2015

CATTLE LAMENESS CONFERENCE

Organised by:

Topics are:

- A foot trimmers perspective
- The role of body condition
- Is trimming heifers feet beneficial?
- Complicated claw lesion treatment & care
- A veterinary practice’s approach

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Wednesday 22nd April 2015

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GENERAL INFORMATION

TIMETABLE of EVENTS

08:45	ARRIVE / REGISTRATION / COFFEE and POSTER DISPLAY	
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10.20	The role of body condition in lameness control	Jon Huxley University of Nottingham
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11:35	The influence of genetics on lameness	Marco Winters DairCo
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15.00	A veterinary practice's approach to reducing cattle lameness	Phil Alcock Bishopton Veterinary Group, UK
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CHAIRPERSON'S INTRODUCTION

Welcome to the 6th Cattle Lameness Conference.

We continue to strive to find you the best speakers with the most relevant (and latest) information. This is achievable only thanks to all our generous sponsors, a number of whom are first time supporters. This year our sponsors are DairyCo Research Partnership, the National Association of Cattle Foot Trimmers, Merial (UK), Hoofcount Automatic Footbaths, Progiene – dairy hygiene, Norbrook Laboratories (UK) Ltd, Quill Productions and Giltspur Scientific Ltd. Without the support of sponsors this conference would not be possible.

At this conference we will be exploring several major topics. Steve Paul will look at the development of the National Association of Cattle Foot Trimmers Association and what it means to a foot trimmer. Professor Jon Huxley is leading the research into cattle lameness at the University of Nottingham's School of Veterinary Medicine and Science and will explore the role of body condition in the control of lameness.

Following the coffee break Marco Winters, DairyCo Geneticist will look at the impact of genetics on foot lameness and the potential of a new breeding index which will improve claw health in the dairy herd. Taking the conference up to lunch there are two papers on the effects of foot trimming the feet of dairy heifers in early lactation and pre-calving, by Oliver Maxwell, School of Veterinary Medicine and Science, University of Nottingham and Sophie Mahendran, Royal Veterinary College, University of London, respectively.

After lunch Professor Alex Starke, Faculty of Veterinary Medicine, University Leipzig, will discuss the problem of complicated claw lesions in cattle, their diagnosis, treatment and post-surgical care. The conference will close with the practitioner's approach, which this year is delivered by Phil Alcock from Ripon, who is looking at the benefits of an holistic approach and working as a team.

In addition to the papers delivered by the expert panel of speakers, there are also a number of scientific posters. We encourage you to read the posters and discuss the findings with the presenting authors.

The organising committee have been encouraged by the increasing number of delegates from overseas. This is a trend we are keen to encourage.

Finally, thank you for attending and supporting the conference. I trust you will have an enjoyable and worthwhile day.

Brian Pocknee

Brian R Pocknee
Chairperson of the 2015 Cattle Lameness Conference, The Dairy Group
On behalf of the CLC Organising Committee

FURTHER INFORMATION

Organised by:

Royal Veterinary College
The Dairy Group
University of Nottingham

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www.cattlelamenessconference.org.uk

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PAPERS

Proceedings of the Cattle Lameness Conference (2015) Sixways, Worcester, pp 1 - 4
Royal Veterinary College, The Dairy Group and University of Nottingham

DEVELOPMENT OF THE NACFT – A FOOT TRIMMER'S PERSPECTIVE

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SUMMARY

This talk will cover a brief overview of Steve Paul's life as a trimmer and owner of Cowsfeet.co.uk. As a founding member of the NACFT (National Association of Cattle Foot Trimmers), Steve will cover the history and background of the association along with the hopes for its future. He will explain the NACFT-recognised qualifications along with explaining the famous Dutch Five Step Method and current alternative trimming methods that have entered the cattle foot trimming arena in the last few years.

THE NACFT

The National Association of Cattle Hoof Trimmers is the UK's representative body for professional hoof trimmers. The Association was founded 16 years ago initially as a get-together to share ideas and views. However, it soon became clear that it was necessary to have a national professional qualification that would help eradicate 'cowboy' trimmers to give farmers the assurance that their cows were in the best possible hands and to ensure the best possible herd foot health country-wide thereby:

- Increasing the credibility and professionalism within the industry, to encourage continuing professional development and to share best practice.
- Controlling lameness to benefit the health, welfare and productivity of all cows across the U.K.
- To give farmers (and vets) the comfort that cows across the country were being treated with the same high standard of professional knowledge and practicality.

The NACFT Committee started working with the RCVS to put into place standards that were acceptable and also an undertaking that foot trimmer trim, and they do not invade the body cavity at any time; that being purely an undertaking for vets.

Originally the only recognized qualification in the 1990s was the Dutch Diploma, so British trimmers looking to gain a qualification had to travel to Holland to train and take exams. The Dutch Method is based on what is seen in E.Toussant Raven ground-breaking book 'Cattle Footcare and Claw Trimming'. However in the last decade the Committee have worked with the NPTC (City & Guilds) to have their own British accreditation. The U.K. NPTC qualification is based entirely on the Dutch Method and both are recognized at Category 1 status within the NACFT.

However, in the last two years, other trimming methods have started appearing from the U.S. notably two; the Kansas and the Dairyland trimming method. There is also the U.K. vet Roger Blowey's White Line method.

Confused? It would be easy to see why, until you realize that all methods by and large are 90% the same principle with 10% variation, so it's not as radical as would first appear. It is also important to point out that all these methods have at their heart the best possible outcome for the cow's foot.

THE DUTCH METHOD – EXPLAINED

Functional trimming:

Step 1

Make the inner (medial) claw 7.5 cm long. Leave 5-7 mm thickness in the tip of the toe. Spare the height of the heel.

Step 2

Make the outer (lateral) claw equally long and the bearing surface equally high as the inner claw (if possible).

Step 3

Make a slope (model) in the soles

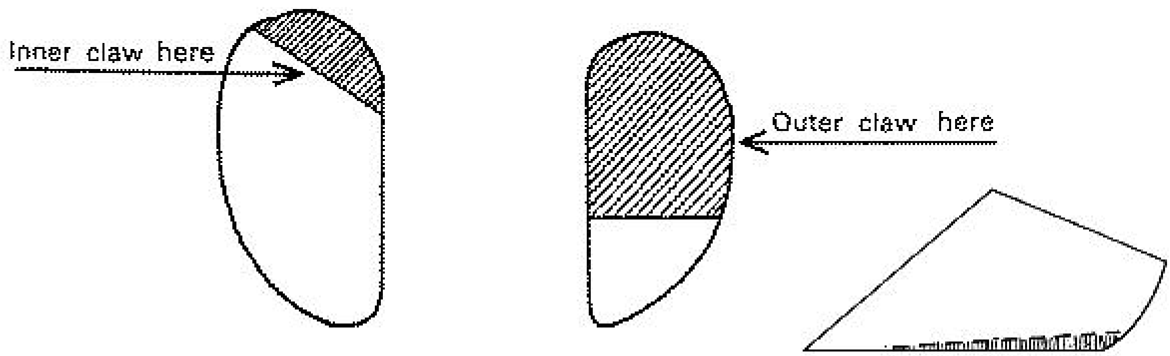
Curative trimming:

Step 4

If one of the claws is damaged (often the outer claw), lower this claw towards the heel 2/3 of the sole. The weight is now partly transferred to the sound claw. If lowering is not (sufficiently) possible, apply a block to the sound claw.

Step 5

Remove loose horn and trim down the hard ridges



OTHER TRIMMING METHODS AND HOW THEY DIFFER

The Kansas Method

Fig 1. Kansas method
Soles trimmed to normal gradient

Fig 2. Dutch method
Soles trimmed perpendicular to long axis of cannon bone

The White Line And Dairyland Method

The White Line and Dairyland Method and the differences and similarities to the Dutch Method will also be shown and discussed.

THE NACFT QUALIFICATIONS

Following the 10-11th April, 2015 NACFT AGM, there will be an update on the future of the NACFT and a breakdown and explanation of the route to becoming a fully licensed trimmer and CPD.

REFERENCES

For further information and sources:
www.nacft.co.uk
Kansas Method:
www.doctorjhoofcare.com/Images/The%20Kansas%20Trimmining%20Method.pdf

NOTES

Proceedings of the Cattle Lameness Conference (2015) Sixways, Worcester, pp 5 - 7
Royal Veterinary College, The Dairy Group and University of Nottingham

THE ROLE OF BODY CONDITION IN LAMENESS CONTROL

Jon N Huxley
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SUMMARY

The aetiopathogenesis of the claw horn lesions (sole haemorrhage, sole ulcer and white line disease) remains relatively poorly understood. Recent changes to our understanding of the structure and function of the claw suggest that the digital cushion, a pad of connective tissue and fat under the distal phalanx, may play a key role in protecting the foot against the development of claw horn lesion. Previous work has demonstrated that the thickness of the digital cushion is related to body condition i.e. it appears that fat is mobilized from the digital cushion during period of weight loss and visa versa. Three recently published studies from the UK all demonstrate that loss of body condition score precedes cows being identified or treated for lameness, suggesting that managing the rate and extent of body condition score loss may be a key lameness prevention strategy.

INTRODUCTION

The aetiopathogenesis of the claw horn lesions (principally sole haemorrhage, sole ulcer and white line disease) remains relatively poorly understood. Early descriptions of claw horn lesions in cattle suggested an aetiopathogenesis similar to that described for ‘laminitis’ in horses. In cattle, rumen acidosis (associated with the overfeeding of concentrates) was suggested to lead to inflammation and degradation of the laminae and eventually increased movement and sinkage of the distal phalanx within the hoof capsule. Movement of the distal phalanx led to compression of the dermis and the formation of the claw horn lesions. Whilst in cross sectional studies the claw horn lesions have been associated with high concentrate diets, causality cannot be attributed using this study design. At the same time, this theory has proved difficult to induce experimentally.

Whilst overall the ‘laminitis’ theory has yet to be completely disproven, other experimentally evidence has suggested an alternative aetiopathogenesis. Firstly Tarlton et al (2002) demonstrated a loss of supporting strength within the laminae around parturition i.e. the distal phalanx was more mobile during this period. Secondly the importance of the digital cushion, a support structure of connective tissue and fat under the distal phalanx, is increasingly being recognised. The digital cushion is a series of three parallel masses which run longitudinally beneath the distal phalanx and is thought to protect the more sensitive foot structures during foot strike and limb loading. The content of the cushion changes with age, starting with loose connective tissue in heifers before filling with fat in parities two and three (Räber et al 2004, Räber et al 2006). Finally a range of anatomical and biomechanical factors particularly related to the relative shape and size of the bony architecture in the distal limb, have been identified which contribute to / exacerbate other aspects of the aetiopathogenesis (Nuss, 2014). Whatever the initial cause of overload in the hoof capsule, the claw horn lesions result from damage to the tissues responsible for horn production, succinctly described by Nuss (2014) for sole ulcers: ‘Continuous displacement leads to compression of the sole corium, which in turn initiates the cascade of vascular compromise, ischemia caused by congestion, oedema and thrombosis, interrupted keratogenesis and finally sole ulcer’.

Interest in the digital cushion as a potentially important aspect of the aetiopathogenesis of claw horn lesions has increased since it was demonstrated that the thickness of the digital cushion was positively associated with body condition score at the time of examination i.e. thinner animals had thinner cushion and visa versa (Bicalho 2009). In the same study the prevalence of claw horn lesions was associated with the thickness of the cushion i.e. animals with thin cushions had a greater number of lesions. The work implied that thin cows had mobilised fat from the digital cushion during weight loss, resulting in compromised claw function and the development of claw horn lesions. However, as this study was cross sectional in nature, no direction to the relationship could be attributed i.e. alternatively lame cows with claw horn lesions could have lost body condition, resulting in thin digital cushions.

This work and work that has followed has attempted to address the question, ‘Do lame cows become thin, or thin cows become lame’. Undoubtedly lame cows become thin, a number of previous studies have demonstrated that lameness has a range of negative effects on feeding leading to lose of body condition (reviewed by Huxley 2013), however if thin cows become lame, body condition score management could be an important lameness prevention strategy.

RECENT UK STUDIES

Three separate UK field studies conducted by the author and colleagues have recently investigated the temporal relationship between body condition score change and lameness.

Study One (Green and others 2014)

This longitudinal study was conducted on data collected from a single, 600 cow UK herd over a 44 month period. Lesions diagnosed when animals were identified and treated for lameness was recorded. All animals were assessed for BCS at approximately 60 days intervals throughout the study period. Mixed effect binomial logistic regression models were used to investigate the association between BCS and treatment for lameness.

A BCS <2.5 was associated with an increased risk of being treated for lameness caused by sole haemorrhage, sole ulcer and white line disease in the following 0-2 and for sole ulcer and white line disease in the following 2-4 months i.e. a low body condition score preceded lameness treatment by a number of months.

Study Two (Lim and others 2015)

The second paper describes a longitudinal study conducted across four UK herds over an 18 month period. Animals were condition and mobility scored every 13-15 days by a single observer. In total 6889 observation from 731 cows were analysed in a multilevel multistate discrete time event history model to investigate the transition of lameness (assessed by mobility score) over time.

Animals with a low BCS at calving ≤ 2.25 had a higher probability of becoming lame, and if they were already lame, they were less likely to recover. Similarly, when the BCS at the current visit was compared to the BCS at calving, cows which had lost condition had a higher probability of becoming lame, and if they were already lame, they were less likely to recover. Interestingly the converse effect was also identified, an increase in BCS from calving was associated with a lower probability of becoming lame, and if they were already lame, they were more likely to recover

Study Three (Randall and others 2015)

The final study was conducted on a very rich dataset available from the SRUC Royal Crichton research dairy herd. Animals were condition and mobility scored every week.

Nearly 80,000 observations from 724 cows over an eight year period were available for analysis in mixed effect multinomial logistic regression models.

Low BCS three weeks prior to a repeat lameness event (i.e. not the animals first ever lameness event) was associate with a significantly increased risk of lameness. A BCS <2 was the greatest risk, BCS >2 led to a reducing risk. Animals with a low BCS 16 or 8 weeks prior to a first lifetime lameness event (i.e. the first time an animal was ever identified as lame) were at greater risk of lameness but only if their first lifetime lameness event occurred when they were in 2nd lactation or greater. Finally animals which lost body condition in the four weeks after calving were at greater risk of a future lameness event.

DISCUSSION

The studies described above have highlighted the importance of body condition score management as a tool for lameness control. Importantly, all three studies identified that change of body condition score preceded animals either being identified lame by mobility scoring or being treated for lameness, using robust multivariate statistical techniques. They suggest that managing body condition score at a herd level may lead to a reduction in the overall risk of lameness caused by the claw horn lesions. Further prospective studies are needed to test the impact of herd level BCS management on lameness to demonstrate that this is an effective and practical control strategy for use on farm.

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NOTES

Proceedings of the Cattle Lameness Conference (2015) Sixways, Worcester, pp 9 -12
Royal Veterinary College, The Dairy Group and University of Nottingham

THE INFLUENCE OF GENETICS ON LAMENESS

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SUMMARY

The contribution of genetic selection as part of a national breed improvement strategy is unquestionable and well established for a number of traits. But, despite significant and continuous gains in the feet and legs conformation traits, little progress has been made in reducing lameness levels on farm. However, merging of existing data sources has the potential to change that and provide us with a new breeding tool for future use. Research has shown that although heritabilities for claw health are low, significant genetic variation exist, which will make genetic improvement possible. It is believed that by collaboration of the various stakeholders and pooling of existing phenotypic and genomic data, a new genetic index can be developed to assist UK dairy farmers in the not too distant future.

INTRODUCTION

Genetics and breeding have an important role in controlling lameness levels in dairy cattle, and should be considered as part of an overall herd improvement strategy, alongside other important short-term herd management improvements. Changes made through breeding are permanent and cumulative and are therefore important for any long term improvement program targeted at reducing lameness levels.

The UK is already seeing the benefit of genetic selection for a reduction in SCC, as well as the selection for improved cow fertility, both of which are showing strong favorable genetic trends and corresponding phenotypic changes in national performance. These two examples highlight that genetic selection for fitness traits can pay off.

Including lameness as part of a broader breeding objective will enable gains to be made in several traits at once, giving the greatest overall benefit.

GENETICS OF FEET AND LEGS

The physical characteristics of feet and legs in dairy cattle are fairly heritable (10% to 20%), meaning that long term improvement can be made, simply by selecting superior bulls and cows to breed from. Moreover, genetic variance is sufficient to allow the ranking of animals allowing the ‘best’ to be easily identified and used for selection.

Breed societies and breeding companies acknowledge the value of good feet and leg conformation and routinely include them as traits in conformation assessments on cows. The traits which are collected by trained professionals and for which routine UK genetic evaluations are published, have all been internationally harmonised through the world breed federations and the International Committee for Animal Recording (ICAR) to ensure a consistent global approach. The resulting national genetic evaluations are included as part of the international genetic evaluation service (INTERBULL) to enable sharing of information between country populations.

These Feet and Legs related traits are;

1. Foot Angle (Shallow to Steep)
2. Rear Legs Side view (Straight to Sickled)
3. Locomotion (Poor to Excellent)
4. Overall Feet & Legs composite (Poor to Excellent)

Being able to measure and subsequently produce genetic information on feet, legs and locomotion traits, means we now have the ability to pick bulls which improve these traits as part of the overall breeding improvements within a herd. Monitoring of genetic trends for these traits has shown us that genetic change for Feet & Leg traits is favorable and continuing.

IMPORTANCE OF FEMALE SELECTION

Whereas bull selection is based on the assessment of the bull's transmitting abilities, selection of cows to breed from can take a slightly different approach, since most of these will not have genetic evaluations for the traits in question.

However, even selection on phenotypic performance, although less accurate, can have a meaningful contribution. We know that several genetic factors can influence lameness, such as poor overall conformation, abnormalities of feet, legs (skeletal structure), locomotion, increased risk for conditions such as arthritis, and even susceptibility to conditions such as sole ulcers. It is recommended that chronically-lame cows and those with a history of mobility problems, as well as those with poor feet and legs conformation - should ideally not be used to breed herd replacements from. A beef bull should be considered in those cases.

GENOMIC SELECTION

Since April 2012 the UK have published genomic evaluations for bulls and for females in April 2013. These genomic evaluations provide an assessment of the animals genetic breeding potential at an early age and are based on an assessment of the animals own DNA (for detailed information on genomic evaluation please read DairyCo's guide to genetic evaluations 'Breeding Briefs' at;
http://www.dairyco.org.uk/resources-library/technical-information/breeding-genetics/breeding-briefs/)

The ability to assess both bulls and heifers with the same degree of reliability now offers the potential to screen the female herd for not only production related traits, but also health and fitness traits, including evaluation for the four conformation traits listed earlier. Having an accurate assessment of the heifers' genetics for feet & legs to inform breeding and selection can meaningfully accelerate the genetic gains a herd is able to make.

GENETICS OF LAMENESS

Although accurate evaluations exist for feet and leg conformation as well as locomotion, we do not have (inter)national genetic evaluations for direct lameness or claw health traits at our disposal for bull selection yet. Therefore the selection taking place at present is indirect, and as such is suboptimal in reducing lameness levels.

Although lameness is a complex trait, several countries have conducted research on direct assessment of claw health data and have shown that although heritability levels are low (around 2 to 10% depending on trait and definition), significant genetic variation exists. This knowledge means that we can select and improve this trait directly, once data is assessed, stored and analysed on a national scale.

Several countries now produce national bull genetic evaluations for claw health including Scandinavia and The Netherlands.

The UK has also conducted several studies recently at Edinburgh University and SRUC (Onyiro et al. 2008, Prichard et al. 2013 and Rees et al. 2013). The three studies analysed herd book classification data on Digital Dermatitis, National claw health data recorded through milk recording organisations and professional foot trimmer data collected during routine foot trimming visits. The benefit of farmer recorded claw health data includes an increase in data volume, whereas detailed foot trimming data provide a greater degree of precision; both of which have pros and cons. All three studies however, demonstrated that it is feasible to establish national genetic evaluations, but lack of coordinated data pooling and analysing is currently preventing us from doing so.

CURRENT BULL SELECTION ADVICE

Farmers are advised to follow in particular the following four simple criteria and select for;

1. Above average Feet & Leg composite (>0)
2. Above average Locomotion (>0)
3. Low Angularity score (<0)

Although low Angularity (<0; or high Body Condition Score), may at first glance appear to be unrelated to claw health, several studies have indicated the importance of body condition score (Pritchard et al 2013, Lim et al 2015). This could either be related indirectly to ‘robustness’, metabolic related issues around loss or gain of condition score, or directly to the hoofs fat pad thickness.

Relative to the above conformation traits, selection for Foot Angle appears to contribute only a small amount although a slightly steeper Foot Angle is preferred (>0). Similarly, Rear Legs Side view selection should be targeted towards an intermediate optimum (= 0)

In addition to conformation several countries, including the UK, have demonstrated that the genetic index with the strongest correlation to lameness is the Lifespan index. This is maybe not surprising as bulls with a higher proportion of lame daughters will automatically result in poorer lifespan indexes as lameness is one of the main culling reasons in the UK. Therefore farmers are strongly advised to only use bulls with;

4. above average Lifespan (>0)

Since both feet and legs composite and lifespan, as well as other fitness related traits, are incorporated in the national selection index £PLI (Profitable Lifetime Index) the correlation between high £PLI and low lameness levels are also favorable. Therefore selection on high £PLI scores should always be considered as part of the breeding strategy since it will automatically improve legs and feet.

BULL SELECTION IN THE FUTURE

Efforts are ongoing to establish a coordinated effort to pool national data that already exists and stimulate more recording of claw health data.

Various stakeholders currently already hold valuable data. For example;

- Breed societies
    - Feet and leg conformation data
    - Digital dermatitis data
- Milk recording organisations
    - Claw health event recordings
    - Mobility scores
- Foot trimmers
    - Detailed claw health information
- Vets
    - Detailed claw treatment data

By collaboration and pooling all of the above datasets, it is expected that an accurate national genetic (and genomic) evaluation service could be set up. Through DairyCo's Breeding+ genetic evaluation service we would be interested to do so with the collaboration of the industry.

Pooling of data could not only provide valuable genetic information, but might also enhance national benchmarking statistics to monitor and inform herd management practices and will further stimulate recording in future.

CONCLUDING REMARKS

There has been relatively little improvement in lameness over the last 30 years due in part to the negative correlation with milk yield and in part to the absence of high volumes of high quality data. Lameness could and should be addressed by pooling nationally available data and the extensive use of the genetic and genomic evaluations produced therefrom. Wastage of cows in future will be unacceptable from a welfare, public perception and environmental impact viewpoint. The sooner the industry organizes itself to address these issues, the less likely a solution will be imposed on the industry by those who have less of an understanding of the issues involved.

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EVALUATION OF FOOT-TRIMMING IN EARLY LACTATION DAIRY HEIFERS

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SUMMARY

This paper describes a randomised controlled trial examining the effects of a fixed time, postcalving intervention in heifers with the Dutch 5 step foot trimming method on Holstein dairy heifers. The results of the trial will be discussed in the presentation.

INTRODUCTION

Lameness is a cause of significant production loss within the UK dairy industry (4, 1, 9) as well as a serious welfare concern with a prevalence of between 16% and 36% dependant on the study (10, 2). It is also an area of veterinary and animal science which has suffered from a lack of good quality peer reviewed evidence for some time (6) with much of the advice given by vets, foot trimmers and consultants coming predominantly from the grey literature and expert opinion.

Improvements in this situation have been seen in recent years with increasing research being undertaken at the highest levels into many aspects of lameness including pathophysiology of claw horn lesions and infectious lameness and the role of foot trimming with regards to both treating claw horn lesions and preventing them. There is however a lack of evidence surrounding the prevention of lesions in primiparous heifers despite evidence to suggest that they are at both an increased risk (3) and have an incompletely developed digital cushion (7). The evidence presented by Reader and others (2011) regarding the increased likelihood of subsequent lameness events even after successful treatment suggests that preventing lesions in heifers should be of the utmost priority to any producer to reduce lameness within a herd.

Despite its popularity as an intervention, either preventative or curative, the Dutch 5 step method of foot trimming as described by Toussaint-Raven (1989) has rarely been tested in randomised controlled trials. Two notable works have been subject to peer review; Manske and others (2002) demonstrated lower odds of claw horn lameness in animals trimmed and examined 6 months later, and Hernandez and others (2007) demonstrated that previous non-lame animals trimmed at 200 days post calving experienced a lameness incidence reduction of 7% points over the lactation however this difference was not found to be significant. Neither of these trials specifically reported the effects on primiparous heifers even though they were included in the trials.

A recent trial by Thomas and others (2015) found that, when trimming newly lame cows, using blocks and NSAIDS in addition to curative trimming resulted in a significantly increased likelihood of improved mobility over trimming alone however this trial was not designed to examine the effects of trimming alone as a treatment compared to no treatment; the 5 step trim was used as a positive control.

The aim of the present trial was to examine the effects on production and fertility of a one of, routine 4 foot trim at 50-80 days post-calving on primiparous dairy heifers.

MATERIALS AND METHODS

A negatively controlled randomised clinical trial was conducted to examine the effects of a one off, 4 foot trim at 50-80 post-calving on primiparous Holstein heifers. 8 farms were recruited to participate in the study across the England. The criteria for enrolment were; average herd 305 day adjusted yield >8500L, sufficient herd size to provide enough heifers for enrolment over the study period, monthly routine milk recording, not currently routinely trimming heifers post calving and willingness to participate in the study.

Farms were visited every 30 days between July 2013 and March 2014. Animals were randomly assigned to either treatment or control groups by drawing the numbers of heifers presented at each visit, out of a hat

The primary outcome was 305 day adjusted milk yield for the first lactation with the hypothesis that the intervention would affect the mean yield. The secondary outcome variable was 100 day in calf rate. Outcome variables were measured at an individual animal level.

At the visit the animals were individually mobility scored according to the method described by 12 (2003) prior to being put in the crush. Once in the crush the animals were body condition scored according to the Penn state University method (Ferguson et al. 1994). After this, animals assigned to the treatment group had a 4 foot functional trim, proceeding to a remedial trim where lesions were present, according to the Dutch 5 step method. Animals assigned to the control group were released from the crush with no further action. Any animals with infectious lameness (i.e. digital dermatitis) were treated with oxytetracyline spray (Engemycin Spray 3.84%TM, MSD Animal Health). No further treatments (e.g. blocks or NSAIDs) were administered.

Details of mobility score, body condition score and lesions found were recorded on standard data capture sheets and photographs were taken of all feet with lesions. All animals presented were enrolled provided they fell within the correct timeframe (50-80 days post calving). Farmers were blinded to treatment group and were requested not to undertake any further routine foot trimming until at least 150 day post calving however they should continue with their routine lameness surveillance and treatment protocols.

DATA ANALYSIS

Milk yields and fertility data were obtained from milk records and the data entered into a relational database (Access 2007, Microsoft corporation). Study randomisation was assessed by comparing treatment and control groups for days in milk at treatment, body condition score and mobility score. No significant differences were found between groups.

The primary outcome measure (305 day adjusted yield) was compared between groups using a two-sample T-test and secondary outcome measure (100 day in calf rate) was compared using a Chi-squared test.

Further associations were investigated using multivariate regression analysis with 2 models built:

Model 1 investigated associations between treatment intervention and 305 day yield, whilst accounting for potentially confounding associations between milk yield and body condition score, mobility score and herd.

Model 2 investigated associations between trimming and 100 day in calf rate, whilst accounting for confounding associations between reproduction and body condition score, mobility score, herd and yield.

RESULTS AND DISCUSSION

Claw horn lameness represents a serious welfare challenge for the dairy sector and a concerted, evidence based approach to tackling the problem is vital if, as an industry, we are to maintain welfare standards especially in the face of decreasing milk prices.

This is an area in need of further work to allow the industry to make appropriate evidence based decisions regarding treatment protocols. The benefits of routine foot trimming as a preventative regimen are yet to be fully described whilst its positive effects as a treatment modality are now being understood better thanks to rigorous randomized controlled trials undertaken in recent years. The role of prevention is particularly important in primiparous heifers due to their susceptibility to claw horn disease and the increased likelihood of subsequent lesions and repeated lifetime lameness events.

Results will be presented and discussed during the presentation.

This study has been submitted for publication to The Veterinary Record.

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Proceedings of the Cattle Lameness Conference (2015) Sixways, Worcester, pp 17 - 22
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THE EFFECT OF PRE-CALVING TRIMS ON SUBSEQUENT LAMENESS EPISODES IN DAIRY HEIFERS

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SUMMARY

Dairy heifers are an important cohort for producers, with the important measures of productivity and longevity being affected by lameness incidence (milk yield, fertility, culling). This study aimed to investigate the use of prophylactic foot trims for the prevention of lameness by the recruitment of 380 heifers across two different highly intensive farms. The effect of three different trimming regimes was evaluated, with the results indicating that pre-calving trimming may have a role to play in reducing heifer lameness.

INTRODUCTION

Cattle lameness is a major challenge in the dairy industry due to the knock-on consequences in reduced milk yield, fertility (Hernandez, et al., 2005) and an increased likelihood of culling (Sogstad, et al., 2007). Protection of the heifer cohorts has been identified as a key target for management as highlighted by the large deterioration in claw health during the first lactation (Capion et al, 2009), a high recurrence of foot lesions between lactations (Manske et al 2002 and Capion et al 2008), the impact of udder development and the weight of the foetus (Chapinal, et al., 2008), the lack of a fully developed digital cushion (Raber, et al., 2004) and the effect of a change in housing and nutrition.

The primary aim of the study was to assess both the independent and combined effects of routine foot trimming of heifers at three weeks pre-calving and 100 days post calving. We hypothesised that post-calving foot trims in heifers were too late in relation to the risk period for lameness development, with the prophylactic foot trims pre-calving theorised to achieve correct foot conformation and minimise the impact of the physiological changes around parturition. Currently there are only 2 papers assessing the use of prophylactic foot trims (Hernandez, et al., 2007; Manske, et al., 2001), but both of them demonstrate up to a 25% reduction in lameness incidence.

Three weeks pre-calving was chosen because this is the time when farmers commonly move their heifers onto the main unit to join the transition group. This allows the foot inspection to occur in conjunction with another management task, so minimising the disruption and excessive handling of the heifers.

100 days post-calving was chosen as it falls within the time frame described by some studies for the highest lameness incidence post-calving (Ettema et al (2006), Leonard et al (1996), Amory et al (2007)). Trimming before 100 days may be more appropriate if that was the only intervention being used in order to try and prevent lameness developing, but we hypothesise that a foot inspection before calving will reduce the development of claw horn lesions sufficiently to allow delay of the post-calving foot inspection until 100 days. The added benefit of this is that it reduced stress on the heifers at the time they are reaching peak yield as foot trimming itself has been shown to be a stress factor – increased standing times, reduced time to eat, increased cortisol level.

MATERIALS AND METHODS

Herd characteristics

The two herds used were located in Dorset, England, and were served by one veterinary practice, Synergy Farm Health.
The heifers were all homebred Holsteins, reared under the same management conditions which included time out at grass and time in sand bed cubicles.

At 3 weeks pre-calving the heifers were moved up to the main dairy into the transition group, who were housed in sand cubicles and were a mixture of multiparous cows and heifers. The herd was already on routine foot trims for cows at drying off and for treatment of cows.

Post-calving the heifers were moved into the milking herd on either one of two farms. Both farms were high yield zero grazing systems with sand cubicles, a rotary parlour with 3 times a day milking, and fed on a TMR ration. Farm 1 was an 800 cow high foot wear unit, and Farm 2 was a new build 1,500 cow very high foot wear unit, which was a short drive away from the calving shed.

Allocation to treatment group

At the start of the study information on individual heifer age, service date and any lameness events already experienced were collected from the farm. All heifers due to calve between November 2013 - 2014 were eligible for inclusion on the trial. A total of 380 heifers were recruited into the study. Heifers were matched on age and expected calving date into a group of four, with heifers then allocated to one of the four treatment groups via stratified randomisation as demonstrated by the diagram below:

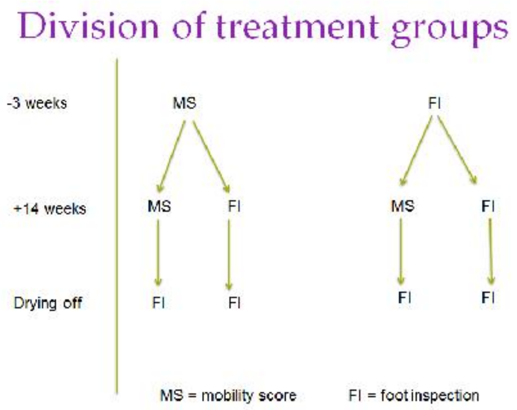

Figure 1: Diagram to illustrate the allocation of heifers into the 4 treatment groups. The times on the left hand side indicate the time of assessment compared to the time of calving.
MS = mobility score, FI = foot inspection

Foot trimming and mobility scoring

The pre-calving foot trimming was carried out by one professional foot trimmer (Dutch Diploma).

The mobility of all the milking heifers was assessed every 14 days throughout the study period following the using a modified version of the DairyCo mobility scoring system (mobility scores of 0,1,2a,2b,3a,3b). The mobility scoring was carried out by a single trained observer who was effectively blind to the treatment group of the heifers.

All heifers within the study had the dorsal wall length and toe angle measured, and assessment of front foot medial claw axial curvature at each intervention date. The dorsal wall length was measured using a steel ruler, and the toe angle was measured using a digital protractor.

PRELIMINARY RESULTS AND DISCUSSION

The overall heifer lameness incidence for both farms was high, with Farm 1 having a total incidence of 23%, and Farm 2 having an incidence of 49%. Although this is higher than had been expected before the trial (Leach et al., 1997, 26% incidence was demonstrated), it does reflect work carried out by Capion et al (2009), who demonstrated a rise in significant mobility score from a 25% prevalence pre-calving to 90% prevalence at 250 DIM.

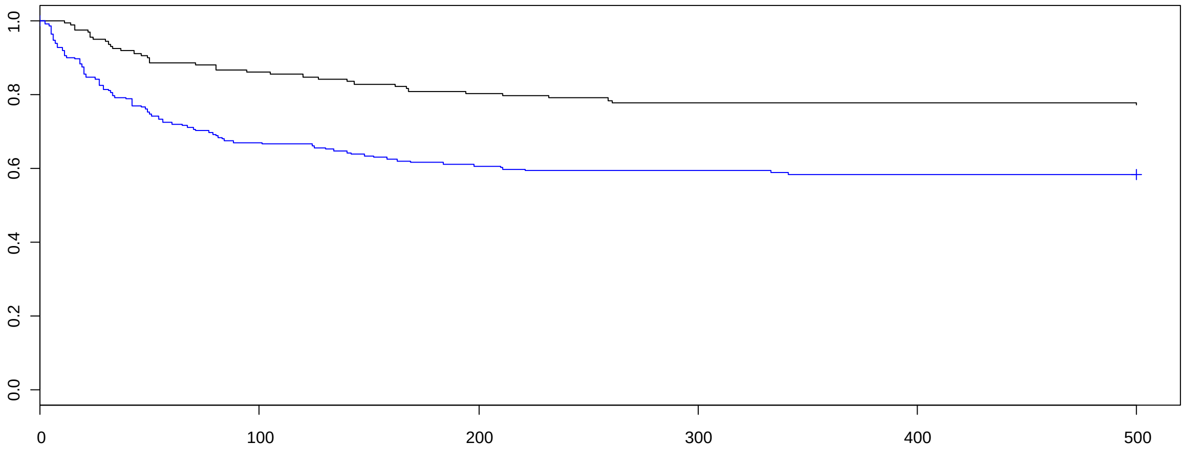

Figure 2: Survival analysis for lameness over 12 months on farm 1 (black line) and farm 2 (blue line). Significant difference $p<0.001$

The main theorised reason for the difference in lameness incidence between the two farms is that farm 2 is a new build, resulting in the exposure of heifers feet to newly laid concrete, leading to a very high wear scenario (especially as it is in conjunction with sand cubicles and 3 times a day milking. Heifers at farm 2 also experience added stress from the transport in a cattle trailer when they join the milking herd, along with entering larger group sizes (350 cows at farm 2 Vs 150 cows at farm 1) which may lead to bullying behaviours and associated reduced lying times (Proudfoot et al., 2009).

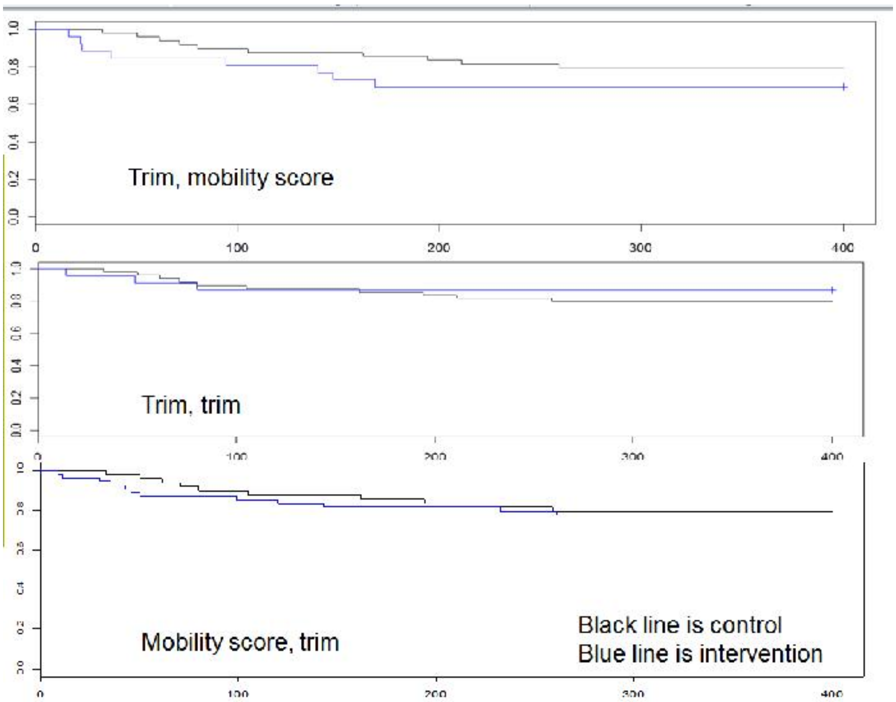

Figure 3: Survival analysis of each treatment group for lameness over 12 months on Farm 1.

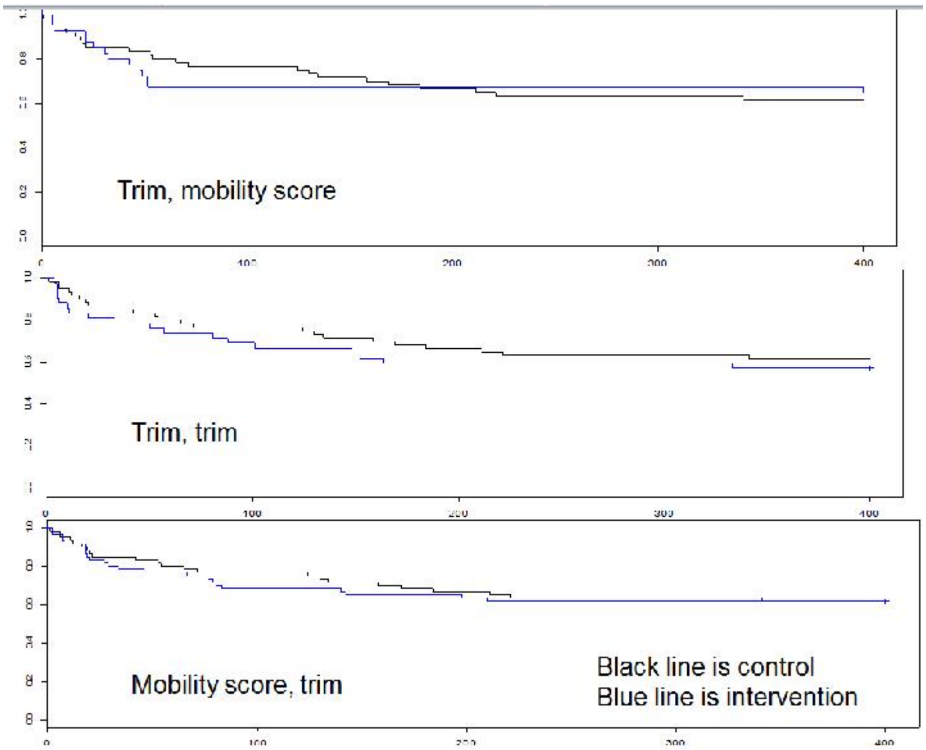

Figure 4: Survival analysis of each treatment group for lameness over 12 months on Farm 2.

Due to the confounding effect of farm location, the results were stratified for farm. On farm 1, there does appear to be a slight increase in the long term survival of the trim – trim group compared to the other treatment groups (not significant).
On farm 2 the results show a slight increase in long term survival of heifers in the trim – mobility score group (not significant). This suggest that over trimming on very high wear

units may be detrimental, with trimming both pre- and post-calving not being necessary as the pre-calving trim can provide and maintain good foot conformation throughout the lactation.

There does also appear to be some effect of seasonality on the results, with analysis split between the winter and summer periods indicating improved survival for the trim – mobility score and the trim - trim treatment groups on farm 1 in the summer period, but in none of the groups in the winter period. On Farm 2 there was improved long term survival for all the treatment groups in the winter period, but in none of the treatment groups during the summer period. The reasons for this pattern of lameness are not yet apparent.

Assessment of the mobility scores indicated that 90% of heifers with a mobility score of 2 or 3 also had repeat significant mobility scores at subsequent sessions. This is in agreement with findings from Leach et al (2012) who found that there was 63 days until treatment of lame cows on farm when left to a farmer’s discretion. Other reasons for this finding include a lack of response or a prolonged time to response of treatment, possibly due to the type of lesion being treated. On Farm 2, a large number of thin soles have been recorded, with these requiring extended periods to resolve due to a combination of continued high wear and slow horn growth. Other factors may be the bullying behaviour that may be effected by the mixed age groups, resulting heifers experiencing longer standing times and a reduced ability of foot lesions to heal (Proudfoot et al, 2009).

CONCLUSION

The data up to this stage in the trial has not provided any clear indications on whether the use of pre-calving trims both independently and in conjunction with 100 days post calving trims are beneficial or not. There do appear to be patterns emerging (effects of seasonality and foot wear patterns) that indicate pre-calving foot trims do increase survival times, but as yet the data is not statistically significant. However, the benefit of trimming does appear to be greatly affected by the type of unit that the heifers are housed on.
It may be that the benefit of the pre-calving heifer foot trims would be greater on units that have raised standing times and suboptimal cow comfort, due to the impact this has on claw horn lesion development i.e. units with overstocking, poor cubicle comfort, reduced feed space and extended milking group times.

The overall effect of this study is to demonstrate the need for individual farm assessment before the implementation of foot trimming regimes, as the extent and number of interventions required to obtain optimal heifer foot health is strongly associated with the level of wear experienced on the unit.

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ACKNOWLEDGEMENTS

Thanks go to Dr Nick Bell for supervising the project, to Dartington Cattle Trust for funding the project, to Synergy Farm Health and their foot trimmer Dave Phillips for the on-farm support and trimming, and to Karl Burgi for his technical advice.

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Proceedings of the Cattle Lameness Conference (2015) Sixways, Worcester, pp 23 - 25
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COMPLICATED CLAW LESIONS IN CATTLE – TREATMENT AND POST-SURGICAL CARE

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INTRODUCTION

The currently high prevalence of lame cows in high producing dairy farms can be traced back to individual animals that have been chronically lame for long periods. In cows with common claw disorders (e. g., sole ulcers, abscesses, white line disease (WLD), or interdigital necrosis) profound septic inflammatory and necrotic processes of the corium or laminar tissue can develop. These septic processes can spread to neighbouring structures like the flexor tendons and sheaths, podotrochlear bursa, distal and middle phalanges, distal sesamoid bone, and may result in septic arthritis of the distal interphalangeal joint (SADIJ). To some extent, affected animals are presented to the hoof trimmer more than once, before veterinary consult is taken. In most cases radical surgical treatment is necessary and treatment options include digital amputation (DAMP) or resection of the distal interphalangeal joint (JRES) to salvage the digit. Therapeutic approaches to defects of the dorsal wall of the claw horn as seen in complicated claw diseases are described below. Because of the insufficient treatment, these lesions are named as “non-healing” lesions.

Anaesthesia and pain management

Pre- and post-operative pain management is required for animal welfare reasons. Effective pain management is essential for all surgical procedures of the bovine digit. Furthermore it allows the surgeon to operate safely. Local anaesthesia is ideal for surgery of a digit. Intravenous (IV) regional anaesthesia can be easily performed. The tourniquet necessary for the latter has the further beneficial effect of controlling bleeding during surgery. Non-steroidal anti-inflammatory drugs (NSAIDs) are a good option because they have analgesic, anti-inflammatory and antipyretic properties. Administration of NSAIDs starting before surgery and lasting for 3 days improves the general demeanour of cattle after surgery of the digit. For longer surgical procedures or in case of uncooperative or nervous cattle, an alpha-2 agonist, such as xylazine, can be administered to relieve stress, keep the animal calm on the operating table and to provide a mild analgesic effect.

Treatment of complicated lesions of the pododerma

The first step of treatment of complicated claw lesions and the underlying principle of each surgical approach is the careful and complete resection of the lesion-surrounding horn. This provides excellent conditions for visual inspection of the infected pododerma. Subsequent rigorous surgical debridement of infected necrotic tissue is mandatory.

Resection of the distal interphalangeal joint (JRES)

JRES is a surgical technique to achieve ankylosis by extensive removal of septic altered cartilaginous, subchondral and deeper osseous tissues, including a thin layer of healthy bone. The approach may be plantar/palmar, dorsal, abaxial or axial, and depends on the location of the primary disorder or the location of a perforating wound involving the joint and cannot be chosen at random.

Plantar/palmar approach

A plantar/palmar approach for resection of the DIJ is used for septic arthritis of the DIJ with subchondral lysis of the bony part of the joint, which results from deep infection of the corium of the plantar/palmar sole and the plantar/palmar aspect of the claw wall. A longitudinal skin incision should be made at a point immediately distal to the dew claw and extended distally to the heel, ending in an oval incision around the tract of the penetrating claw defect. Then a piece of horn is removed, the DDF tendon is transected, the distal sesamoid bone removed and necrotic parts of the tuberculum flexorium resected. Using a drill with a bit diameter of 6–9 mm, a hole is drilled through the centre of the DIJ emerging at the dorsal claw surface immediately below the coronary band.
If it is suspected that infection has resulted in alteration of the digital flexor tendon sheath, the tendons and the tendon sheath should be thoroughly examined. In both surgical techniques, namely resection of the distal sesamoid bone and DIJ resection, opening of the flexor tendon sheath is not always mandatory.

Dorsal approach

The indications for resection of the DIJ using a dorsal approach include septic arthritis caused by a penetrating wound in the dorsal region. In addition to the dorsal approach, a second arthrotomy portal is created on the abaxial aspect. Cartilage, subchondral and necrotic bone are curetted and the joint should be lavaged via the approaches.

Abaxial and axial approaches

The indications for an abaxial or axial approach include septic arthritis of the DIJ caused by penetrating wounds or spread of infection, for example from WLD or interdigital phlegmon. Using this approach the plantar/palmar, retroarticular structures may not be involved. Starting at the primary lesion, the DIJ should be resected, and cartilage, subchondral and infected bone are removed with a curette, trephine or drill~~,~~ which emerges in the dorsoaxial or axial region to allow joint lavage and placement of a fenestrated drain.

Thorough resection of all necrotic soft tissue and bone is strictly required for a successful outcome. Independent from the approach, the portals stay open and can be used to lavage the joint post-operatively until the infection is under control. The wound must be thoroughly lavaged with 0.9% isotonic saline solution with or without diluted povidone–iodine (0.01–0.1%) during and after joint resection. Compared to digital amputation, DIJ resection does not allow complete exposure of the joint, which averts inspection of all the associated structures and constitutes a disadvantage. Although wide resection of abnormal tissues is likely to remove all infected tissue, this is not always the case.

Digital amputation (DAMP)

We perform DAMP as a disarticulation of the distal interphalangeal joint (DIJ) without skin closure and without preservation of the coronary band. The skin should be incised proximally to the coronary band and disarticulation carried out at the proximal interphalangeal joint (PIJ). The remaining diseased tissue and the joint cartilage of the distal surface of P1 are removed with a curette.

Post-operative care

The wound cavity is commonly covered with antibiotic or povidone–iodine ointments or powder and sterile gauze. In cases of lesions of the pododerma with the inert risk of a complicative digital dermatitis, the use of chlorotetracyclinehydrochloride-spray is recommended. To avoid post-surgical bleeding after removal of the tourniquet, a pressure bandage is applied. If and how often the bandages need to be changed will depend on the local inflammatory findings and progress of healing. In most cases we suggest an interval between 3 and 5 days. Following claw preserving methods such as JRES, a wooden or rubber block is fixed to the opposite healthy claw to ensure that the affected claw does not make contact with the ground. Since septic arthritis of the DIJ is commonly accompanied by a varying degree of phlegmon, we recommend parenteral administration of antibiotics for 3–5 days after JRES or DAMP.

CONCLUSIONS

The high prevalence of severe or long lasting lameness is not only a welfare issue, but currently also one of the major causes of culling in the dairy population. However, even severe claw disorders are not necessarily a reason for culling. There is clear evidence that even under field conditions, cows with such complicated claw disorders can have the same life expectancy as their unaffected herdmates when appropriate surgical treatment and aftercare is provided. The long-term success of DIJ resection or digital amputation in cattle will also rely on close observation for new claw diseases in the partner claws or claws of the contralateral limb. Frequent locomotion scoring is required and this can easily be done when the cow walks into and out of the milking parlour each day. This intensive daily (or weekly) monitoring for lameness and regular functional claw trimming every 3–4 months should be an integral part of long-term care for all dairy cattle as part of good dairy farming practice.

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Proceedings of the Cattle Lameness Conference (2015) Sixways, Worcester, pp 27 - 38
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DIFFERENT ASPECTS OF ENGAGING IN LAMENESS CONTROL IN PRACTICE

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SUMMARY

Farming is always changing and that those experiencing the present often feel that 'things are changing faster than ever'. Whether this is true or not it is for certain that dairy farming continues to change at a pace and even in the last 10 years average UK milk output per cow and average herd size have increased by approximately 20% and 30% respectively (Dairy Co Datum 2014).

Not only has the size and shape of farms altered but so have the roles and responsibilities of farm owners, workers as well as vets and other contractors.

Some of these changes have been described by others such as Sibley (2013) who outlines how the predominant presentations of lame cows have changed over recent decades and how vets now treat fewer lame cows, playing more of an advisory role while paraprofessionals and farmers now do most of the practical foot-trimming. These changes have provided opportunities for vets to use their skills in different ways to facilitate change at the herd level. There have been successes, a number of progressive farmers now demand a culture of 'zero tolerance on lameness' and back this up with a lameness prevalence of below 5%. A number of positive initiatives such as the Dairy Co healthy feet program support this.

However, lameness remains the biggest welfare challenge facing the UK dairy sector and while the opportunity for vets playing a leading role in prevention is clear the perception that vets have a diminishing role in practical foot trimming means that vets have moved from being seen as the authorities on the treatment of lame animals to an often peripheral part of the processes supporting foot care on many farms.

To be truly effective consultants in lameness control vets need to pay attention not only to their knowledge of herd health management but also the practical skills associated with foot trimming and lameness treatment. This paper is an anecdotal description of some of the ways that we are trying to achieve this in North Yorkshire.

ROUTES OF ENGAGEMENT

In order to maximise our involvement in improving lameness control we are trying to find as many different ways to engage with our farm clients. The principal ways in which we have increased our involvement in lameness control are:

- Providing a complete mobility monitoring and foot trimming service
- Farmer training
- Increasing vet enthusiasm and competence in foot trimming – 'referral & surgical trims'.
- Technology
- Herd health risk management – risk assessment and action plans through practice health schemes and Dairy Co healthy feet.

FOOT TRIMMING SERVICE

Providing a complete foot trimming service has had the greatest impact on our ability to engage in lameness control on a large number of farms. Being able to combine the veterinary health management input (through risk assessments and action plans both generically as well as through formats such as the Dairy Co health feet program), with taking responsibility for the routine foot care on a farm is a potentially powerful offer.

Whilst good working relationships and information sharing is eminently achievable between vets and foot-trimmers not working in the same business there are obviously opportunities to having responsibility for the whole process.

Having enhanced equipment and logistics – such as hydraulic foot trimming crushes, also provides an opportunity for vets with an interest in hoof care to work at a consistently higher and sometimes safer standard as well as enhancing the credibility of vets as having expertise in hoof care.

The economics of the foot-trimming business are such that, while there is a clear opportunity for a revenue stream to the veterinary practice, the costs are such that a significant part of this investment is about adding value to the clinical service and the satisfaction of being able to deliver hoof care in the way that we would like to.

There are clearly risks, the job done with lame cows be an emotive subject and there is risk associated with the reputation of the practice and liabilities in the event of a mistake made on an expensive cow. There are hazards associated with handling cattle as well as in the use of power tools and knives. The choice of foot-trimming crush and handling facilities are very important as well as providing clear guidelines for staff on safe working practices. Client education in this regard is also key if a sustainable service is to be delivered.

Staff retention is also a commonly cited risk, both in terms of continuity of service as well as in terms training people who could become tomorrow’s competition. It is essential that the job as a foot-trimmer within practice is clearly differentiated from the job of a lone trimmer and there will be people better suited to both ways of working. Our aim is to integrate foot-trimmers as members of the clinical team, to invest in interesting CPD opportunities, ensure back up and support as well as removing some of the risk associated with working alone. Ensuring that a culture of sustainable working patterns without pressure to maximise trimming throughput every day is also important, with an emphasis on quality rather than quantity.

Training of our paraprofessional colleagues needs to include not just technical competencies but aspects of communication, client service, managing difficult situations and safe working skills. We are increasingly investing in our vets in this way, it is important that we do it for the whole clinical team. The job can be highly rewarding but it can also be hard, physical and sometimes repetitious, job satisfaction is not necessarily a given.

Other roles for para-professionals in terms of mobility are also opportunities for us, we have two veterinary nurses working as farm animal ‘VetTechs’ mobility scoring and auditing processes such as footbath management, cow handling and lameness records, these are all ways in which we can add value. Our farm clients are prepared to pay for these services wherever they perceive a benefit. These revenue streams are primarily a cost covering exercise but we believe that there is an increasing opportunity for our business and our clients businesses to benefit from VetTech work.

EDUCATION

Growth in herd size raises a variety of issues which have an impact on the changing needs of skills development on farm.

1. Farm owners increasingly 'hands off' on many farms.
2. Increased use of contractors.
3. More farm staff potentially involved in foot trimming on many farms.
4. Use of power tools now common on farm.

Even on farms that are putting considerable effort and investment into foot care we see the same problems showing themselves:

With respect to functional trimming:

a) Over trimming of sound cows resulting in thin soles
b) Failure to preserve the heel height of the medial claw of the hind foot resulting in poor foot angle and imbalance between the claws.
c) Inadequate or non-existent alleviation of pressure at the sole ulcer site through step 3 of the Dutch method.

With respect to treating lame cows:

a) Under trimming of some claw lesions resulting in poor resolution and a significant population of chronic lame cows.
b) Failure to recognise or create a plan for 'non healing lesions'
c) Failure to execute step 4 of the Dutch method making optimum treatment of sole and wall ulceration more difficult.
d) Blocks applied incorrectly or not at all.
e) Failure to detect treat lame cows early. This is sometimes associated with poor detection / awareness / motivation but can also be the result of a disproportionate amount of time being spent on chronic lame cows which may be the result of (a).
f) Absence of a check back service. Many cows improve in their mobility transiently following treatment masking an unresolved lesion that could be cured if a check up was carried out.

The role of senior herd managers and farm owners has changed on many farms, as a result those ultimately responsible for the outcomes of foot trimming are often not hands on with the cows and as a result are not confident in their own skills and knowledge, whether or not they admit to this. This can result in a lack of awareness of 'what a good job looks like' and can make it very hard to breed a culture of improvement. We now offer 'advanced foot trimming courses' for senior herdspeople and business owners, to address this. Even those experienced in foot trimming need to keep abreast of newer conditions such as 'no healing claw lesions'.

Raising confidence and standards on farm through training has been a major aspect of activity for us in our practice and we will run at least six farmer foot trimming courses per year. Training farmers and farm workers from scratch in the Dutch method as well as running courses for experienced herdsmen and farmers where we try and improve technique and work on some of the common problems highlighted above.

We also provide training in the use of angle grinders for experienced herdsmen and farmers who have demonstrated a minimum level of competency in cattle foot trimming. Although there are potential risks associated with providing training with power tools we feel that they are now so widely used by operators who have had no training that we have a significant opportunity to help reduce the risk to operator and cows.

DEVELOPING SKILLS IN THE VET TEAM

In our practice - 10 years ago there would be a call to see a lame cow pretty much every single day. Today such calls are infrequent and this has implications for the ability of young farm animal vets to develop the competencies and confidence in foot trimming that they need in order to credibly engage in all aspects of lameness control. Even when a herd health emphasis is placed on the role vets are going to play routine hoof care and lame cow treatments are a key part of lameness management and the 'Skills assessment' forms part of the Dairy Co health feet program.

With prompt detection and treatment so important in terms of managing lameness across any herd, why are we as vets seeing fewer lame cows these days when we are on most of our dairy client's farms every week or every fortnight? For most herds members of the farm team have improved their skill level and do more themselves, for others an external contractor is used and commonly a combination of the two is in place. Much of this is positive but foot trimming competency is variable and some farms make cows wait for the foot trimmer even when the next visit might be three weeks away. There are certainly cows needing seeing - do we as vets want to see lame cows?

With chronic claw horn conditions present at varying prevalences across all of the herds we work with there is a need to form better action plans for such cows, many of which could be cured or significantly improved through better intervention. The emergence of 'non healing' lesions is perhaps the best example of this. Dealing with such cases properly usually requires anaesthesia and can easily take thirty minutes. It is not realistic, or in many cases appropriate for these cases to be treated adequately in the midst of a busy foot trimming session where thirty plus cows need to be trimmed.

Because many of these cases are effectively getting surgical treatment, knowledge of anatomy, pain relief, anaesthesia and haemostasis are required and so effective treatment is really in the sphere of the vet.

This combination of factors mean that unless vets are willing to skill up and offer cost effective ways to attend to these cows, as well as educating and encouraging farmers to present them, then many will remain inadequately treated, representing much of the chronic lameness in the UK herd.

Having an in house foot trimming service has provided the opportunity for a number of our vet team to spend time on foot trimming visits developing their skills. It has also made calling in to do a surgical trim at the end of a foot trimming visit more achievable. We also offer lame cow referrals at a similar rate to foot trimmer lame cow trim in order to try and break down barriers. Although we are not very busy in this regard, we have reversed the trend of seeing fewer lame cows year on year. The vet team is doing more trimming and we are saving cows and generating fee income in the afternoons as a result.

The kind of presentations that we ask to see:

- Any claw horn lesion that has been treated twice by the foot trimmer or herdsman
- All 'non heeling lesions'
- Wall ulcers
- Complicated sole ulcers
- Toe necrosis
- Deformed claws, corkscrew claws.

The majority of the 'non heeling lesions' are of the type being associated with digital dermatitis treponemes infection (Evans et al 2011). If we can prove the value of surgical trimming of such cases then this is an ideal opportunity to re-engage vets with practical aspects of foot trimming as well as reducing the need for digit amputation.

There is a lack of peer reviewed work on the best approach to claw horn conditions in cattle (Huxley et al 2014), (Maxwell et al (2015). Work at the University of Nottingham is seeking to establish something of an evidence base to move this subject forwards. Roger Blowey has shown how much can be achieved in the context of 'in practice' research and with so little published work in this area an opportunity for those interested in lameness to follow his lead is clear.

On one large dairy farm in our practice we have succeeded in re-engaging with practical foot trimming and making a noticeable difference to lameness severity and prevalence.

On this 900 cow Holstein herd an external para-professional carries out routine foot care every two weeks, cows are mobility scored weekly by a trained member of the farm staff and lame cows are attended to as soon as they are detected.

All conditions involving exposure of the corium are re-examined by myself as part of an initiative aimed at zero tolerance on chronic lame cows. Cows that do not immediately improve following initial herdsman / foot trimmer treatment are presented at the next weekly vet visit while cows that do respond well are presented four weeks later.

We treat chronic and 'non healing' lesions aggressively utilising IVRA and NSAID treatment.

In order to track the success of these interventions the majority of these cases have been photographed and shared using smart phones and the organisational app 'Evernote'.

This recording was not intended to support any published work and is only offered here as a retrospective, anecdotal, but relatively objective assessment of a reasonable number of cases from one large farm over a 12 month period. 16 cases fitted the case criteria which was:

- Wall ulceration present
- No deep digital sepsis, no parenteral antibiotics applied
- No concurrent causes of lameness.
- Some photographic evidence accompanying the case.

These cases were treated with surgical trimming which removed all traces of abnormal horn and corium. A number of cases involved resection to the depth of the pedal bone to achieve this.

Oxytetracylcline spray was administered and a bandage applied for 48 hrs to prevent haemorrhage.

A block was attached in some cases but in others it was not where step 4 of the 'Dutch method had alleviated pressure on the claw. In some cases blocks stayed on and were removed at 4 weeks, in other cases they were left on and in other cases they fell off. This was not recorded.

Cases were photographed using the file sharing application 'Evernote'. This allowed progress of cows to be monitored.

Clinical resolution in this case study is defined as the cow walking soundly, mobility score 0 or 1, no exposed corium or evidence of infection and a covering of horn over the lesion.

Of the 16 cows selected. 10 showed clinical resolution without the need for further trimming.

4 Required additional trimming to affect resolution but were ultimately cured following a maximum of three interventions.

2 cows were culled prior to re-assessment but we were advised not for lameness.

See appendix for examples of these cases and related conditions.

USING DATA AND TECHNOLOGY BETTER

We use the foot trimming software 'HerdKeeper' which involves ruggedized touch screen laptops to record all foot trimming and mobility scoring sessions. This automatically uploads all sessions onto a central database from where the data can be analysed by the team. We have not yet realised the full potential of this system yet.

With mobile phone technology making data sharing so much easier and with smart phones seemingly now ubiquitous amongst farmers and far staff we have found uses for other applications to support foot trimming work. This has already be touched on in the farm example above.

As already described on one large dairy farm we installed the app Evernote on mobile phones and farm office computer as well as on the vet's phone. Evernote allows notes to be made in a variety of formats including photographs, the images can be annotated easily and all files are synchronised through a central cloud based server such that all users can share the 'notes'.

We used this to photograph difficult lameness cases to try and achieve the following:

- Improve consistency of recording of lesions.
- To monitor healing and success of treatment.
- To empower staff to highlight the nature of problems that they were unsure of and to show what action had been taken.
- To support training by allowing discussion around cases without the need to have everyone cow-side at the time of a difficult case.

There are many similar picture sharing technologies that could be used in this way, Evernote is not unique and perhaps the concept may be incorporated into specific hoofcare software in the future.

Fig 1. Screen Shot From ‘Evernote’

CONCLUSION

With much work to do in improving the mobility and welfare of UK dairy cows there remain a multitude of opportunities for farm vets to engage at a number of levels.

Developing stronger working relationships with professional foot trimmers can be rewarding, as can the provision of para-professional trimming services in practice. Better data sharing can yield opportunities to assess current practices and drive a culture of continuous improvement.

Technology already exists which promotes better data capture and analysis. As well as free technologies which make sharing visual information with all those involved at the farm level relatively straightforward.

Re-engagement with the practical aspects of foot trimming is important. Aside from the variable quality of hoof care which inevitably exists the surgical treatment that recurring claw horn lesions may require is a clear role for the vet.

A high level of technical competence in foot trimming is also a pre-requisite to offering credible training. Playing an active role in skills development on farm ranges from providing grass roots training on lameness detection, foot trimming and treatment for dairy farm employees as well as supporting skills and awareness of those managing them.

With a dearth of peer reviewed data in this important area, there are opportunities for vets playing an active role in practical lameness control on farms to contribute more to building the evidence base behind treatment strategies for lame cows.

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SURGICAL TRIMMING PRE AND POST TREATMENT
- Subjective assessment of treatment success.

COW 1803

Wall Ulcer 25/03/14

Before Treatment - Above

Immediately after Treatment

COW 419	
Dorsal Wall Ulcer 18/03/14	Approx 12 Weeks Post Treatment

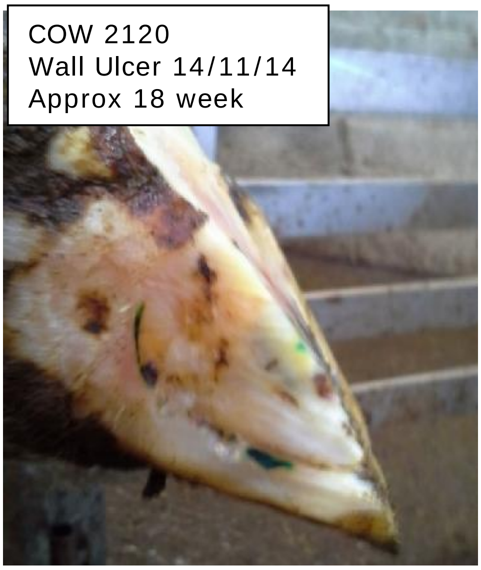
COW 2817	
Dorsal Wall Ulcer 22/12/14	Approx 8 Weeks Post Treatment

OTHER FOLLOW UP EXAMINATIONS FOLLOWING SURGICAL TRIMMING

COW 132
Wall Ulcer 20/11/14
Approx 17 weeks

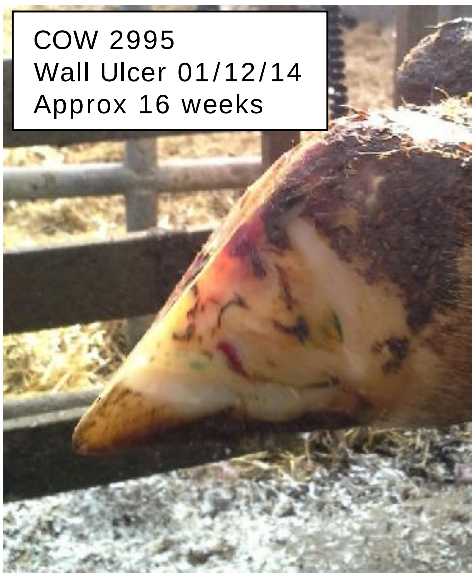
COW 1894
Wall Ulcer 27/11/14
Approx 16 weeks

COW 2120
Wall Ulcer 14/11/14
Approx 18 week



COW 234
Wall Ulcer 20/11/14
Approx 17 weeks

COW 2467
Toe ulceration 09/12/14
Approx 14 weeks



COW 2995
Wall Ulcer 01/12/14
Approx 16 weeks

COW 2597
Wall Ulcer 13/11/14
Approx 17 weeks

COW 610
Wall Ulcer 29/01/15
Approx 4 weeks & 8 Weeks

COW 2664
Wall Ulcer 25/10/14
Approx 22 weeks

COW 2853
Wall Ulcer 15/03/14
Approx 52 weeks

NOTES

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Proceedings of the Cattle Lameness Conference (2015) Sixways, Worcester, pp 39 -40
Royal Veterinary College, The Dairy Group and University of Nottingham

Analysis of using a wireless acceleration sensor in order to detect a lameness dairy cattle

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ABSTRACT

The lame of dairy cows have been evaluated subjectively and experientially in the large animal clinical field. There are few data that may be used to compare with the lameness score (LS) and objectively the severity of lameness. In the present study, a wireless three-dimensional (X, Y and Z axis) acceleration sensor was applied for assessment of lameness in a dairy cow. Averaged total acceleration activities of lame cows were significantly increased more than those of normal cows during walking ($p<0.01$). The distribution of scalar histograms recorded from the acceleration sensors were completely different among normal, LS2, LS3 and LS4 during walking.

BACKGROUND

Lameness impacts herd management in economic losses and productive longevity. There is no consensus among clinical veterinarians on how slight and medium cases of lameness should be diagnosed. An easy-to-use, objective method of diagnosing lameness in dairy cows is required. In this study, a wireless three dimensional acceleration sensor was used to detect gait in lame dairy cows. We were compared between Lame Score and the value of acceleration during walking in dairy cattle.

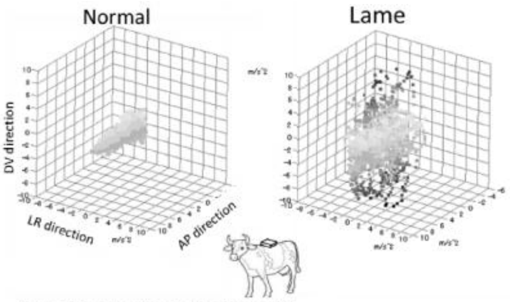

Figure 1. 3D-trajectory of acceleration data recorded from normal and lame cows were shown.

METHOD

20 normal and 28 lame Holstein cows, which were kept in three free-stall barns within the jurisdiction of the NOSAI Hyogo Veterinary Clinical Hospital and Experimental Farm of Iwate University, were used. The wireless acceleration sensors (38 x 38 x 12 mm) were fixed on the dorsal side of thoracic vertebrae (T12) and the commercial collar using double-faced adhesive tape. All cows walked voluntarily on a straight pathway for 10 sec. The sampling frequency of the sensor was set to 200 Hz and the length of a stored data set was fixed at 1024 points. The 3-dimension trajectory analysis was used to visualize gait in order to discriminate between normal and abnormal movement during walking (Fig.1). The scalar data of walking were calculated from 3-axis acceleration data. In order to compare the acceleration data and lameness score, histograms of the scalar were

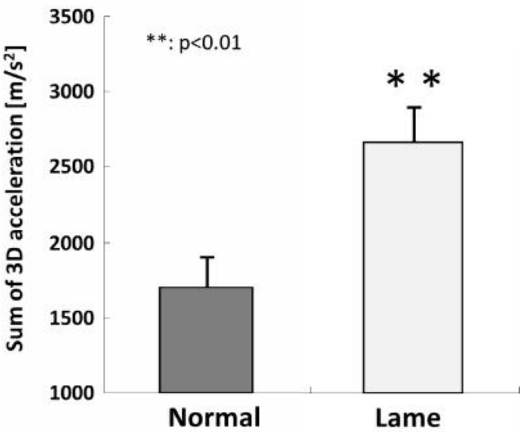

Figure 2. Acceleration values of Normal and Lame cows

estimated. Lame scoring of each cattle was detected by more than three experienced clinical veterinarians. The averaged scalar values of normal and lame on this difference were used by ANOVA. The distribution of histograms were compared by using unbiased variance value. This study was approved by the Animal Research Committee of the Faculty of Agriculture, Iwate University, Japan. Experiments were conducted according to the Iwate University Guidelines for Animal Experimentation.

RESULTS

The averaged scalar value of lame cows was significantly increased compared to normal cows (Fig.2, ANOVA: $p < 0.01$). In cases accompanied by remarkable pain, such as papillomatous digital dermatitis (PDD), the waveform of acceleration displayed a spindle wave on the diseased side. It was revealed that the 3-dimensional trajectory of a normal cow showed an elliptical or circular trajectory. On the other hand, the 3-dimensional trajectory of lame cows showed not only irregular movement, but also a spindle wave on the diseased-leg side (Fig.1). The distribution of scalar histograms recorded from the acceleration sensor were completely different among normal, LS2, LS3 and LS4 during walking (Fig.3). It is remarkable that the large components of scalar were increased in LS3 and LS4.

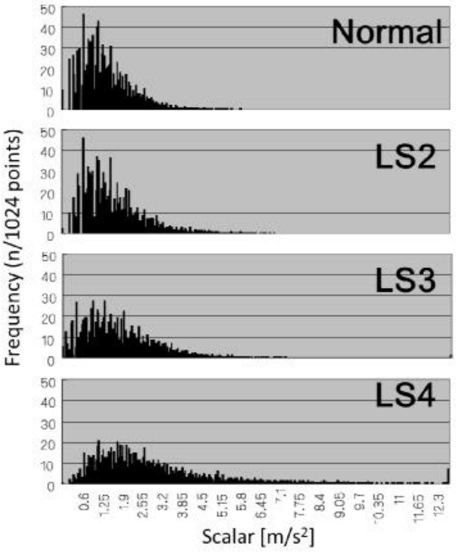

Figure 3. The distribution of scalar histograms recorded from the acceleration sensor in Normal, LS2, LS3 and LS4 cows.

DISCUSSION AND CONCLUSION

The present study using acceleration monitoring for gait analysis of dairy cows obtained the same results as clinical examinations. This acceleration sensor data suggested that it will be automatically discriminated between the normal and lame cow's walking. Furthermore, the distribution of scalar histogram will adapt to lame scoring. This application will be suitable for detection of diseased legs and other parts, prognosis judgement for locomotor disability after medical treatment, development and assessment of new cures, and evaluation of lameness scores.

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ACKNOWLEDGEMENTS

This study supported by Council for Science, Technology and Innovation (CSTI), Cross-ministerial Strategic Innovation Promotion Program (SIP), "Technologies for creating next-generation agriculture, forestry and fisheries" (funding agency: Bio-oriented Technology Research Advancement Institution, NARO).

Proceedings of the Cattle Lameness Conference (2015) Sixways, Worcester, pp 41 -43
Royal Veterinary College, The Dairy Group and University of Nottingham

THE USE OF LOCAL POSITIONING TECHNOLOGY TO ASSESS THE FEEDING BEHAVIOUR OF LAME AND NON-LAME DAIRY COWS

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SUMMARY

The position and activity of 10 lame and 9 non-lame dairy cows were recorded using novel local positioning sensors mounted on the neck of the cow. Decision tree algorithms were developed to infer feeding behaviour from the raw positional and acceleration data. Overall daily feeding duration was significantly lower for lame cows than for non-lame cows. Feeding duration in the morning and afternoon were also significantly lower for lame cows but no difference in feeding duration was found at night.

INTRODUCTION

Prompt treatment of dairy cows reduces severity and duration of lameness cases (Leach et al, 2012) however this relies on a reliable and affordable automated method of identifying lame cows early. Changes in behaviour often precede clinical signs of disease and may therefore be useful predictors of disease. Previous work has shown that lame cows are delayed in getting up to feed after feed deliveries or 'push up' (Blackie et al 2011); cows eat fewer, larger meals more quickly with increasing lameness scores (Palmer et al., 2012) and that these changes are detectable seven days before diagnosis (González et al., 2008). This study aims to use novel real-time location sensor technologies to measure both the location and activity levels of dairy cows to identify other potential behaviour signals which may be used for automatic early detection of lameness.

MATERIALS AND METHODS

Twenty cows from a group of 120 high-yielding cows on a commercial dairy farm were fitted with neck mounted OMS500 local positioning sensors (Omnisense®). Cows were milked three times a day (05:00, 13:00, 21:00) housed in cubicles and fed a TMR. Fresh food was provided every morning on return from milking and pushed up at 11:00, 13:00, 17:00, 20:00 and 00:00. All cows in the high yield group were locomotion scored using the DairyCo Mobility Score and 10 non-lame (score 0) and 10 lame (score 2) cows were selected, balanced for yield, DIM and parity. Cows which had had another health incident in the previous three months were excluded. At the end of data collection period the cows were trimmed using the Dutch 5-step method to confirm lameness diagnosis.

The sensors recorded 3D-acceleration and position data every eight seconds for five days. The raw data were smoothed over a rolling two minute window. A decision tree algorithm was then produced in order to transform accelerometer and positional data into a series of feeding and non-feeding activity bouts. A cow was considered to be feeding where the mean acceleration was greater than 2.3 activity units and greater than 70% of position readings were within the area defined as the feeding zone. A total of 11 cow days (from 6 individuals including full data from one non-lame animal) were excluded from the analysis due to incomplete sensor data. Feeding activity of lame and non-lame cows was compared using a t-test (Genstat v.17).

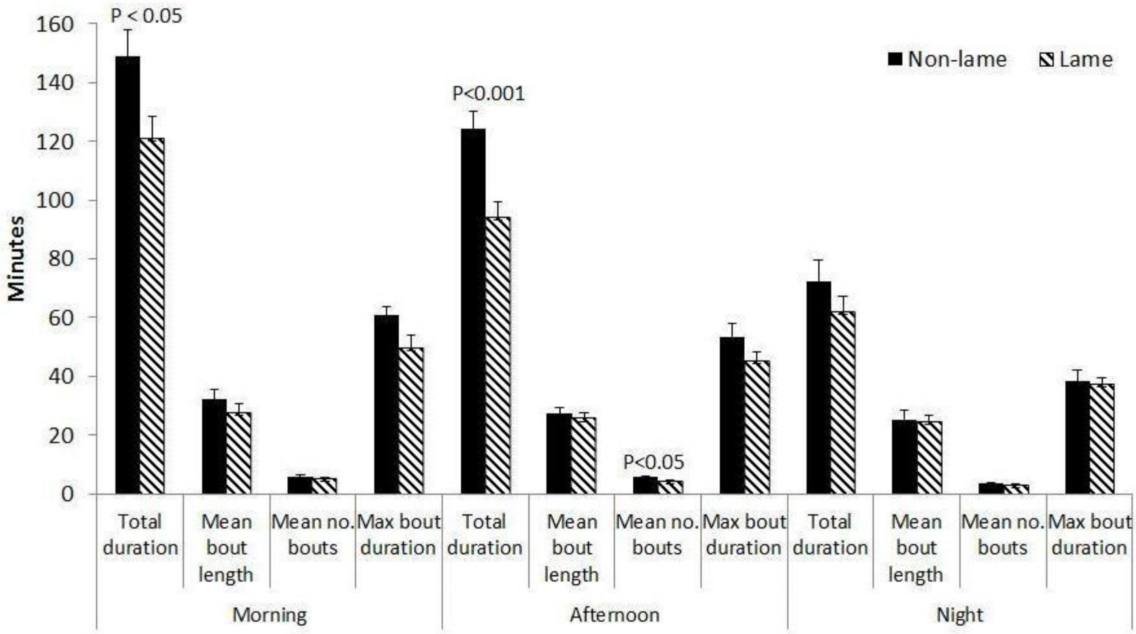
RESULTS

Mean parity number, DIM and 305 day yield were 2.7, 139d and 11,341l for non-lame cows and 4.0, 113d and 11,813l for lame cows. The total daily feeding duration and the duration of the longest feeding bout were lower for lame cows than for non-lame cows (table 1). Feeding behaviour varied during the day with total feeding duration being highest in the morning and lowest at night. Total feeding times were significantly lower for lame cows in the morning and afternoon but there were no differences at night for any of the feeding variables (figure 1).

Table 1 Feeding behaviour of lame and non-lame cows while housed in a cubicle shed (significance calculated using a t-test)

Mean (±SEM)	Non-Lame	Lame	Significance
Total duration per day (min)	345 (±16.5)	277 (±11.3)	P<0.01
Mean bout duration (min)	25.8 (±1.79)	24.1 (±1.81)	NS
Mean no. bouts per day	15.0 (±0.77)	12.7 (±0.97)	P=0.066
Max bout duration per day (min)	70.7 (±3.07)	58.6 (±3.58)	P<0.05

Figure 1 Feeding behaviour of lame and non-lame cows during the morning (6am-1pm), afternoon (2pm-9pm) and night (10pm-5am) while housed in a cubicle shed



DISCUSSION

The reduction in time spent in 'feeding activity' by lame cows in this study, as determined by an algorithm using position and activity, agrees with previous studies of feeding behaviour carried out using automatic feeders (Palmer et al. 2012; González et al. 2008). As the data from the sensors can be collected in real time, with the development of suitable algorithms, it may be possible to monitor changes in feeding behaviour and therefore identify the onset of lameness early. The changes in feeding behaviour during the day should be taken into account when developing predictive models as the difference between lame and non-lame cows were not present overnight.

CONCLUSION

The measurement of feeding behaviour is possible using sensor generated position and acceleration data and provides an opportunity to develop algorithms to enable early disease detection.

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Proceedings of the Cattle Lameness Conference (2015) Sixways, Worcester, pp 45 - 47
Royal Veterinary College, The Dairy Group and University of Nottingham

LOW BODY CONDITION PREDISPOSES CATTLE TO LAMENESS

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ABSTRACT

Detailed herd records, including weekly locomotion scores (LS), were collected from one UK dairy herd over an 8 year period and used to investigate the hypothesis that low body condition score (BCS) is associated with an increased risk of lameness (first lameness events and repeated lameness events). The effects of other cow level factors, including body weight (BW), were also investigated. Low BCS 3 weeks prior to a repeated lameness event was associated with a significantly increased risk of lameness. Low BCS 16 or 8 weeks prior to a first mild or severe lifetime lameness respectively, was associated with an increased risk in 2nd lactation and greater cows, supporting the hypothesis that low BCS predisposes cattle to lameness. Low BW (independent of BCS) was also found to be associated with an increased risk of long term repeated lameness events. The findings of this study provide evidence to support targeting management towards maintaining BCS in order to minimise the risk of lameness.

BACKGROUND

The impacts of lameness on herd performance have been widely reported; including, milk yield losses (Green et al., 2002), increased culling (Booth et al., 2004) and impaired reproductive performance (Garbarino et al., 2004). A number of cow level risk factors have been associated with lameness. Higher yielding cows are more likely to become lame compared with cows that are never lame (Green et al., 2002; Archer et al., 2010). Low BCS has also been demonstrated to be a risk factor for lameness (Green et al., 2014). Green et al. (2014) reported that cows with low BCS ≤ 2 (on a scale of 0 to 5) are more likely to be treated for lameness (all causes, sole ulcer and white line disease) in the 2 or > 2 to 4 months following such a score. This finding supports the hypothesis that low BCS is associated with an increased risk of lameness caused by claw horn lesions, possibly due to a decrease in the digital cushion thickness which has been correlated with BCS loss (Bicalho et al., 2009). The aim of this study was to investigate the association between BCS and mild or severe lameness for both repeated as well as first lifetime lameness events. The work described here is based on a paper published in the Journal of Dairy Science (Randall et al., In press).

MATERIALS & METHODS

Records were obtained from a total of 724 cows, managed at the Scotland's Rural College's (SRUC) Crichton Royal research farm, for the period 1st Sept 2003 to 31st Aug 2011. Locomotion scores (1 to 5 scale) and BCS (0 to 5 scale with 0.25 increments) were collected weekly. BW was recorded automatically after milking 3 times daily. Cows were categorised as not lame (LS 1 to 2), mildly lame (LS 3) or severely lame (LS 4 to 5) as the lameness outcome. Mixed effect hierarchical models were used to explore the relationship between explanatory variables and lameness outcome. BCS, BW and milk yield data was lagged by 2 to 16 weeks to explore their longitudinal association with the outcome. Modelling was conducted in 2 stages;

1. Multinomial model for repeated lameness events; to explore the relationship between explanatory variables and long term repeated lameness events
2. Discrete time survival models for first lameness events in a)heifers and b)2nd lactation and greater cows; to investigate the relationship between BCS and

lameness, without the confounding effect of a previous lame event causing BCS loss

RESULTS

The proportion of lame (mild and severe) observations in each lagged BCS category had a trend of decreasing percentage of lame events from BCS < 2 to BCS >3, with BCS 2.5 having the lowest percentage (Fig 1)

1. Repeated lameness events model; The median BCS was 2.25 and mean (± SD) BW was 619.5 (± 80.5) kg. Cows with BCS < 2 (3 to 16 weeks prior to the lameness event) were at significantly greater risk of lameness compared with other BCS categories. Risk decreased as BCS increased. Low BW cows (<550kg category) were at significantly increased risk of mild or severe repeated lameness events compared with cows in heavier BW categories (550 – 700 and >700kg)
2. First lameness event models; a) Heifers; BCS and BW were not associated with increased risk of lameness. b) ≥2nd lactation cows; BCS ≥2.5 16 weeks prior to a first mild lameness event were at reduced risk of lameness compared with BCS <2. The same effect was seen at BCS = 2.25 8 weeks prior to a first severe lameness event

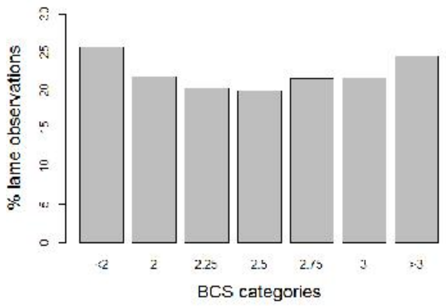

Figure 1 % lame observations; BCS 8 weeks previously

DISCUSSION

These findings indicate that a BCS < 2 is associated with the greatest risk of mild or severe lameness in dairy cows, and that the risk of lameness decreases with increased BCS. The results suggest that maintaining BCS ≥ 2.5 may be optimal for reducing the risk of lameness in dairy cows. This study also provides evidence for low BW being an important risk factor for lifetime risk of repeated mild or severe lameness events in dairy cows.

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ACKNOWLEDGEMENTS
This work was supported by an Industrial CASE studentship. Funding from the Biotechnology and Biological Sciences Research Council (BBSRC) and Boehringer Ingelheim is gratefully acknowledged. We also acknowledge staff at the SRUC Dairy Research and Innovation Centre, specifically, Ainsley Bagnall, Maggie March and Dave Roberts for access to and collection of the data.

Proceedings of the Cattle Lameness Conference (2015) Sixways, Worcester, pp 49 - 50
Royal Veterinary College, The Dairy Group and University of Nottingham

THE DIGITAL CUSHION STORY: HOW DOES BODY CONDITIONS LOSS LEAD TO CLAW HORN LESIONS?

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ABSTRACT

The digital cushion is thought to be important in the formation of claw horn lesions, yet its exact role is unclear. A longitudinal cohort study investigating how the digital cushion changes within cows in relation to body condition, with lameness and lesions being recorded throughout, is nearing completion. Background and methodology are presented, and data collection will be complete shortly for analysis in June 2015.

BACKGROUND

Lameness is one of the most significant diseases in the dairy industry in terms of prevalence, production and welfare. Claw horn lesions (CHLs), such as sole ulcers and white line disease, incur great economic losses (Wilshire and Bell 2009). Since a lameness event increases a cow's risk of lameness later in life, avoiding lameness initially is key to preventing cows from developing recurring lameness. Despite various popular beliefs of how these diseases develop, their pathogenesis is not fully understood, making targeted prevention difficult.

Loss of body condition is an important risk factor for lameness (Green and others 2014; Hoedemaker and others 2009; Lim and others 2015; Randall and others 2014), yet it is not understood why. The flexor tuberosity of the pedal bone sits deep to the 'typical sole ulcer site'. The subcutis in this area is a highly collagenous structure with large depots of fat (predominantly mono-unsaturated fatty acids), and is termed the 'digital cushion'. The digital cushion appears to be modified well to protect the dermis and epidermis from the downward force of the flexor tuberosity, as described by Raber and others (2006).

Thickness of the digital cushion can be assessed using ultrasonography. A cross sectional study of cows at various stages of lactation suggested that the digital cushion is thinner in cows with lower body condition scores (Bicalho and others 2009), and that these cows were at higher risk of CHLs. Much remains unexplained surrounding the loss of body condition and fat from the digital cushion, in relation to the onset of CHLs and lameness. The current study examines whether the digital cushion becomes thinner as a cow loses condition, and explores whether this could be a mechanism for the onset of CHLs.

METHOD

186 cows on two high yielding robotic milking farms were repeatedly examined between drying off and 30 weeks post calving. A power calculation stated that 130 cows are needed to complete the study for appropriate analysis, based on data from Bicalho et al., (2009).

During the five examinations, which occured at (1) drying off, (2) post-calving, (3) 60DIM, (4) 140DIM, (5) 210DIM, the following were recorded:

- Body condition score
- Backfat thickness (ultrasonographically)
- Lesion score

- Measurement of digital cushion depth using ultrasonography, following a functional foot trim

Further, cows were mobility scored (DairyCo 0-3 scale) fortnightly, with daily milk yield and body weight data available from the automatic milking systems.

RESULTS

Current situation, April 2015
Of 186 cows enrolled, 159 cows completed the examinations and are eligible to be used for analysis; recording mobility scores and production data will be completed shortly, for analysis in June 2015.

Linear regression modelling will assess how the digital cushion changes in relation to common measures of body fat coverage. Further, changes in body condition or digital cushion thickness will be investigated as the cause of lameness and lesions.

DISCUSSION AND CONCLUSION

The current study could identify if the digital cushion is important in lameness, as is commonly discussed in the literature. The association between body condition change and change in digital cushion depth will be assessed, and the role of the digital cushion in lameness may be clarified.

Outputs from this study could highlight the importance of managing body condition carefully in lameness prevention, and increase our understanding of the pathogenesis of claw horn lesions.

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ACKNOWLEDGEMENTS

The authors thank DairyCo for funding this work.

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