow about four to six millimetres per month (Manson & Leaver, 1988; Manske et al., 2002; Andersson, 1995; Nilsson et al., 1998) and during natural circumstances the wear is equal to the growth which achieves a toe angle of 45˚ at the front claws and 50˚ at the hind claws with a toe length of 75 millimetres. However, the wear pattern has changed due to changes in the environment from grass etc to concrete etc for a large part of the cattle population. A rough and hard surface causes a greater wear at the heal bulb region which is softer. This is not desirable because the heal bulb area is exposed to the highest pressure from the bodyweight (Manske et al., 2002; Andersson, 1995).

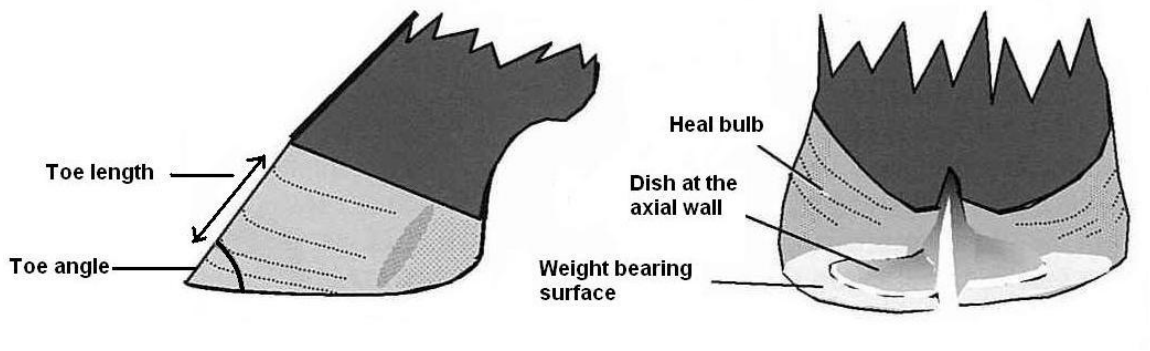

Figure 1. The dairy cow claw. Adapted from Manske et al. (2002).

The purpose of claw trimming is to adapt the claws to be functional in the present environment by unloading the areas that are most exposed to pressure on the sole where high pressures could cause different kinds of claw lesions. The easiest way to describe the trimming of a claw is in different steps; first the thickest claw, medial or lateral, should be trimmed followed by creating symmetry within and between the claws. Next step is to make the bearing surface plane in order to remove local pressures at the rear of the claw where sole ulcers often appears, this by making a dish at the axial wall (Manske et al., 2002; Andersson, 1995; Carvalho et al., 2005; Van der Tol et al., 2004; Amstel et al. 2002; Blowey, 2002). This method of trimming is called the Toussaint Raven method (TR) (Carvalho et al., 2005; Van der Tol et al., 2004). Another method used besides TR is one where the thickness of the sole is controlled by trimming the claw until the white line is visible at the toe (VL). As one purpose of the horn is to protect the claw against mechanical damage it is important not to trim the sole thinner than five millimetres (Manske et al., 2002; Andersson, 1995). This should be adjusted with consideration to which housing system the cows are kept in because the wear differs between tied stall barns and loose housing systems and even within lose housing systems depending on which flooring is used (Manske et al., 2002; Amstel et al.

2002; Ouweltjes et al., 2009). With the VL method 14.6 % of the claws had a thickness below five millimetres while the TR method caused 1.5 % of the claws to get thickness below five millimetres (Amstel et al. 2002). The TR method has also been compared to a so called Dutch method where no dish at the axial wall is created. Observations of cows walking on soft foundation showed no significant differences in claw health or locomotion scores between the methods (Ouweltjes et al., 2009).

There are different tools used during trimming, both old classical tools like hammer and blade combined with claw knife and claw scissors and modern once like the claw grinders, all of these tools are used more or less today (Andersson, 1995). The tool mostly used today by professional claw trimmers is claw grinders, which exists in two different versions, the pneumatic which builds on air pressure and the electrical. Both of these are combined with the claw knife. The claw grinders could be combined with different blades on the cutting disc, a disc with few blades trims more of the horn at each cut and a disc with more blades demands more labour to get the claw trimmed. It is recommended for beginners to use cutting discs with more blades as it decreases the risk of removing too much of the horn which could cause damage to the claw (Lycke, 2009). To be able to perform claw trimming the cows must be restrained in trimming chutes. There are different types of trimming chutes in use like the mechanic, hydraulic or pneumatic and trimming chutes where the cow is in a standing position as well as chutes where the cow is flipped to lie on the side. In the aspect of animal welfare there seems to be no differences between these restraining methods when measuring the stress hormone cortical (Stanek et al., 1998).

Impact of claw trimming

The cow's bodyweight is carried by the claws, but the distribution of the weight is not equal on the front and the hind claws (Scott, 1987; Andersson, 1995) and it differs within the claws if trimming is not performed. Thus preventive trimming reduces possible future claw lesions like ulcers and hemorrhages (Peterse 1987; Andersson, 1995). When the cow is in a standing resting position, most of the weight is carried by the front claws while the weight is slightly more distributed away from the front claws during movement (Scott, 1987; Andersson, 1995). The purpose of the trimming is to improve the movement of the cow by creating symmetry and a correct shape of the claw (Andersson, 1995). This is accomplished by the TR method, among other methods of trimming, by balancing the pressure over the claw and redirecting the pressure from the heel bulb and lateral sole, that are weight bearing in untrimmed cows, to put more pressure to the softer medial sole and toe. But even though the method balances the pressure, it does not lead pressure away from local vulnerable spots such as the area of claw ulcers (Carvalho et al., 2005; Van der Tol et al., 2004). The heel bulb is sensitive to pressure because of its softer surface. Too much exposure to pressure on this area increases the risk of foot rot that is a painful claw lesion and the cow tries to unload this by walking more on the toe which causes an incorrect load as a consequence followed by sole ulcers (Nilsson et al., 1998). According to Van der Tol et al (2004) this kind of problem could be avoided by

focusing the trimming to redirect the pressure to the wall, which is the strongest part of the claw.

When the wear increases on the claw by keeping the cows on rough flooring (Vokey et al., 2001) or by performing trimming (Manson & Leaver, 1988 (b); Manske et al., 2002 (1)) the growth of the horn increases, although this growth is not equal to the wear and could cause an asymmetric wear which suggests that routine claw trimming should be performed at least once per lactation according to Manson & Leaver (1988 (b)). If routine trimmings are performed once per year the incidence of too long claws, acute toe angles, and overgrown capsules, which could lead to an incorrect weight distribution with local pressures, are more frequent than if trimmings were to be performed twice a year (Manske et al. 2002, 1). However, how often trimmings should be performed is not the same for all farms as the amount of wearing, shaping of the claws and prevalence and severity of claw lesions is affected by the housing system and the type of floor. The claws are most susceptible to claw lesions in the cow's high yielding period, due to this the period of trimming are recommended to be three to four month after calving or a couple of months before calving (Manske, 2002; Nilsson et al., 1998). Cows that are housed in tie stall barns on rubber mats have responded more positively to the treatment of claw trimming compared to cows in free stall barn in the aspect of claw health (Fjeldaas et al. 2004). Claw trimming has been shown to increase the milk yield of both primi-and multiparous dairy cows when comparing the yield before and after trimming (Sogstad et al., 2007).

Claw health in dairy production

Claw health in the dairy cow herd can be observed and recorded to assess the prevalence of claw lesions. This can be recorded at trimming (Manske et al. 2002) and by the farmer during other periods of the year. To be able to recognize bad claw health by the eye can be difficult if one does not know what to look for. Signs indicating bad claw health can be overgrown claw capsules, relieved claws and a deviant stature (Andersson, 1995).

In a study by Manske et al. (2002) cows from 101 Swedish farms were observed and 72 % of the cows on these farms suffered from at least one claw lesion where the most frequently occurring lesions were heel horn erosion, hemorrhages, abnormal claw shape and sole ulcers. Only 5.1 % of the cows showed a tendency for lameness which strongly indicates that most of the claw lesions do not cause lameness and it can therefore be difficult to discover the lesions when only looking at the cows.

Two hundred ninety farms in Switzerland were included in a study of sole disorders. White line disorders and heel erosions were the most frequently found disorders and the frequency of lameness was found to be 10 %. Most cases of lameness were found in tie stall barns and the best locomotion was found in free stall systems (Biefeldt et al., 2004). The most frequently found claw lesions on farms seems to be white line diseases, sole ulcers, foot rot and digital dermatitis (Bicalho et al., 2007 (a); Green et al., 2002). Seventy percent of the cows studied by Green et al. (2002) expressed lameness sometime during the trial.

Locomotion scoring

Locomotion scoring is a way of scoring the cows gait and should be performed in a way so that the scoring of one particular cow could be repeated by a different observer with the same results and followed up at a later occasion to assess the claw health development. The scoring can be performed by visual or automatic observations and can be applied in behaviour studies such as locomotion scoring. In the visual locomotion scoring the cows are graded according to the severity of locomotion disruptions and the purpose of grading systems is to score different degrees of lameness and these can be more or less specific (Flower & Weary, 2008). However, the repeatability between observers is high, 0.84 (Manson & Leaver, 1988 (a)). Except from the observer's experience, the reliability of the observations could be affected by the interpretations of the different scoring systems as different observers could interpret the grades differently when the system is based on subjective descriptions of the gait performance (Flower & Weary, 2008). Another thing that could affect the reliability is the time of observing and factors that could interfere with the locomotion. For example the degree of udder distension could affect the locomotion making important to consider the time since last milking when scoring (Flower et al. 2006; Chapinal et al. 2009). How many cases of locomotion disturbances that are observed can also be influenced by the season. During February and August a higher frequency of increased locomotion scores, which indicates a bad claw health are observed and the lowest locomotion scores which indicates a good claw health are observed during the summer season if grazing is applied on the farm. On the contrary, the highest locomotion scores have been observed during the summer season if grazing is not applied and the cows are housed indoors all year round (Onyiro et al. 2008).

A five graded system used by Sprecher et al. (1997) assesses the posture and gait skill of the cow based on observing both back-level posture and gait. The score of three to five in this system describes different levels of lameness that includes an arched back both in resting position and during movement. These high scores differs from each other by the gait performance where a score of three is a gait with shortened strides and a score of five is severe lameness where the cow does not put any load on one or more limbs (Table 1).

A version of the system used by Sprecher et al. (1997) has been used by Bicalho et al. (2007) (b) where a grade over three was classified as lame. However, this method was considered too time consuming because of the amount of factors to take in to consideration in the observations and was modified into a version with a scale from one to three. This version was based on observing the cows back posture while walking and in resting position. Grade one (healthy) is normal with a straight back when standing and walking, grade two (moderate) describes a cow standing with a straight back and walking with an arched back and a grade of three (lame) describes a cow that is both standing and walking with an arched back. A problem with this kind of system is that within cows which showed a score of three they assumed an affected locomotion. However, the locomotion is not affected in all cases of cows expressing an arched back and cows without an arched back could be lame (Amory et al., 2006).

Table 1. Locomotion scoring from Sprecher et al. (1997)

Lameness score	Clinical description	Assessment criteria
1	Normal	The cow stands and walks with a level-back posture. The gait is normal.
2	Mildly lame	The cow stands with a level-back posture but develops an arched-back posture while walking. The gait is normal.
3	Moderately lame	An arched-back posture is evident both while standing and walking. The gait is affected and is best described as short-striding with one or more limbs.
4	Lame	An arched-back posture is always evident and gait is best described as one deliberate step at a time. The cow favors one or more limbs/feet for putting weight on.
5	Severely lame	The cow additionally demonstrates an inability or extreme reluctancy to bear weight on one or more of her limbs/feet.

Even if the locomotion scoring system gets simpler it is still time consuming and there is therefore a need of a tool that can identify lameness on herd level with low labor demand and high accuracy. One of the automatic systems tested is called the step metrix locomotion scoring which measures the force of the claw against the ground. When this system was compared with a visual locomotion scoring system with five grades, the visual system was more reliable in detecting painful lesions and lameness on cows, especially in their hind feet (Bicalho et al, 2007 (a)).

Another type of automatic device tested to record lameness was created by Song et al. (2008) and consisted of a video camera which recorded the locomotion and hoof location. These findings were compared to visual observations and strong correlations between these measures were found and it could be concluded that the automatic system had great potential.

A computer program where the farmers could keep records on locomotion scores on each cow have been developed by the company Zinpro (2009). The program makes it possible to keep records that are easy to follow up and it could estimate how much high locomotion scores affect the production results.

The effect of locomotion disorders on production

With the guidance of the locomotion scoring system one could calculate the risk of impact on the cow´s health except from the claw health. When using the Sprecher system with the

grades from one to five, it was found that cows graded higher than two are at higher risk of having a longer open interval (Bicalho et al, 2007 (b); Sprecher et al., 1997) and have more days to first service than the average cow in the herd. Furthermore these cows did not require more services for pregnancy but were at 8.4 times higher risk of being culled (Sprecher et al., 1997). A higher risk of being culled was also found in a group of cows that had a lameness score of three or higher and were in their first 70 days of lactation, these cases of lameness increased with higher lactation number. The impact of the lameness on fertility depends on the grade of lameness, it were more affected when the grades increased (Bicalho et al, 2007 (b)).

When a higher locomotion score affects the cow's ability to move it has also been found to decrease the cow's eating time, which causes a lower dry matter intake. This affects the production adversely by a decreased milk yield (Bach et al., 2007, Flower & Weary, 2008; Andersson 1995; Nilsson et al., 1998). This effect of a decreased milk yield is also accomplished when the roughage- concentrate ratio changes to a lower level of concentrate (Reist et al., 2003; Sehested, 2003). How much the production is affected by a higher locomotion score depends on which lactation the cow is in. Primiparous cows' behaviours are affected to a higher degree by a high locomotion score than multiparous cows, which could be observed by a larger decrease in yield for primiparous cows. However multiparous cows are more often affected by high locomotion scores (Bach et al., 2007). The yield of a cow graded with a four or five produces 0.78 kg less milk per day than a non-lame cow (Onyiro et al. 2008). When observing the period of four month before detection of lameness to five month after the detection and treatment the decrease in milk yield were found to be 360 kg per lactation (Green et al., 2002). According to Bach et al. (2007) most cases of lameness could be observed four to eight months into the lactation, while Green et al. (2002) states two to five months.

Interdigital phlegmon, also called foot rot, was involved in 9 % of the lame cows and resulted in a 10 % decrease in milk yield while other claw lesions, such as sole ulcers, that caused lameness did not significantly affect the yield, showing that not all cases of lameness affects milk yield (Hernandez et al. 2002). Lameness can also affect the farmers labour demand, as a lame cow has difficulties in moving which increases the time of fetching and moving the animals (Bach et al., 2007; Green et al., 2002).

Risk factors for reduced locomotion

There are several considerable risk factors that could affect the locomotion in dairy cattle, for example flooring conditions, feeding, type of housing system, lactation factors, breed and claw trimming (Carvalho et al., 2005; Amory et al., 2006; Biefeldt et al., 2004).

Season

The season when performing claw trimming constitutes an impact on the locomotion. To trim close to the start of the grazing period can be a stress on the claws because the environment in the stable is often at its worst in the end of the stable period. It could also make the claws even more sensitive to the new circumstances with the different ground material outdoors such as stones (Biefeldt et al., 2004; Manske et al., 2002). The influence of season and year was studied by Boelling & Pollott (1998) who found that the locomotion scores increased during the stable season until December and that locomotion scores varied between years.

Claw trimming

The claw trimming itself is a risk factor that could affect the cow locomotion. A farm that possesses a trimming box where the herdsmen performs the trimming on the cattle is in increased risk of lameness, the most common reason for this is the farmers limited knowledge about claw trimming. This could be improved by making the knowledge available on how a claw should be trimmed in a correct way (Amory et al., 2006). Claw trimming on routine basis have been compared to non routine trimming and it was found that 76.8 % of those that got trimmed on a regular basis were affected with one or more claw lesions while for cows that did not get trimmed regularly only 68.9 % were affected with claw lesions (Fjeldaas et al. 2006). Similar result was found if routine trimming only is performed once per year instead of two it increases the risk of claw lesions compared not to perform trimming at all because of the increase growth which occurs when the wear is big (Barker et al., 2007)

Feed

The composition of the feed in use on the farm could affect the claw health in dairy cows. Starch rich feed with a large part consisting of grains or some other crop and rapid changes in feeding ratio causes a rapid fermentation that could cause rumen acidosis, which has been found to reduce the quality on the claw horn, making it softer and more exposed to wear and thereby an increased risk of claw lesions. Corn silage is a crop with high starch content and it has been discovered that farms that include corn in the feed show a tendency for higher locomotion scores in their cows (Amory et al., 2006). Protein content in the feed is also important to consider because of its influence on cow locomotion. A high level of protein increases the growth of the claw which can cause overgrowth and an incorrect pressure distribution that increases the risk of claw lesions and duration of lameness (Manson & Leaver, 1988 (b)).

Lactation

High yielding cows are more often associated with lameness compared to cows with moderate or low milk yield. This does not mean that lameness increases milk yield, but rather that the higher metabolic demands on a high yielding cow affects the claw health adversely (Biefeldt et al., 2004; Green et al., 2002). It was also observed that the locomotion scores become significantly higher with higher lactation number (Boelling & Pollott, 1998).

Flooring

The locomotion of dairy cows can be quantified with the parameters speed (m/min), duration of standing still (h/day) and daily distance (m/day) (Kempkens & Boxberger, 1987). When locomotion scoring is performed, it is important to take the flooring conditions into consideration because of its influence on the locomotion. When scoring made on floors with high-friction rubber mats was compared to scoring on concrete floors it was found that both the healthy cows and cows affected with sole ulcers had an increased stride length, shorter periods of reliving any limbs, a faster more symmetric gait and received lower locomotion scores on the rubber mats. These differences between the floors were larger for cows that suffered from sole ulcers (Flower et al., 2007; Telezhenko & Bergsten, 2005; Rushen & Passillé, 2006; Ouweltjes et al., 2009). Telezhenko et al. (2007) found that cows prefer to walk on rubber mats rather than concrete when able to choose.

The contact surface of the claw is different on different flooring materials. The sole has a greater contact area on abrasive floors like mastic asphalt and concrete and these floors causes an increased wear. This is especially true for asphalt floors, making the dishing at the axial wall made at trimming to get worn out quickly, resulting in a thin sole (Telezhenko et al., 2008).

Material and methods

Animals and management

The study was performed on two research farms of the Swedish University of Agricultural Sciences located in the middle east and one conventional farm located in south west of Sweden. In total 212 cows entered the study of which 84 were classified as primparous and 128 as multiparous (Table 2). The lactation number within and between the farms varied (1-11) and the cows were grouped in different lactation stages according to Manske (2002); early (0-60days), middle (61-150) and late (>150 days). Only cows which were lactating in the beginning of the trial were included, dry and sick cows were not observed. All three farms used different claw trimmers which were professionals, two of them had hydraulic and one had pneumatic automatic trimming chutes. All trimming chutes were of similar construction with a standing cow, fixation of the head, supported with a mat under the belly and limbs attached with a rope. Herd staff assisted during the trimming by bringing the cows to the trimming box and attached their limbs. The trimming was made with electric or pneumatic grinders with three blades on the cutting disc. Apart from maintenance trimming twice or three times a year, acute trimming in between could be made in own trimming chutes of an old mechanical type on all three farms.

Table 2. Information of the cows on the different farms

	Farm 1	Farm 2	Farm 3
Cows in total	72	85	55
Lactation range	1-11	1-4	1-7
Lactation stage;			
early (0-60 days)	18	13	6
Middle(61-150 days)	19	49	31
Late (<150 days)	35	23	18
Primipaourus	23	44	17
Multipaourus	49	41	38
Breed (SH= Swedish Holstein, SRB= Swedish Red Bovine)	SH & SRB	SH & SRB	SH & SRB

Farm 1

The cows were housed in an uninsolated free stall system and the flooring in the stable was a rubber solid floor. The milking was routinely performed two times a day in a milking parlour

of double eight fish leg design. The flooring in the waiting area in front of the milking parlour consisted of both rubber and concrete. During the trimming day the cows were gathered in the waiting area and went through the milking parlour into the trimming box and when the trimming was done they walked out straight into the feeding area. The farm had recently made a change in the feeding by changing to full ration mix from the separate feeding system of silage and feed concentrate.

Farm 2

Half of the cows were earlier kept in a isolated free stall system with concrete floor and about half was tied up on rubber carpets. In the new free stall system which was uninsolated the flooring was a solid rubber floor, and the flooring in the waiting area in front of the milking parlour and passages from the parlour were of concrete. The milking parlour were a double eight fish leg parlour with milking three times a day for the cows that were considered high yielding and two times for the cows with lower yield, this grouping was not constant which means that cows were moved between the two groups. The grouping was done to meet the feed demands depending on yield. The cows were trimmed in the stable with the cows around the trimming box and the cows to be trimmed were lined up two or three at a time in a gate system in front of the chair. The production on this farm was considered unstable at the moment for the study because the stable was newly built and the routines of the management were not settled.

Farm 3

The flooring in the isolated free stall and the waiting area was of solid concrete. The feeding area was separated from the resting area with selection gates and was regulated through a milk permission time. The farm used an automatic milking system (AMS) with milk permission six hours since last milking. The AMS recorded the amount of milk at each milking, calculated the expected daily yield and recorded the actual yield. During the trimming the cows were removed to a waiting area in another part of the building and then herd into the trimming box with the help of a gate system. After the trimming was performed the cows were let back into the feeding area of the stable.

Locomotion assessment

Locomotion scoring was recorded for each animal one day before claw trimming and at one occasion every day for five days after the claw trimming. To avoid errors due to a stodgily udder and errors between measurements on each cow, the observations were made within six hours after milking and were performed on the same flooring conditions every day.

The locomotion scoring system used based on observations made of the cows back posture while standing and walking in combination with their walking performance. The scoring system were divided in four different levels, with the grades 0-3 (table 3) (Berry, 2007). To investigate what factors that were influencing the locomotion the trimming process was observed. The claw trimmers on each farm conducted their recording according to the Swedish claw health recordings, which made it possible to compare the locomotion scores with the recordings on claw health within the farms. The locomotion assessment was

performed by one observer and the claw health recording papers were not analysed until the trial was completed for each farm.

Table 3. Locomotion scoring system used in the study, adapted from Berry (2007)

Locomotion score	Description	Assessment
0	Normal	Standing and walking with level back posture, non affected gait
1	Mild locomotion disturbance	Standing with a level back posture, walking with an arched back, non affected gait
2	Moderate lame	Standing and walking with an arched back and affected gait with short strides
3	Severely Lame	Standing and walking with an arched back, gait severely affected and repulsion to put weight on one or more limbs

Observations during trimming

The trimming procedure was observed at all three farms and factors that could have an influence on the locomotion were noted. Those observations included handling of the animals, flooring conditions and the trimming boxes when they were in use.

Statistics

On the third farm the milk production was recorded through the AMS and the data from eight days before trimming and eleven days after the trimming was analyzed for significances in a mixed procedure in the SAS system, version 9.1, the parameters period, numbers of milking, intake of roughages and concentrate and locomotion was considered. To analyze the affect on the locomotion of trimming the period of observation was set to before and after trimming in a SAS procedure. The data of locomotion scores are presented as descriptive results.

Questionnaire

A survey on two pages that contained questions about the circumstances during trimming and a schedule where the farmers could notice contingent lameness before and after trimming was sent out to 137 farmers during six weeks. (Appendix 1) About half of the farmers that received the survey got a personal phone call were they got informed of the study before it was sent. The questions in the survey were created in cooperation with the claw trimming association and the Swedish dairy association. With the survey, a colored map over claw lesions and an answer envelope from the claw health recording were attached. Due to the low

answer frequency the results were not statistical analysed and are presented as descriptive results.

Results

Locomotion scores

Farm 1

Locomotion scores

Primiparous cows

The primiparous cows (n=23) expressed an increased amount of mild locomotion disturbances (grade 1) the day after trimming, in part due to that the more severe grading of two decreased. On day five of the trial period a higher proportion of the cows were graded with a normal locomotion compared to before the trimming (Figure 2).

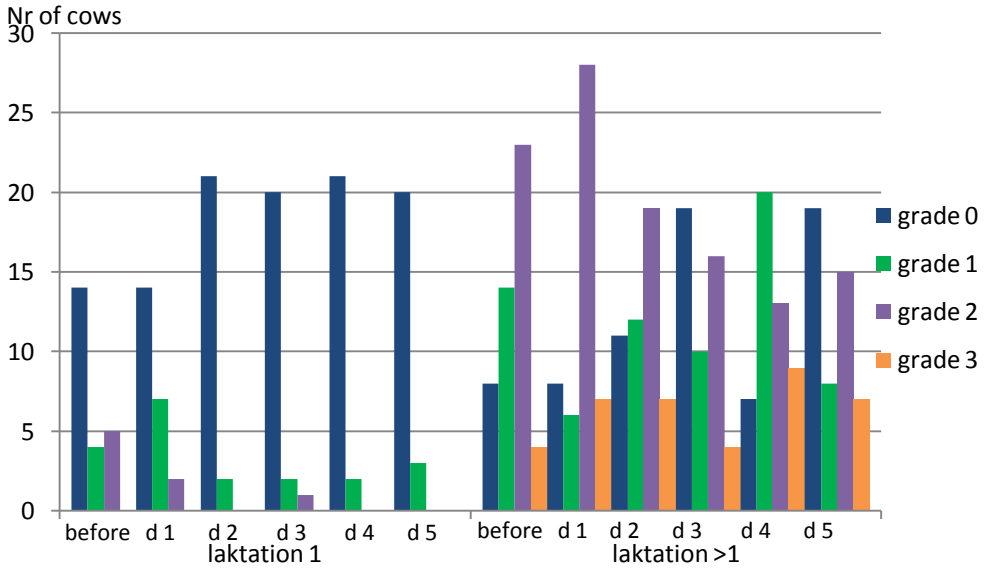

Figure 2. Locomotion scores in first lactating (n=23) and multipaourus cows (n=49) during 6 days, with trimming the day between observation day "before" and d 1.

Multiparous cows

The differences in locomotion scores in the multiparous cow group (n=49) was larger than in the primiparous group but the tendency towards a higher proportion of cows with normal locomotion at the end of the trial period was the same. The occurrence of mild to moderate locomotion disturbances decreased after the trimming and the severe cases of lameness increased. This is due to that cows scored with severe lameness after trimming were graded according to the system with mild or moderate locomotion before and could be connected to the occurrence of claw lesions. In total eighteen multiparous cows were scored with this severe grade at least once during the observation period.

On farm 1 it was observed that not all cows that were affected with some kind of claw lesion expressed this in the locomotion. Even though the primi- and multiparous cows almost had the same occurrence of claw lesions the lameness was more pronounced in the multiparous group.

Clawhealth

In total, the presence of claw lesions in the herd was 54 % affected with hemorrhages and 19. 5 % affected with sole ulcers. Most of the recorded lesions were of a mild type. Claw lesions like sole ulcers or hemorrhages, which are treated at trimming, were associated with 13 of the 18 cows with the locomotion score of three. In general the multipaourus cows had a worse locomotion than the primiparous cows. Of the cows classified as multipaourus, 63 % suffered from either hemorrhages, claw ulcers or a combination of these two claw lesions while for the primiparous cows there were 52 % affected with some kind of claw lesion. Considering cows with claw lesions, the differences between the different lactation stages that were affected with claw lesions did not differ exceptionally but how affected these cows were of the claw lesions was different. This shows that cows in middle lactation did not suffer as much as the cows in the early and late lactation from these lesions (Table 4). In the late lactation stage group, 77 % were multiparous cows, and within the early lactation stage 67 % were multiparous cows compared to 53 % in the middle lactating group.

Table 4. The influence of lactation stage on the appearance of claw lesions and locomotion disturbances, stage 1 (0-60days), stage 2 (61-150) and stage 3 (>150 days).

	Cows	Affected with claw lesions (%)	Claw lesion and locomotion score >1 (%)
Lactation stage 1	18	50	78
Lactation stage 2	19	58	54,5
Lactation stage 3	35	66	90,5

Farm 2

Locomotion scores

Primiparous cows

The cows in their first lactation suffered an increased locomotion score of mild and moderate locomotion the day after the trimming. Day two after trimming the moderate locomotion decreased and at day five of the trial period a higher proportion of the cows expressed normal locomotion compared to before trimming, as observed in Figure 3 they accomplice a fast recovery after the trimming in their locomotion.

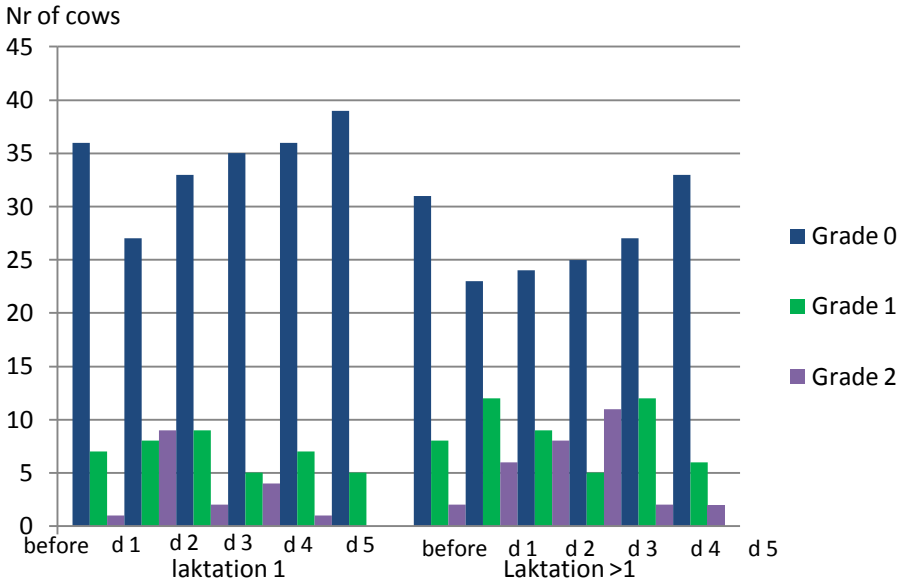

Figure 3. Locomotion scores in first lactating (n=44) and multipaourus cows (n=41) during 6 days, with trimming the day between observation day before and d 1

.Multiparous cows

The same pattern as with the primiparous cows are observed in this group with a increase of mild and moderate locomotion disturbance after the trimming. During the following days the moderate locomotion disturbance increases and at the end of the trial period the cows have recovered to an higher proportion of normal locomotion and a decrease of mild and moderate locomotion compared to before trimming.

The multiparous group expressed a slower recovery than the primiparous group and of the total of 85 cows, 31 were sometime during the observation period affected with a moderate locomotion disturbance and 25.8 % of those cows were not affected with claw lesions. This indicates that claw lesions are not always expressed in the locomotion and that lameness is not always a consequence from claw lesions. (Table 5)

Table 5. The influence of lactation stage on the appearance of claw lesions and locomotion disturbances, stage 1 (0-60days), stage 2 (61-150) and stage 3 (>150 days).

	Cows	Affected with claw lesions (%)	Claw lesion and affected with locomotion score >1 (%)
Lactation stage 1	13	46,2	33
Lactation stage 2	49	92	40
Lactation stage 3	23	74	29

Claw health

The presence of claw lesions in the herd were 62. 4 % hemorrhages, 3. 5 % sole ulcers and 63. 5 % foot rot. Of the hemorrhages approximate half of the cases were classified as severe, the other lesions were of mild type. The primpaourus suffered from more severe claw lesion than the multipaourus (50 %, 15%) and were affected with a higher frequency of claw lesions (95. 5%) than multipaourus cows (63. 5%). The recorded claw lesions on the cows were hemorrhages, sole ulcers or foot rot or a combination of some of those. The cows that were in middle or late lactation were affected with more claw lesions than those in early lactation.

Farm 3

Locomotion scores

Primiparous cows

The group of first lactating cows expressed an increase of moderate and severe locomotion disturbance the day after trimming as shown in figure 4. The increase of those disturbances continues two days after trimming with a decrease of normal locomotion before the mild and moderate locomotion disturbance decreases and the locomotion recovers to the same number of cows with normal locomotion as before the trimming. But the proportion of cows with normal locomotion at the end of the trial period does not exceed the proportion of cows with normal locomotion before the trimming.

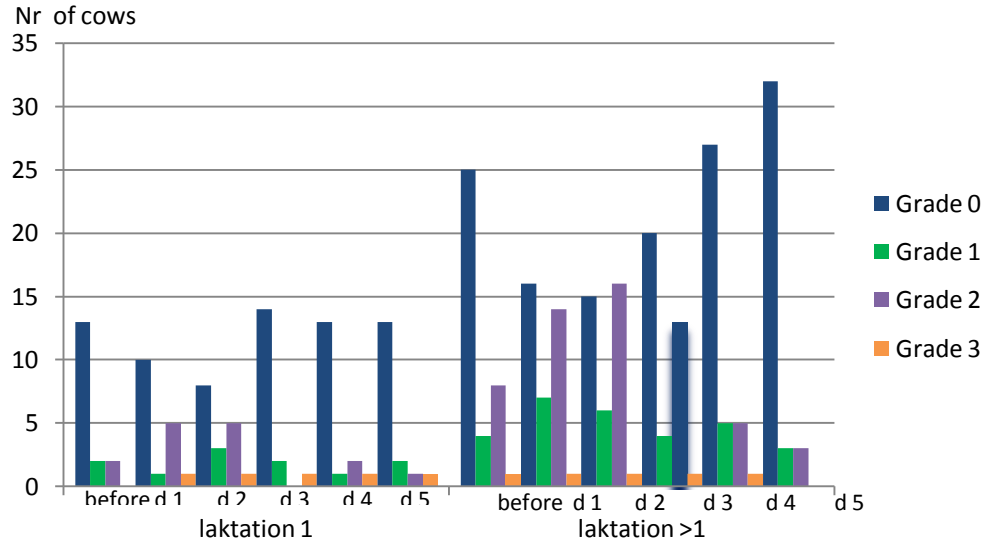

Figure 4. Locomotionscores in first lactating (n=17) and multipaourus cows (n=38) during 6 days, with trimming the day between observation day before and d 1.

Multiparous cows

The group of multiparous cows expresses the same tendency of increased locomotion scores two days after the trimming and then decreases and results in a higher proportion of cows with normal locomotion at the end of the trial compared to before trimming.

Claw health

The presence of claw lesions in the herd was 7 % of hemorrhages and 22 % of foot rot. About half were of severe type and can be associated with the high locomotion scores but not in all cases when some cows with establish severe hemorrhage and foot rot were not affected in the locomotion. There were an even distribution of the claw lesions between the lactation stages,

all of the cows in early lactation that were affected with claw lesions indicated affected locomotion in contrary to the cows in middle and late lactation (Table 6).

Table 6. The influence of lactation stage on the appearance of claw lesions and locomotion disturbances, stage 1 (0-60days), stage 2 (61-150) and stage 3 (>150 days).

	Cows	Affected with claw lesions (%)	Claw lesion and affected with locomotion score >1 (%)
Lactation stage 1	6	33	100
Lactation stage 2	31	29	11
Lactation stage 3	18	22	75

Summary of locomotion scores

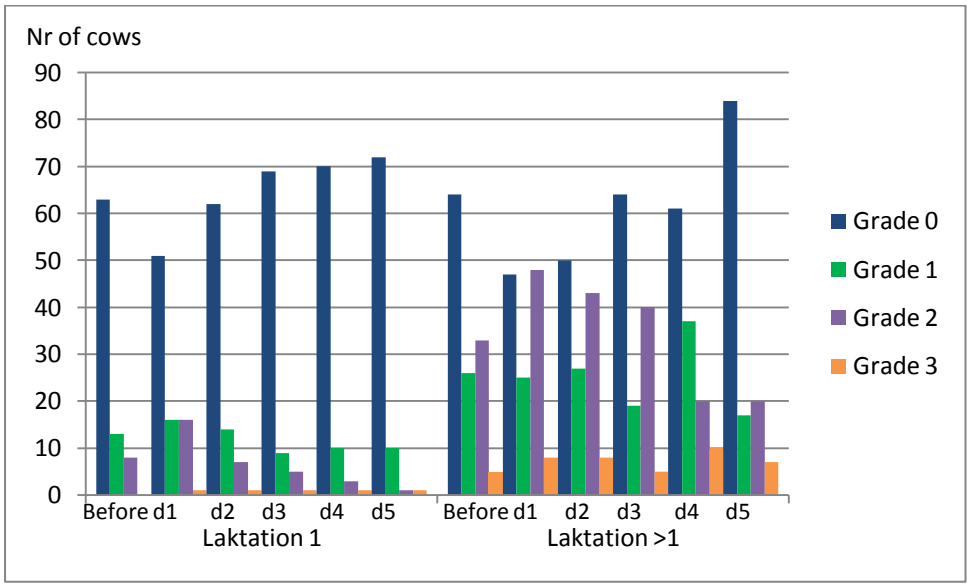

Figure 5. Locomotionscores in first lactating (n=84) and multipaourus cows (n=128) during 6 days, with trimming the day between observation day one and two.

As observed in figure 5, primipaourus cows had increased locomotion scores on observation day two and three compared with before trimming. At the end of the observation period the locomotion scores were improved, with a higher proportion of cows with normal locomotion and a decrease of the higher locomotion scores. The multipaourus cows were affected with a decreased locomotion two days after the trimming, the locomotion then improved during the following days until the end of the observation period. At the last observation there were a higher proportion of cows with normal locomotion compared with before the claw trimming.

The total prevalence of lesions recorded by the claw trimmers concluded in 31 % heel erosions, 8% sole ulcers and 45.3% hemorrhages.

Statistics

The period before and after the claw trimming with all farms included were set to be period 1 and period 2, and the period have an significant effect with the p-value of 0.004 on the locomotion which proves that the claw trimming are affecting the cows locomotion ability.

Production farm 3

The observation period of milk yield before and after claw trimming were set as period 1 (date august 20 to august 27) and period 2 (date august 29 to September 5) and there were no significant effect of the periods on the milk production, rather the concentrate intake and the numbers of milking had a significant influence on the yield. The locomotion on this farm had no significant effect on the rough or concentrate intake or the numbers of milking.

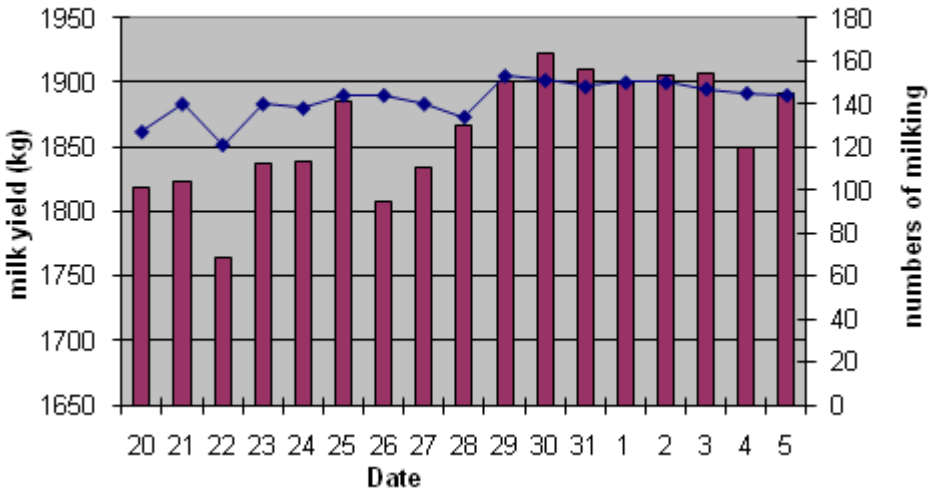

Figure 6. The claw trimmings influence on daily milk yield and numbers of milkings in the herd (n=55) with trimming occasion at the 28 th.

Even though the locomotion had no significant effect on milk yield, there was a tendency to this with the p-value of 0.1183 which also could be observed in Figure 6 were the yield seems to increase after the date of 28 when the trimming took place and a more even daily yield are achieved.

Risk factors during trimming

Many factors during the trimming process were observed to be a considerable risk of affecting the locomotion. As the claw trimming routine progressed during the day the floor in the waiting area, around the trimming chutes and the floor in the trimming chutes got severely contaminated with dung. This made the flooring slippery and the cows slipped and fall on their knees or stretch. The days after the claw trimming this was noticed by observations on swollen knees, which did not seem to affect the locomotion of these cows.

The cows were brought to the trimming chutes by the herdsmen, this was achieved by chasing them because they were loose and did not voluntary walk in to the trimming box. This way the cows ran around in circles until they were forced to enter the waiting gate or the trimming chutes, this could be a stressful situation especially when the number of cows left in the waiting area were few.

In the trimming chutes the cows limbs were to be attached, this was done by the herdsmen or helper. A rope were attached to the limb and then raised to a safe position, the risk moment was observed to be when the plate the claw is resting on during the trimming was put up. The plate was raised by hydraulic forces, and it was observed to be raised to high which made a steep angle of the joint and then adjusted to a correct posture. The following days after the trimming a swelling were observed at the joint, and especially at the front limbs.

The time used to get each cow trimmed could affect the locomotion in combination with the technique used by the claw trimmer. A fast claw trimmer could trim many cows per hour, but lesser time per cow or bad light opportunities could influence the assessment of the claws shape, length, thickness and possible lesion that could be left incorrectly treated and affects the locomotion.

Survey

The survey that was sent out to the farmers did not exceed the answer frequency that would make it reliable (35 answers of 137). From those who answered only three experienced that lame cows in relation to the claw trimming occasion were a problem and the most common number of trimmings a year were two times a year. Of those 35, 25 stated that they kept the cows in a tied barn system. None of them which answered the survey stated that trimming were perform only when needed and the most common tools in use were the cutting discs and hydraulic trimming chutes.

Discussion

Claw trimming and associated risk factors

Incidences at the claw trimming process that could affect the locomotion proved to be many. Some contributing factors are the trimmers technique and how many blades there are on the cutting disc that the claw trimmer uses. This affects the amount of claw trimmed and how the surface of the sole is achieved to distribute the pressure from the body weight. To get an effective distribution of the pressure the medial sole at the axial wall were dished out according to Manske et al., (2002), Andersson (1995), Carvalho et al. (2005), Van der Tol et al. (2004), Amstel et al. (2002) and Blowey (2002). The claw trimmers involved in this study expressed awareness of the type of flooring the cows were housed on because the wear are different in a free stall barn and in a tied stall. Due to the circumstances they estimated the wear and geared the amount of claw trimmed to this, which is supported by Manske(2002) and Nilsson et al. (1998). This awareness among the claw trimmers is valuable because a thin sole makes it more vulnerable to pressure and claw lesions (Manske et al., 2002; Amstel et al. 2002; Ouweltjes et al., 2009). If the claw horn is trimmed with too great marginal an overgrowth is expected if the time to next trimming is far away, this could increase the local pressures on the sole and cause claw lesions (Manske, 2002; Nilsson et al 1998). The claw lesions itself causes in many but not all cases disturbed locomotion, and an overgrowth claw causes a disturbed locomotion due to relive of the claw before the claw lesions develops.

Factors involved during the trimming in the trimming chutes could affect the locomotion. Almost all cows that entered the trimming chutes were running and a slippery floor increased the risk of falling both when entering and exiting. It was also observed that even if the situation was not stressful when handling the animals on the way to the chutes the animal seemed to find it exciting to leave the pen and raced and jumped, which could be a risk factor for lameness in the trimming process if slipping.

Mostly two limbs were strapped at a time, but sometimes three limbs were strapped, if those were not attached at the right strength the cows struggled and hit the trimming box with their knee or the joint against the holding mechanism. This occasionally caused wounds or swelling on the legs, were the wounds could be at risk for infection and the swelling could limit the flexing ability of the joint which can be observed as a rigid locomotion.

The hydraulic mechanism on the trimming chutes could be considered both as an advantage and disadvantage, the advantage is that the leg gets lifted up at a constant force to right position and the cow does not get the chance to struggle. The disadvantage could be considered when the chutes are not correctly set in the forces and the limbs gets lift up too strongly and a too strong pressure could be affecting the limb and cause lameness. The plates that are supporting the claw during the trimming are a greater risk when controlled by hydraulic forces and manually put to place, this was observed during the trimmings to be put up to high and caused a steep angle at the joint. Later this was observed as swelling at this joint on the same limb.

The trimmers used a cutting disc with three blades on, according to Lykke (2009) this kind of cutting disc demands skills because of the amount of horn trimmed per cut. In the case of this study the trimmers did not seem too trim the claws too much. Eriksson (2009) found cases of lameness connected to claw trimming appearing several weeks after the trimming..This was the first time the whole herd was trimmed at the same time. The cows affected with lameness were all affected with claw lesions. These claw lesions were both old that were not healed yet and lesions not found at the earlier trimming. When cows that were newly calved were brought up in the trimming box it was discovered that the sole was very thin, this is probably due to the great wear caused by long walking distances, a flooring of concrete and mastic asphalt combined with a wet pathway to and from the milking parlour. The mastic asphalt and concrete floors are known to cause a great wear on the sole (Telezhenko et al., 2008).

Flooring

The flooring conditions could affect the cow locomotion, in floorings with higher friction the cow strides increases and that locomotion is better on rubber floors than on concrete. (Flower et al., 2007) The flooring on the farms were dry and no cows were observed to slip, in contrary cows were observed to stand secure on three legs and lick their groin. One farm differed in flooring with concrete from the others that used a solid rubber mat which could have affected the observations. The cow locomotion was easier to observe on the concrete compared to the rubber mats, cows with the same claw lesion recorded seemed to move easier and faster on the farms with rubber flooring, this observation is supported by Flower et al., (2007) Telezhenko & Bergsten, (2005) Rushen & Passillé, (2006) and Ouweltjes et al., (2009). These differences in flooring could affect the observations in such a way that cows on the farm with a concrete flooring could be scored with to high locomotion scores.

Observer

The locomotion observations and scorings could also have been affected by the observer, by limited experience of observing cows posture and gait. The cows on the farms used in the study expressed mainly good locomotion, and this could have made the observer to finicky. If more farms had been observed with more animals' maybe an additional level in the locomotion scores should be added or some animals would be graded with a lower locomotion score, this because of, as mentioned above, the observer's experience. The locomotion scores set could differ on the cows from different observation days with normal locomotion almost the entire observations period and only one day scored with mild locomotion disturbance or moderate lame. This could be due to an incorrect observation, something that affected the cow on that day, or perhaps the cow express natural fluctuations in locomotion same as in milk production. The investigation of locomotion in this study are based on observations at one moment before the claw trimming and observations on each day five days after, maybe an longer observation period is needed before to strengthen the validity.

Locomotion scores

When observing the locomotion scores of primi- and multiparous cows and compares those with the recorded claw lesions, this is in many cases associated to each other. The lesions are recorded as mild or severe and in spite of that the primi- and multiparous cows suffered about the same amount of severe and mild type of lesions, except farm two where the primiparous had a higher level of severe lesions, the primpaorous cows locomotion recovers faster. It could be noticed during the observation period that older cows have an increased locomotion in general compared with the primiparous cows', this observation is supported by Bach et al (2006). The decreased locomotion and a slower recovery could be due to other factors located in the joints, if this could be an explanation it is possible that the slower recovery is due to that the joints are affected during the claw trimming process.

The locomotion scores during the different days on the different farms had the same pattern with an increase of locomotion scores a couple of days after the trimming and then decreases. At the end of the observation period the locomotion scores are lower than before the trimming and indicates that the trimming have an positive effect on cow locomotion, this is comport with the results of Manson & Leaver, (1988 (b)) and Manske et al. (2002 (a)).

On farm one and two the stall had large and open walking areas which made it easy to observe the cow locomotion, farm three had limited space for the cows to walk long distances because of the gate systems, instead the cows gathered in the feeding area and then often straight to the cubicle. The same was observed at the feeding area, cows considered lame with a score two or above had no problems finding an eating place at farm one and two, in the third farm the places were limited and the cows constantly got chased away and got to change place. Cows with higher locomotion scores were observed to choose a feeding place in close relation to the milking parlour after milking. The days in closest relation to the trimming it was observed that the cows that had any kind of affected locomotion spent much time in the cubicles either standing or lying and it took much effort to get them to leave the cubicle.

Milk production

The statistical analyses showed a tendency towards that the locomotion actually effects the milk yield, this was supported by the analyses of how the locomotion affects roughages and concentrate intake, this p-values were also a bit high in this study but with more data available this could be significant when logical a decreased locomotion makes it more difficult for the cows to get to the feed both in the aspect of moving towards this area and compete for a feeding place.

Survey

The answer frequency of the questionnaire was too low, it could be a result of farmers forgetting to answer because of the time of the year it was sent out, in this case probably in the middle of the spring work on the fields. The frequency could have improved by a remainder, but the resources for this kind of work were limited and to choose a better time of

the year. To get a greater variation of farmers in the country that uses different claw trimmers the group selected to answer the survey should have been made in a different way.

Conclusion

The claw trimming process have an significant impact on the cows locomotion and there exists many factors that could contribute to this, in many cases the cows are affected with an decreased locomotion that follows of treated claw lesions but in many cases of disturbed locomotion a lesion is not the factor. It remains to investigate how great impact the different factors that are involved in the trimming process have, like if the fall on slippery floors are the reason for this, how great impact the forces and construction of the trimming chutes have or how important the claw trimmers knowledge about trimming for different environments are. The behaviour of the cows is clearly affected of this problem and a tendency towards an affected milk yield is also evident.

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SWEDISH DAIRY ASSOCIATION

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Enkätstudie om hälta i samband med klövverkning

I ett pågående projekt som drivs av Svensk mjölk i samarbete med Sveriges Lantbruksuniversitet (SLU) undersöks om halta kor i samband med verkning är ett problem och i så fall hur vanligt. Syftet är att med hjälp av följande frågor få en uppfattning om, och i så fall vilka faktorer som inverkar på att kor blir halta och vad som kan göras för att minska problemet. Studien förutsätter att klövhälsa rapporteras och anslutning till kokontrollen.

Projektet har utarbetats tillsammans med din klövvårdare som vill säkerställa högsta möjliga kvalitet i sitt arbete med nöjda kunder. Din klövvårdare vill gärna ha feed back på sitt arbete och om det är problem försöka rätta till detta. En del av nedanstående frågor besvaras med hjälp av din klövvårdare.

Din medverkan är viktig och vi hoppas att du vill svara på följande frågor och registrera eventuell hälta hos korna innan verkning samt eventuell hälta som uppträder inom en vecka efter verkningstillfället. Enkäten skickas därefter in i bifogade svarskuvert tillsammans med klövhälsorapporten. Tack på förhand önskar Jeanette Back genom Svensk mjölk och SLU!

Jag godkänner att ni använder data från provmjölknings- och klövverknings tillfällen under

2009, för min besättning

SE nr …… ……..

Underskrift

1. Vilket inhysningssystem tillämpas för mjölkande kor? ……..
2. Hur ofta verkas normalt varje ko i besättningen per år (1ggr, 2, 3, vid behov)? …….

   Datum för senaste verkning?.....
3. Hur lång tid tar verkningen i effektiv tid ……. timmar, fördelat på …..dag/dagar.
4. Vilken typ av verkstol används? ……..
5. Vilka verktyg används ……Antal skär på klövfräs? ……
6. Hur förs kor till verkstol, lösa eller med grimma?……..……
7. Hur många personer hjälper till förutom klövvårdare? ……..
8. Används grindsystem under verkningen? ……
9. Upplever ni att det är stressigt i samband med verkning?……
10. Upplever ni att halta kor efter verkningen är ett problem

    Ja Ibland Nej

11. Beskriv rutinerna under verkningen nedan. Kan t ex de kor som ska verkas äta och ligga medan de väntar och efter verkningen, påverkas mjölkningen, mjölkningstider, utfodring etc? Vad är din uppfattning om varför problem kan uppstå?

……

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Följande protokoll är till hjälp för att ni lätt ska kunna registrera hälta innan och efter verkning. Bedöm hälta enligt klövhälsorapport (se också bifogad klövatlas i färg) så att:

En stel ko som står med rakrygg men som går med krökt = **/**

En halt ko som står och går med krökt rygg = X

KOID	Före	Dag 1	Dag 2	Dag 3	Dag 4	Dag 5	Dag 6	Dag 7	Dag ...