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CATTLE LAMENESS CONFERENCE

Topics are:

- Update on digital dermatitis
- Digital cushion – an evolving picture
- Lameness & assurance standards
- Research updates
- A veterinary practitioner's approach

Wednesday 26th April 2017

Ricoh Suite
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GENERAL INFORMATION

TIMETABLE of EVENTS

08:30	**ARRIVE / REGISTRATION / COFFEE and POSTER DISPLAY**	
09:25	**CHAIRPERSON'S INTRODUCTION** **Brian Pocknee, *The* Dairy Group**	
09:30	The work of the Dairy Cattle Mobility Steering Group	**Dick Sibley** Chairperson, DCMSG, UK
09:50	*Questions and Discussion*	
10:00	Digital Dermatitis: A wolf with sheep's clothing	**Arturo Gomez** Zinpro Corporation, The Netherlands
10:45	*Questions and Discussion*	
10:55	**COFFEE and POSTERS**	
	Session 2 Chairperson: Nick Bell, Bos International Ltd	
	INTRODUCTION TO SESSION 2	
11:25	Where the digital cushion story is taking us	**Reuben F Newsome** University of Nottingham, UK
11:55	*Questions and Discussion*	
12:05	Lameness: A Red Tractor perspective	**Jessica Sloss** Assured Food Standards Europint Centre, London
12:30	*Questions and Discussion*	
12:40	Antibiotic lameness treatments: a low hanging fruit	**Robert Hyde** University of Nottingham, UK
12.55	*Questions and Discussion*	
13.00	**LUNCH and POSTERS**	
	Session 3 Chairperson: Jon Huxley, University of Nottingham	
14:00	**INTRODUCTION TO SESSION 3 and VOTING ON POSTERS**	
14:05	How does sole depth vary at set dorsal wall lengths in Holstein Friesians?	**Beth Reilly** Royal Veterinary College, UK
14.20	The importance of good feet and leg conformation	**Jessica Edwards** National Bovine Data Centre, Telford, UK
14:35	*Questions and Discussion*	
14:50	Kicking out digital dermatitis: An on-farm case study	**Sara Pedersen** Farm Dynamics, Cowbridge, UK
15:30	*Questions and Discussion*	
15:40	**POSTER AWARD and CLOSE**	
15.45	**TEA and DEPART**	

TABLE of CONTENTS

General Information

Scientific programme

** Research Update Session (also presented as posters)*

TABLE of CONTENTS (continued)

Poster abstracts (presenting author underlined)

Poster abstracts – also as an oral presentation in the Research Updates session
(presenting author underlined)

CHAIRPERSON'S INTRODUCTION

Welcome to the 8th Cattle Lameness Conference.

Our continuing aim is to find the best speakers with the most relevant (and latest) information to present to the CLC. Scientific conferences rely on the financial support of their industry, and the Cattle Lameness Conference is no exception. We are indebted to the generous support of all our sponsors. This year they are Dartington Cattle Breeders Trust, Hoofcount Automatic Footbaths, Zinpro, Kilco (International) Ltd, Provita Eurotech Ltd, Giltspur Scientific Ltd and Norbrook Laboratories (UK) Ltd. In addition, the future of the CLC is now looking more certain with financial support being committed over the next three years by the Dartington Cattle Breeders Trust.

The conference will start with a review of the work of the Cattle Mobility Steering Group, presented by its Chairperson Dick Sibley. He will be followed by Arturo Gomez, Zinpro Corporation, based in Spain who will provide an update on Digital Dermatitis. Following the coffee break Reuben Newsome, University of Nottingham, will provide an update on the digital cushion research. He will be followed by Jess Sloss, Technical Manager, Red Tractor Farm Assurance who will look at lameness from the perspective of the Red Tractor Dairy Standards. As a change from the previous format, all presenters of the Knowledge Transfer section were given the opportunity to submit their posters for oral presentation. The scientific committee selected which three would be asked to present at the research update. The first presentation will take the conference up to the lunch break, with the remaining two KT posters being presented after the interval.

The conference will close with the practitioner's approach, which this year is delivered by Sara Pedersen, Farm Dynamics Ltd, who will present a digital dermatitis case study.

There are nine scientific posters being presented at this year's CLC. A number only surpassed by the inaugural meeting in 2009. We encourage you to read the posters and discuss the findings with the presenting authors.

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 2017 Cattle Lameness Conference, *The* Dairy Group
On behalf of the CLC Organising Committee

FURTHER INFORMATION

Organised by:

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University of Nottingham

Organising Committee

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PAPERS

Proceedings of the Cattle Lameness Conference (2017) Sixways, Worcester, pp 1 - 3
Royal Veterinary College, The Dairy Group and University of Nottingham

THE WORK OF THE DAIRY CATTLE MOBILITY STEERING GROUP

Dick J Sibley
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INTRODUCTION

Lameness in dairy cattle has been a long-term problem for the industry: the economic benefits of minimising lameness have not been strong enough to drive change in the same way that infertility and mastitis have been tackled. There has been a view within some sectors of the industry that lameness is inevitable, and the costs of prevention may exceed the economic benefits.

As welfare issues in the cattle industry became more prominent during the last century (not least due to the interest in productions systems prompted by the BSE crisis (1), there was more focus on the real welfare issues affecting dairy cattle, and lameness was raised as one of them. The FAWC Report on the Welfare of Dairy Cattle was published in 1997 (2). It contained a plethora of realistic and justifiable criticisms and recommendations, including the following paragraph on lameness: '*All dairy farmers and stockmen must take heed of this serious problem, monitor the situation and take appropriate preventive and corrective action. Veterinary advice may be required. The issue already is a matter of public concern, and if action is not taken, there may ultimately be calls for legislative control. FAWC intends to review the situation in five years and comment to Ministers, as necessary.*'

A prominent member of FAWC at the time, and a true welfarist, was Professor John Webster at Bristol vet school. He attracted interest and funding to investigate the causes and control of lameness, including the attention of a charity that had several million pounds to spend on animal welfare projects. The Tubney Charitable Trust had a total fund of over £65 million, much of which was allocated to animal welfare research. The charity had an unusual objective in that it had to spend its entire fund over 15 years. It closed in 2012, having spent the £65 million, and its short history is brilliantly documented in a short book by Sarah Ridley, the chairman of the trust (3).

Bristol University secured substantial funds to run a project which evolved into the Healthy Feet Project which had several interlocking workstreams with the main objective to demonstrate that dairy cattle lameness was not inevitable, but controllable. The project was a partnership of many interested and enthusiastic groups and organisations, co-ordinated by a steering group, which I was privileged to chair.

THE HEALTHY FEET PROGRAMME

The Healthy Feet Project demonstrated that lameness was measurable, manageable and preventable. It was not inevitable. The excellent work on farmer communication and engagement enabled the science and technology that was known and learned could be relayed to the vet and farmer effectively, with real changes making real differences to dairy cattle lameness. However, the project finished in 2010, but the opportunity to continue the implementation of its work was soon offered through the South West Healthy Livestock Initiative (SWHLI) which obtained funding to deliver health management programmes to livestock farmers in the South West Region. Such was the profile of dairy cow lameness in the South West, not least due to the success of the Healthy Feet Project, that farmer workshops identified dairy cow lameness as a priority for funding. Thus, the Lameness Workstrand became a key component of SWHLI with over 500 dairy farms taking advantage of the funded programme of lameness management.

The advantages of delivering a structure lameness management programme on to dairy farms with the evident, measurable and achievable health and welfare benefits became apparent to the dairy industry as a whole, and was adopted by DairyCo, (now AHDB Dairy) in the form of the Healthy Feet Programme (4). This initiative brings farmers vets and foot trimmers together to deliver better healthcare to farms interested in managing lameness. The programme required a steering group to direct its activities, akin to the successful Tubney funded Healthy Feet Project, and the Dairy Cattle Mobility Steering Group was born.

THE DAIRY CATTLE MOBILITY STEERING GROUP

Mission Statement

The Steering Group will endeavour to engage all parts of the dairy industry in achievable, affordable and effective measures to eradicate severe lameness, minimise moderate lameness and maximise mobility in the UK dairy herd.

The group will encourage organisations and individuals to develop and implement a structured approach to lameness control and allow dairy farmers and their staff to measure, manage and monitor lameness in their herds.

The group will enable collaboration and co-ordination between all parts of the industry to promote participation in lameness management, engage farmers, advisors and technicians in the prevention and management of lameness, and encourage new science and research to meet the needs of the industry, and to transfer that knowledge to all those involved by any means available.

The group meets twice a year, and comprises individuals with an interest, enthusiasm and expertise in dairy cattle lameness. Although many of the individuals are members of organisations with interests in lameness, they attend as individuals. In order to avoid the group becoming simply a discussion committee, specific tasks have been identified and allocated to small subgroups, Guest speakers are invited to attend meetings that are focussed on specific issues.

Current task groups are focussing on the following issues:

- Foot trimmer register – the creation of a register of foot trimmers, with standards and regulation to ensure consistent quality standards. This task has progressed well, with the two main foot trimmer organisation working hard to create independent registers.

- Farm standards, categorisation of mobility performance – investigating the potential of categorising farms according to mobility performance, and the creation of a "gold standard" of lameness. The long-term aim would be to introduce more rigorous standards into the current farm assurance schemes, with the options for farmers to achieve and demonstrate higher standards.

- Objective measures of lameness – the current system of mobility scoring has its weaknesses, not least being the labour requirement and the variability of results. New technologies will provide more objective measures of mobility, with the potential for automated monitoring and measurement. The group has already identified existing databases of lameness that allow the monitoring of lameness prevalence in large numbers of cows to indicate progress with lameness control.

- FSA engagement – the Food Standards Agency has an interest and an influence in dairy cattle lameness as most chronic lame cows end up culled, and delivered into the hands of the FSA in slaughter abattoirs. This group has successfully engaged the FSA in lameness monitoring, and an education and engagement programme with official veterinary surgeons in abattoirs who are responsible for welfare.

- Procedure for dealing with culls – The DCMSG identified at an early stage that chronically lame dairy cows have a poor prognosis and are unlikely to cure. Rather than them being kept for long periods on farms in the naïve hope that they will recover, there is a need for a route where they can be culled without severe economic penalty, but with minimal risk to their welfare. This is currently being explored, in conjunction with the road transporters, welfare legislators and veterinary organisations.

- Engagement with mobility messages – one of the key outcomes of the Healthy Feet Project was the methodology and effectiveness of communication with those who can influence dairy cattle lameness. Science and technology has to be applied on the farm to be effective. The different ways of communicating and delivering key messages and information to those who need it and can use it, as well as generating enthusiasm and motivation to deal with this problem are being constantly explored. The DCMSG support of the Cattle Lameness Conference and the Foot Health Day are examples of where communication and knowledge transfer are being delivered. The AHDB Healthy Feet Programme is constantly reviewed and modified to maximise engagement and effectiveness.

In the future, the DCMSG intends to become engaged with other organisations and policy groups involved in dairy cattle health and welfare, including the Cattle Health and Welfare Group, the Animal Health and Welfare Board and the Farm Animal Welfare Committee.

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NOTES

Proceedings of the Cattle Lameness Conference (2017) Sixways, Worcester, pp 5 - 15
Royal Veterinary College, The Dairy Group and University of Nottingham

DIGITAL DERMATITIS: A WOLF WITH SHEEP'S CLOTHING

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SUMMARY

- Digital dermatitis is a disease presenting both active and chronic stages that drive cattle behaviour and performance, and help perpetuate the disease in the herd.
- *There is no excuse!* The prevention and control of digital dermatitis needs of a robust and thoughtful management to be successful.
- Topical treatment at an early stage of the disease is a good and convenient starting point in the control of the disease
- *Digital dermatitis prevention programs need to start from the bottom up!* Build healthy replacement animals, master the simple intervention rules and keep watching continuously.

INTRODUCTION

Digital dermatitis (DD) represents by and large the most prevalent lesion in confined cattle. The dairy industry agrees that it is a "problem" we have to fix. However, the results of the traditional control and prevention measures such are footbath and topical treatment do not completely satisfy the expectations for success. In addition, despite the agreement that action needs to be taken, and likely due to the intricate and sometimes subtle associations of digital dermatitis with other lameness and major health events, the allocation of resources becomes uncertain because precise estimates of the economic consequences of the disease are not yet available. This abstract aims at presenting some of the disease characteristics that make it so resilient and how we should look at the traditional control measures to achieve reasonable results. We will additionally explore some of the recent published data and the knowledge boundaries we still need to cross to keep moving our progress forward.

YES BUT... WHO CARES!

The scientific community has long ago identified DD as a multifactorial infectious disease with a strong bacteriological component (1, 2). The existence of a complex microbial community in DD lesions (3, 4, 5) opens many plausible hypotheses for its aetiology. For several reasons, spirochetes of the *Treponema* genus are considered to play a relevant role in the aetiology. Thus, *Treponema spp*. are found ubiquitously in DD lesions (6, 7, 8), T*reponema spp*. were never found in control samples of healthy skin and significant immune responses were not observed in animals without clinical signs of the disease (9, 10,11). As an indirect measure, DD shares common characteristics with other spirochetal diseases across species such as human borreliosis, syphilis or yaws (12). All spirochetal diseases, including DD, are characterized by the succession of active and chronic stages of the disease and cystic/resistance forms are described as variations to the morphology of the spirochetes in its active form (13) that characterize the epidemiology of the disease.

Despite the evidence, the industry has not clearly considered the chronic DD forms as a key stage of the disease and has neglected the fact that the cystic/resistance forms could drive the resilience and the endemic status of DD observed today on farms.

SAME RULES AND NEW TECHNOLOGY

Looking back at the literature, the scientific community has reflected, in their inconsistent approach to the evaluation of topical and footbath treatments, the frustration farmers experience in the field every day. Trials aimed at evaluating disinfectants show a wide variety of designs and set ups that make very difficult the in-between trial comparison (Table 1 and 2). Fortunately, the traditional approaches to DD control and prevention appear to be successful when used correctly as reflected by individual trials that show a clear decrease in DD prevalence when used under certain conditions (14). The same experiences are anecdotally observed in the field including many success stories.

Footbaths that guarantee a certain number of disinfectant applications per cow passage ($\geq$3.5m in length) have been proved to make an impact on the footbath efficacy and at least correspond to the most common sense engineering, that has been traditionally lacking otherwise (14, 15). Similarly, topical treatments that focus primarily on timing (early detection and stage of lactation) than on the specific antibacterial compound, have also shown to be a right strategy to face a control program of the disease.

Other technologies have contributed in the field to increase the efficacy of the DD management. Namely, the use of hoof health records, the inclusion of DD detection as a routine of the farm scheduled tasks, specific aspects of the hoof trimming technique or the use of nutritional approaches aimed at increasing skin protection and recovery (16).

Do you imagine a progressive dairy farm without: reproductive records, the inclusion of a periodic reproductive status assessment of all cows, manual or ultrasound pregnancy check or neglecting blood urea levels to handle the reproduction of the herd?

LOTS OF KNOWNS, MANY UNKNOWNS, BUT COMING KNOWLEDGE

Public opinion, and new environmental regulations are making difficult to continue with the traditional approach to defend and improve herds from DD infection. In one side, although only a percentage of cows affected with DD will show clinical lameness, the elevated prevalence (17) of the disease makes for a lot of cows lame in our herds. Actually, some of the non-infectious hoof lesions are correlated with the occurrence of DD (18). In the other side, new environmental policies have conditioned the use of traditional disinfectants such as Copper Sulphate or Formalin (19). Is there an alternative to the cheap and barely-shown effective footbath or topical treatments? The research community is certainly trying hard to do it (20, 21, 22) but success is yet limited. Certainly many open fronts are actively looking for the "magic bullet" but we are facing a complex disease that will make it very difficult. Coming knowledge has started to show evidence that the genetic background of our animals can predispose them to suffering from the disease (23) but how to use this information in rearing programs is still to be discussed. However, what we have learnt is that if we really want to help building a solid DD control program, we need to guarantee that the "starting points are free" of the disease. Specifically, the rearing period should provide a close to 0 prevalence in before the first calving (18) and secondly, at the start of the lactation, or more precisely during the transition period, animals must be prevented of new cases or relapses of DD infection.

We feed animals to their maximum potential of dry matter intake and efficiency to achieve the best growth and subsequent milk production. Can we afford to spend the energy that is diverted to the immune system, pain and inflammation due to a highly prevalent disease such is DD?

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Table 1. Characteristics of footbath trials listed in Web of Science® since 2000.

Publication	Design	# Cows Control (C), Treatment (T)	Footbath # and dimensions	Contrast	Outcome*
Fjeldaas et al., 2014	RCT, Trial 1: BID 12 wk Trial 2: BID every second wk for 12 wk Trial 3: BID 12 wk Trial 4: BID 12 wk	45 Norwegian Red T 1:39 T 2: 40 T 3: 41 T 4: 46	T 1: Single 2.3 m T 2: Single 2.3 m T 3: - T 4: -	T 1: Water vs None, BID 12 wk T 2:7% CuSO4 vs None, BID every second wk T 3: Automatic Water Flushing vs None T 4: Automatic Water Flushing + Glutaraldehyde vs None	Superior efficacy of water alone (T1) and 7% CuSO4 solutions on DD treatment and prevention
Smith et al., 2013	Self-controlled, SID 5 d per wk v10 wk	3 Dairies, n= 120, 170 and 200 milking Holstein	Split 2.3 m	3% Provita Hoofsure vs 5% CuSO4	Comparable efficacy
Fiedler et al., 2013	BID 2 d per wk, 8wk	110 milking Holstein	Single	2-4 % T-Hexx Dragonhyde vs Water	No differences in efficacy between the groups
Nowrouzian et al., 2013	BID 3 d 1 wk + BID 2 d 1 wk	3 dairies, n=182	Single	2% Provita Hoofsure Endurance in footbath vs 2% Provita HE direct spray.	Footbath less effective than direct spray
Holzhauer et al., 2012	Self-controlled 16 wk, BID 5d per wk (Copper) BID 1 d per 2 wk (Formalin)		Split 2.3 m	4% Formalin vs CuSO4	Efficacy for CuSO4 reducing new lesions 3X more than 4% formalin

Table 1. Characteristics of footbath trials listed in Web of Science® since 2000 (Cont.)

Publication	Design	# Cows Control (C), Treatment (T)	Footbath # and dimensions	Contrast	Outcome*
Logue et al., 2012	Self-controlled 15 wk, BID 3d per wk	6 dairies, n= 600 milking Holstein	2x Split 2.3 m	5% CuSO4 vs. non-heavy metal test product	Higher efficacy of 5% CuSO4 than test product. Longer baths very significant!
Speijers et al., 2012	RCT Trial 1: 14 wk, BID 2 d per wk or Trial 2: 14 wk	T1: 70 milking Holstein T2: 64 milking Holstein	Single 2 m	T 1: 5% CuSO4 each wk vs 5% CuSO4 every 2 wk T 2: 5% CuSO4 each 2 wk vs 5% CuSO4 every 4 wk	5% CuSO4 more effective weekly than bi-weekly or monthly.
Döpfer et al., 2011[1]	RCT, 13 wk, SID 5d per wk	120 milking Holstein	Single 1.8 m	2. 5% Copper Sulfate + Acidifier vs. foaming test product	Efficacy demonstrated for 2.5% CuSO4 and failure of foaming product after extended use
Teixeira et al., 2010	RCT, Trial 1:SID 2d per wk, 25 wk Trial 2: SID 2d per wk, 25 wk	T1: 362 milking Holstein T2: 325 milking Holstein	Single 1.5 m	T 1 : 5% T-Hexx Dragonhyde vs 5% Formalin T2 : 5% T-Hexx Dragonhyde vs 10% CuSO4	Dragonhyde better than 5% formalin and similar to 10% CuSO4

Table 1. Characteristics of footbath trials listed in Web of Science® since 2000 (Cont.)

Publication	Design	# Cows Control (C), Treatment (T)	Footbath # and dimensions	Contrast	Outcome*
Speijers et al., 2010	RCT, Trial 1: 5 wk, BID 2 d per wk Trial 2: 8 wk, BID 2 d per wk Trial 3: 10 wk, BID 2 d per wk	T1: 118 milking cows T2: 117 milking cows T3: 95 milking cows	Single 2 m	T 1: 5% CuSO4 vs 2% ClO- vs no footbath T 2: weekly 5% CuSO4 vs weekly 2% CuSO4 vs fortnightly 5% CuSO4 vs fortnightly 2 % CuSO4 T 3: Weekly alternating 5% CuSO4 and 10% water vs Weekly alternating 5% CuSO4 and water vs fortnightly 5% CuSO4	5% CuSO4 more effective weekly and more effective than 2% CuSO4. No efficacy of 2% ClO- and low efficacy of salt water
Thomsen et al., 2008	Controlled trial 8 wk, SID 2 d per wk	12 dairies, Danish Holstein and Danish Red. N= 100 X 12	Split 2.3 m	T 1: Virocid (glutaraldeyde) vs no footbath Trial 2: Kickstart 2 (organic acid) vs no footbath Trial 3: Hoofcare DA (quaternary ammonium) vs no footbath	No efficacy proven of any of the products tested

Table 1. Characteristics of footbath trials published in Web of Science® since 2002 (Cont.)

Publication	Design	# Cows Control (C), Treatment (T)	Footbath # and dimensions	Contrast	Outcome*
Holzhauer et al., 2008	Self-controlled 24 wk,	Milking Holstein T1: 14 T2: 16 T3: 14 T4: 15	Single 3 m	T1:Fortnightly 4% Formalin vs none T2: 4 treatments of a 2% multicompound vs none T3: weekly 2% multicompound vs none T4: weekly 3% Sodium Carbonate vs none	All strategies effective on reducing DD but none of them superior to 4% formalin
Randhawa et al., 2008	Controlled trial 3 d per 2 wk, 20 wk	97 milking cows	Single 3 m	4% formalin + hoof trimming vs no footbathing+ hoof trimming	100 % formalin efficacy on DD
Bergsten et al., 2007	Self-controlled Trial 1: BID , 16 wk Trial 2: BID , 16 wk Trial 3: BID, 16 wk	T1: 112 milking cows T2: 240 milking cows T3: 101 milking cows + 64 controls	T1, T2: Split 2.3 m (T3 – not described)	T1: 7% $CuSO_4$ vs water T2: $CuSO_4$ + peracetic acid T3: Kovex (peracetic acid) + hydrogen peroxide)	$CuSO_4$ showed efficacy in preventing DD No effect observed for Kovex
Hemling et al., 2007	Self-controlled SID 7 d per wk, 24 wk	71 milking cows	Automated Split footbath (dimensions not specified)	5% Formalin vs 2% Double Action (non-metal or aldehyde test product)	Similar efficacy in both treatment groups
Manske et al., 2002	Self-controlled BID 47 d	44 milking cows	Split 1.5 m	0.6% Hoofpro+ (acidified $CuSO_4$) vs water	Not significant preventive effect of Hoofpro+

Table 2. Summary of peer reviewed literature on the efficacy of topical treatments on DD.

Publication	Design	# DD Cows/feet	Contrasts	Outcome
Cutler et al, 2013	RCT, feet examined 3-4 d post-treatment and 8-12 d post-treatment	214 feet	Tetracycline Hydrochloride (2-5 g) paste (Onycin 1000, Vetoquinol) vs 2-5 g Tetracycline Hydrochloride powder + bandage (2d) vs No treatment	Equal effectiveness of Tetracycline (47.4% vs 57.1%) [19% no pain response after treatment]
Schultz and Capion, 2013	RCT, Feet examined 3, 14 and 34 d post-treatment	173 cows/ 201 feet	Chlortetracycline Spray vs 10 g salicylic acid powder + bandage (3d)	Significant more healing in salicylic acid group at day 34 post-treatment (OR= 4.98)
Berry et al., 2012	Single group, feet examined 1, 12, 23 and 37. Monthly until 341 d	29 cows/ 39 feet	10 g Lyncomicin HCL powder + water + bandage (<4d)	54% lesions were retreated before 34 d. Older cows significantly more risk to relapse (HR 0.13) than young cows (<4^{th} lactation)
Toholj et al., 2012	RCT, surgical debridement of the lesion before treatment	171cows	Oxytetracycline spray d 0, d 2 and d 5 after diagnosis vs Oxytetracycline spray d0 + bandaging vs 8% water solution Copper Sulphate vs 8% water solution Copper Sulphate + bandaging vs No treatment	Oxytetracycline + bandaging demonstrated the higher percent of cows recovered (86.1%)
Holzhauer et al., 2011	RCT, feet examined d 0 and d 28	172 cows/ 205 feet	Intra hoof-fit gel (copper and zinc chelates) vs Oxytetracycline spray	Superior efficacy of Intra hoof-fit gel than osytetracyline spray (92% vs 58%)

Table 2. Summary of peer reviewed literature on the efficacy of topical treatments on DD. (Contd.)

Publication	Design	# DD Cows/feet	Contrasts	Outcome
Berry et al., 2010	RCT, feet examined on d 1, d 12-14 and d 30	25 cows	10 g lincomycin hydrochlorice vs 10 g oxytetracycline hydrochloride vs No treatment	Similar efficacy between lincomycin and oxytetracycline at d 30 (72% and 63%)
Loureiro et al., 2010	RCT	16 cows	5 g oxytetracycline powder + bandage (6 treatments, every 2 d) vs 20 mg/kg oxytetracycline IM (3 treatments every 3 d)	Superior efficacy of Oxytetracycline powder + bandage
Nishikawa and Taguchi, 2008	Single group, feet examined 29 d post treatment	89 cows	5 ml oxytetracycline 100mg/ml + bandage	13.8% complete healing in first lactation. 38.7% complete healing in 2+ lactations
Cecen et al., 2008	Retrospective study, feet examined at d 7, 14, 21 and 28	119 cows/ 139 feet	Intramammary antibiotic preparations vs antibacterial ointment vs antiseptic + surgical debridement+ bandage	Similar efficacy between topical intramammary antibiotic and other topical treatments
Shahabaddin et al., 2007	RCT,	126 cows	Lincomycin HCL spray vs Solka Hoofgel vs Solka Hoofgel + bandaging vs Surgical removal + Solka Hoofgel + bandaging vs	Surgery + Solka + bandaging and Solka + bandaging showed the greater rate of wound diameter reduction.

Table 2. Summary of peer reviewed literature on the efficacy of topical treatments on DD. (Contd.)

Publication	Design	# DD Cows/feet	Contrasts	Outcome
Sala et al., 2007	Single group, feet examined d 21 and d 45 after treatment	21 cows	Topical application Solka Hoofgel	Solka Hoofgel showed therapeutic efficacy. Incomplete histological recovery.
Laven and Logue, 2006	Review of topical treatments against DD		* Efficacy of antibiotics other than Oxytetracycline (1998-2001) * Efficacy of non-antibiotic topical sprays (1996-2002)	
Laven, 2006	RCT, feet examined at d 4, 7, 21, 42	53 heifers + 28 cows	35 g Erythromycin per 100 litters footbath (SID, 2 d, 30 seconds) vs 1 mg/kg cefquinome IM (SID per 5 d) vs 1 mg/kg cefquinome IM (SID per 5 d) vs 10 mg/kg erythromycin IM (Single injection)	Cefquinome IM for 5 d showed significantly superior efficacy than the other 2 IM treatments at day 42 and as effective as Etrythromycin footbath
Kofler et al., 2004	RCT, Feet examined at d 4, 10 and 28	47 cows/ 52 feet	Protexin Hoof-Care (formic, acetic and propionic acid, aluminum salts, copper and zinc sulphate and essential oils) vs Oxytetracycline spray	Similar efficacy in treating DD lesions in relation to pain, lameness and weight bearing

NOTES

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Royal Veterinary College, The Dairy Group and University of Nottingham

WHERE THE DIGITAL CUSHION WORK IS TAKING US

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SUMMARY

The claw horn lesions (sole ulcer, sole haemorrhage and white line disease) are an important group of lameness-causing diseases and occur with disruption to claw horn growth that leads to pain within the foot. Claw horn disruption occurs as the forces being transferred through the foot exceed what it can withstand. This principle highlights two vital components that lead to claw horn disruption and lesion formation: [A] the anatomy of the foot has been insufficient to cope with the forces applied to it, and [B] the forces applied to the foot have been too great for the anatomy. This paper explores how key anatomical structures of the foot enable it to function optimally, how the foot anatomy changes with physiological state and how this increases the risk of insult to it, and how the anatomy of the foot changes irreparably with continued lesion occurrence, causing degeneration of the foot and perpetuating further lameness. Understanding these principles enables us to appreciate when the foot is at greatest risk from claw horn disruption, to identify the best methods of preventing lameness from claw horn disruption and to determine the best forms of treatment.

INTRODUCTION AND FOOT ANATOMY

Sole ulcer was first reported in the year 1920 (1), sole haemorrhage appears to be an early stage of the same disease process and increasingly white line disease is considered to be part of the same disease complex: the lesions are likely a result of trauma to the horn-producing tissues, and collectively can be termed the lesions of "claw horn disruption". Many studies have identified risk factors for claw horn lesions and a good way of understanding how these risk factors influence lameness is by appreciating the anatomy of the foot and how it is adapted to forces during locomotion.

The entire weight of the cow is transferred through the bones of the leg and into the distal phalanx. The distal phalanx sits within the hoof capsule and is suspended from the hoof wall by laminar attachments and is supported above the sole by the digital cushion (2). The digital cushion sits around the flexor tuberosity – the region of the distal phalanx onto which the deep digital flexor tendon inserts, which strikes the ground first during foot-strike – and is thought to absorb and dissipate concussive forces transferred through the distal phalanx during foot-strike and loading. The sole horn grows from a layer of cells beneath the digital cushion called the germinal epithelium, and trauma to and haemorrhage within this tissue impedes its growth and function, which eventually leads to cessation of growth and ulceration (3). The digital cushion is thought to play a role in claw horn lesion prevention by reducing shock, dissipating forces laterally and reducing peak forces on the germinal epithelium of the sole (4,5). Since all aspects of the foot are designed for shock absorption and force dissipation, insufficiency of any anatomical structure within the foot – for example a thin digital cushion, laxity of the suspensory apparatus or even inappropriate foot shape e.g. with toe overgrowth – could cause greater forces being transferred onto the germinal epithelium of the sole, where the typical sole ulcer develops.

THE DIGITAL CUSHION

Epidemiological work has demonstrated that body condition loss preceded lameness events, whether lameness was defined by visual detection of impaired mobility (6,7) or treatment incidence of lesions (8). Body condition score (BCS) has been found to be positively associated with digital cushion thickness (5), an association that could be biologically plausible because the digital cushion contains adipose tissue (4,9); lipid could be deposited to and mobilized from the digital cushion during periods of positive and negative energy balance. Having a thin digital cushion appears to predispose subsequent lameness from claw horn lesions (10,11), and studies have also reported a heritable component to digital cushion thickness (12) and that rearing systems can influence it (13). However, until recently no work had assessed how the digital cushion changed throughout lactation or determined whether thinning of the digital cushion predisposed lesions and lameness.

To address this, a prospective cohort study repeatedly assessed the digital cushion on the hind claws at five "assessment points" between 8 weeks prior to and 35 weeks post calving (14,15). At each assessment point, the thickness of the digital cushion was measured on each hind claw using ultrasonography. BCS, back fat thickness (an objective ultrasonographic measure of subcutaneous fat) and lesion presence were also recorded at each assessment point, and cows were mobility scored fortnightly from calving. The first phase of the analysis used multilevel linear regression modelling to determine which cow measures correlated with digital cushion thickness over time (14). It showed that the digital cushion did change with BCS/ back fat thickness, although only to a small extent. The analysis also showed that cows that developed lesions had a thinner digital cushion prior to the lesion occurrence, which became thickened with sole ulcer presence; this thickness at the time of a sole ulcer may have represented inflammation. An unexpected finding of the study was that the digital cushion was thinnest at approximately one week post-calving, before cows had lost much body condition. This could have been an effect of peri-parturient hormones such as relaxing, which have been hypothesized to cause relaxation of the suspensory apparatus of the foot and cause the distal phalanx to sit lower in the hoof capsule (16,17).

The second phase of the analysis used binomial regression modelling to determine whether cow measures predicted either lameness (measured by mobility score) or lesions later in lactation (15). Having a thin digital cushion, being thin (low BCS) and loss of body condition all predisposed a leg to becoming lame or a claw to developing a lesion. However, thinning of the digital cushion (i.e. the amount of thickness it lost between two assessment points) did not influence lameness or lesion occurrence. These results showed that it was the absolute thinness that the digital cushion reached that influenced lameness and lesions, which could change with measurable cow factors such as BCS and stage of lactation.

The key findings of this work highlighted that the ultrasonographic measure of digital cushion thickness strongly influenced the likelihood of a lesion developing on a claw later, and that digital cushion thickness varied with many factors including BCS and proximity to calving. There were also unexplained differences in digital cushion thickness between cows, which could be explained by genetic differences between cows or differences in rearing systems (12,13). It seems plausible that any factor influencing the ultrasonographic measure of the digital cushion could influence claw horn disruption, as the measure could be an indicator of the forces applied to the germinal epithelium. The extent to which these factors can be manipulated using interventions, and therefore serve as control points for lameness, is not yet clear, but understanding changes to the anatomy around the onset of lesions could help us target the most appropriate prevention measures for lameness during the key risk periods. Additionally, the finding of this work that the digital cushion was thicker when a lesion was present highlighted inflammation and trauma within the sole, the importance of which will be discussed below.

CHRONIC LAMENESS

In addition to failure of the normal foot leading to lameness, a large number of studies have shown that there is a degenerative component to lameness: lameness increases the risk of future lameness (6,18,19), delayed treatment is less effective (20–22) and delayed detection increases the risk of more severe lameness (23). Anatomical studies have begun to explain this by demonstrating that the digital cushion of claws displaying sole ulcers at slaughter were thinner than other claws, possibly indicating scar tissue and degeneration of the digital cushion that has occurred with lameness (2), and that permanent changes in the flexor tuberosity of the distal phalanx appear to be present when sole ulcers were present at slaughter (24).

In order to explore the degeneration of foot anatomy with lameness and lesion incidence throughout life (rather than solely lesion presence at slaughter), a retrospective cohort study used computed tomography to image the hind claws of 72 cull Holstein-Friesian dairy cows (25). The cows were from a research herd and both weekly mobility scores and lesion treatment data were available since first calving. Abnormal bone development on the flexor tuberosity was quantified and was found to be increased with age and lameness, whether lameness was denoted by either "prolonged high mobility scores" or "treatment for a claw horn lesion" during life. Previous work had found evidence of inflammation in the region of the digital cushion with claw horn lesions (14), and other works have suggested that the digital cushion becomes depleted with inflammation associated with lameness (2,9). Combined with this evidence, it seems plausible that prolonged lameness associated with claw horn disruption is associated with significant – likely permanent and irreparable – degeneration of the foot anatomy that is responsible for shock absorption and dissipation, therefore leading to a vicious cycle of further tissue damage, degeneration and lameness.

Understanding this damage within the foot that occurs with prolonged lameness highlights the critical importance of early detection and effective treatment of lameness. Previous studies have demonstrated that identifying lame cows and performing a therapeutic foot trim improves resolution of lameness (22), the best treatment for claw horn lesions is a combination of a therapeutic foot trim, a block being applied to the non-lame claw and a course of a non-steroidal anti-inflammatory drug (21), and cure rates are poorer when treatment is delayed (20). Detecting the lesions early and treating them appropriately – with a combination of NSAIDs and pressure relief provided by a block – gives the best currently known resolution for new lameness cases. Since lameness creates a self-perpetuating cycle of degeneration within the foot, early detection and treatment of lameness is an important component of any lameness control program.

CONCLUDING REMARKS

We have a good understanding of why the claw horn lesions occur, how to detection and treat lameness and importance of doing so. Less evidence is available regarding which interventions on a farm will best prevent lameness in the first place, and this likely varies on a farm by farm basis. However, understanding the challenges to the anatomy of the foot can help us understand why lameness occurs and which interventions may be beneficial. For example, peak forces on the foot might be too great in part of the farm management system, or forces may be too prolonged due to longer standing times, or social pressure might be too high when the foot is most prone to damage immediately after calving. A holistic view of the challenges that the foot faces in light of the system the cow is in, combined with understanding the key anatomy of the foot and how it changes, is a valuable starting point for addressing this painful and costly disease.

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Royal Veterinary College, The Dairy Group and University of Nottingham

LAMENESS: A RED TRACTOR PERSPECTIVE

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SUMMARY

This paper will provide an introduction to Red Tractor Assurance, the history and governance of the scheme and the standards. It will outline how the standards have been developed over time to consider welfare outcome indicators and the role of the farmer, the vet and the assessor in this process.

AN INTRODUCTION TO RED TRACTOR ASSURANCE

The Red Tractor scheme is the biggest farm assurance scheme operating in the UK, with over 60,000 members. Schemes were developed in the mid-1990s driven by 2 events; the introduction of the Due Diligence defence in the Food Safety Act 1990 and as a response to well-publicised food contamination issues as well as, amongst others, BSE and salmonella in poultry. Retailers and other trade buyers need to know about the standards of their suppliers and a single national scheme avoids multiple assessments by different trade customers.

The Red Tractor scheme is managed by Assured Food Standards; a company limited by guarantee set up by the UK supply chain. The company is jointly owned by the UK farm unions (NFU, NFU Scotland, Ulster Farmers Union) together with Agricultural and Horticultural Development Board and retailer and food processor trade associations (British Retail Consortium, DairyUK). It operates on a not-for-profit basis.

Technical Advisory Committees for each commodity sector manage the standards and keep them under review. These include representatives from the UK supply chain supported by independent experts and academia. Changes to the standards are subject to broad consultation; all standards are transparent and posted in full on the website.

The scheme establishes standards of good agricultural practice. Farms are assessed against them and where appropriate given a certificate of conformity. Certification is a prerequisite in the buying specifications of most trade buyers.

The standards have comprehensive coverage of food safety and for livestock, animal health and welfare. They also include elements of environmental protection. Standards incorporate the relevant legislation and additional requirements reflect industry good practice and market expectations.

Farms are assessed on a 12 or 18-month cycle and assessments are carried out by independent Certification Bodies who are accredited by UKAS to ISO17065 and use the standards according to prescribed procedures. There is an annual charge for this service, either payable by the farmer or the milk buyer, depending on the commodity sector.

THE RED TRACTOR DAIRY SCHEME

The National Dairy Farm Assurance Scheme (NDFAS) was set up in 1999 in response to the events outlined above. It was later rebranded as Red Tractor Assurance for Dairy Farms after 6 commodity sector schemes were brought together under the Red Tractor brand. The scheme currently covers more than 11,000 farms which account for approximately 95% of UK production.

STANDARDS

Red Tractor expect farms to meet all standards at all times and dairy farms are assessed on an 18-month cycle to verify conformance. Standards are categorised into 3 categories; 'Key', normal and 'Recommendations'. A serious non-conformance against a 'Key' standard will result in immediate suspension from the scheme. Less serious non-conformances will be recorded and must be rectified, normally within 28 days. The certification will remain valid provided this is achieved. 'Recommendations' are just that, and failure to conform will not affect the certification but they allow Red Tractor to collect data on certain features.

The current version of the standards (version 3) were introduced in October 2014 and will be revised and updated for implementation in October 2017. They include a requirement for a Livestock Health Plan and assessors not only look for this to be documented but also implemented. Red Tractor indicate a number of components that must be included, one of which is foot care. Producers must outline what foot problems are relevant to the farm, who is responsible for treatment and how and when the problem must be treated, including what treatments and products are used. The health plan can be completed by the producer although it is recommended that it is produced in conjunction with a veterinary surgeon who has knowledge of the farm.

For many years, Red Tractor have required assured producers to keep health and performance records. All incidences of lameness must be noted. These records must be reviewed by the farm vet, who reviews the records and data, inspects the livestock, identifies key issues and makes recommendations for improvement and reviews the use of medicines and antibiotics.

In October 2013 Red Tractor took the first step towards a package of measures aimed at improving herd health through welfare outcome indicators. These included a recommendation that the producer should use the AHDB Dairy Mobility Scoring system across the whole milking herd on at least a six-monthly basis.

WELFARE OUTCOMES

In 2005, the FAWC report[i] expressed a desire "to see improvements in the way that animal welfare is assessed, with a greater focus being placed on animal-based measures and welfare outcomes". Specifically, it was recommended that these animal-based measures included, *inter alia*, "evidence of pain, injury and disease (lameness, mastitis, visible injuries, ectoparasitic infestation)".

The FAWC opinion on dairy cow welfare suggested that the UK Government or assurance bodies could interpret the legislation (specifically EC 853/2004) in a similar fashion to the Dutch; that milk from severely lame cows is kept out of the bulk tank[ii]. The same report suggested that "on farm recording of disease and welfare by the farmer should be encouraged, perhaps as part of farm assurance schemes". This recommendation was latterly repeated in the Cattle Health and Welfare Group (CHAWG) Dairy Cow Welfare Strategy 2010.

During the first decade of this century the EU Commission invested heavily in the development of a 'welfare outcome' approach for many farmed species through the WelfareQuality® project. Whilst the project created a sound academic basis the protocols were complex and therefore time consuming, about one day per dairy farm.

This has obvious cost implications and makes them impracticable for routine use and researchers in a number of countries have begun to develop more pragmatic approaches.

In the UK, the Assurewel project was established by researchers at the University of Bristol together with Soil Association and RSPCA. The project aspired to embrace the wider industry and the Red Tractor scheme was invited to collaborate in road testing some of their developments. Red Tractor trialled protocols for welfare outcome assessments in 2011 and implemented some measures two years later as part of the routine farm assurance assessments. The Red Tractor assessor scores a random selection of 10 cows on 4 cow measures: mobility, body condition, hair loss, lesions and swellings, and cleanliness. The mobility scoring protocol uses the AHDB Dairy Mobility Scoring system. The assessor also records data on health and performance kept by the farmer (lameness, mastitis, culling rate, involuntary culls, calf mortality (0-24 hours, 24 hours – 42 days)). Red Tractor continues to work with Assurewel on analysis of these data.

ASSESSOR TRAINING

As a quality control, Red Tractor require all Certification Bodies working in the Red Tractor scheme to be accredited by UKAS to ISO17065. One feature that this should achieve is assessor competence but in 2013 Red Tractor decided to take additional steps by producing its own training courses. These are specific to every sector and standards and every assessor must take the course and pass an "ensuring understanding" test in order to carry out Red Tractor.

Red Tractor has also introduced its own programme of witness assessments carried out by a team of independent auditors. They score the farm assessors on their competence and knowledge demonstrated during the farm assessment.

In the Dairy sector, all assessors must also undertake formal training, delivered by Assurewel, on Welfare Outcome assessments and must pass online tests before undertaking Red Tractor dairy assessments. These tests have been written by Assurewel.

CONCLUDING REMARKS

Since the introduction of Welfare Outcome Assessments, Red Tractor have been collecting on-farm data which is being analysed by Assurewel. These data will begin to provide a representative picture of the (health &) welfare of the national herd and will give a useful insight into common issues. The data will also be useful in identifying areas of research. Red Tractor will work with the industry on how these data can be effectively used for the benefit of producers and the industry.

NOTES

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HOW DOES SOLE DEPTH VARY AT SET DORSAL WALL LENGTHS IN HOLSTEIN FRIESIANS?

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SUMMARY

The research aim is to investigate the range of sole depths that occur in Holstein Friesians at set dorsal wall lengths (DWL) of 7.5cm, 8.0cm, 8.5cm and 9.0cm.

INTRODUCTION

Over the past five years, the DWL guidance specified within the Dutch Five Step Method (1) has come under review by numerous authors (2,3,4). Recent research has backed a revised DWL of 8.5cm (4). This study aims to assess the range in sole depth that arises from set DWL in UK Holstein Friesian.

MATERIALS AND METHODS

A cross-sectional prospective study was conducted using uni- and multiparous dairy cattle in the south west of England on 11 dairy farms. Inclusion criteria included: breed (Holstein, Holstein-Friesian, and Friesian), minimum parity of 1, recordable DWL and sole thickness. Claws were measured following trimming or inspection by qualified foot trimmers (NPTC3/Dutch Diploma). Firstly, DWL of the medial hind claw was measured. The landmark used to measure DWL was from the point at which the horn becomes unyielding to digital pressure to the apex of the claw. Sole thickness of the lateral claw was then measured at the apex of third phalanx using ultrasound, Honda Electronics HS2000, with a 5MHz convex probe. Data was standardised using an algorithm based on simple trigonometry, to enable comparison with claws trimmed to a step at the toe of 5mm as described by Dutch Five Step Method. One hind foot was selected at random for each cow, to account for lack of independence.

RESULTS

Of 230 cattle examined, 174 Holstein Friesian cattle met inclusion criteria.

At DWL of 7.5cm 18.4% of cows had sole thickness of <5mm (Table 1). At the original recommended DWL(1) of 7.5cm the range of theoretical sole depths that occurred were −12mm to 23 mm with a median of 10mm. Of these, seven cows had sole thickness of less than 0mm when cut to a theoretical length of 7.5cm.

When cutting to the current recommended DWL of 8.5cm this was increased to a range of −5mm to 31mm, with a median of 13mm. Of these 5/169 cattle (2.9%) fell below the minimum sole depth. Even with a 9cm DWL one cow had a sole depth of less than 5mm (Figure 1).

DISCUSSION

This study used the common foot trimming landmark for measuring DWL; the point at which horn becomes unyielding to pressure. It has been assumed <5mm sole thickness at the toe is too thin. It is possible that a sole depth of <5mm causes no pathology and trimming to <5 mm allows for a steeper foot angle. Further research into minimum sole thickness is required to assess the impact of varying sole depths in dairy cattle as all current research is based upon anecdotal evidence (1). However, assuming that 5mm is the minimum sole thickness we suggest a minimum DWL for novice trimmers in stepped claws of 8.5cm; correlating with others work (4,5).

The range in sole depth emphasises the variety in Holstein Friesian claws in the UK. Farm environment, stage of lactation, trimming frequency and previous foot health may play a role in the range of sole thickness seen at set DWL.

CONCLUSION

We suggest a minimum DWL of 8.5cm in stepped claws is used for novice trimmers to ensure sole depth is 'adequate'. Further research is needed to establish what the *minimum* sole depth is for dairy cattle before they are predisposed to claw lesions.

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NOTES

Proceedings of the Cattle Lameness Conference (2017) Sixways, Worcester, pp 29 - 30
Royal Veterinary College, The Dairy Group and University of Nottingham

ANTIBIOTIC LAMENESS TREATMENTS: A LOW HANGING FRUIT?

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With antimicrobial use in livestock becoming a regular feature in mainstream media, pressure continues to mount on the livestock sector to improve monitoring and reduce antimicrobial use. The government response to the recently published O'Neill report stated that Defra has commitment to reduce antibiotic use in food animals to a multispecies average of 50mg/kg by 2018. There is likely to be continued pressure to reduce antibiotic usage at both a farm and practice level.

The University of Nottingham has created an antimicrobial usage calculator, both in order to evaluate usage at a farm or practice level, but also to examine various 'what-if' scenarios, in order to illuminate the most dramatic potential reductions in antimicrobial usage. The interpretation of antimicrobial usage depends largely on the method of calculation. Several methods exist, the most common being to monitor the mg of antimicrobials used per kg of livestock (mg/PCU [population corrected unit]), defined daily dose (DDDvet) or defined course dose (DCDvet). The latter two methods are an estimation of doses or courses of antibiotic per animal. All methods have various caveats to their use; for example, mg/PCU might have the potential to encourage incomplete courses of antibiotics, or selection of antimicrobials based on a low mg/kg dose rate. DDDvet and DCDvet overcome some issues by assigning a standard dose/course rate across products and analysing how many doses or courses are prescribed per animal, however takes no clear account of the total mg of active agent used.

When analysing effective methods of reducing antimicrobial use, it becomes abundantly clear that particular areas of treatment represent a vast proportion of the antimicrobial usage. For example, the usage of a monthly antibiotic footbath would total around 28mg/PCU for a 100 cow dairy farm, an exorbitant figure particularly when considering that a protocol such as blanket dry cow antibiotic therapy for every cow in the herd might total just 4mg/PCU.

Another high contributor to antimicrobial usage is the usage of parenteral antibiotic therapeutics. Adult cow injectable treatments can easily comprise a large proportion of the total antimicrobial usage for a herd, and non-judicious treatments might be an area to target for rapid reductions in total mg/kg antibiotic usage.

It is not uncommon for herds to employ the parenteral usage of antibiotics in an attempt to control non-infectious causes of lameness. By referring to recent literature, a veterinarian may have significant opportunity to greatly reduce antibiotic usage by instead employing NSAID and block treatments for claw horn lesions.

Similarly, the usage of off-license antibiotic footbath solutions to control digital dermatitis represents a vast total in terms of mg/kg, and would be challenging to justify as 'judicious use of antimicrobials'. The disposal of antibiotic footbaths represents an enormous environmental challenge, and the exposure of bacteria within slurry tank storage systems to low doses of antibiotics before agricultural application bears obvious environmental and public health concerns. Alternatives to antibiotic footbaths such as formalin, copper sulphate, and other commercially available products carry their own caveats for use including carcinogenic risks, the promotion of antimicrobial resistance and environmental concerns.

Lameness treatments represent an area where significant reductions in antimicrobial usage might be rapidly achieved by relatively simple changes in protocol. By reducing the use of unnecessary parental antibiotic therapies, and eliminating the use of antibiotic footbaths, proportionally vast reductions in antibiotic usage can be achieved.

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Royal Veterinary College, The Dairy Group and University of Nottingham

THE IMPORTANCE OF GOOD FEET AND LEG CONFORMATION

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INTRODUCTION

Complex cooperative efforts of muscles, tendons, ligaments and bones of the locomotor system enable the functionality of movement. Cattle feet and legs also serve as supportive weight-bearing structures; with feet tissues absorbing most movement associated concussion.

Therefore, optimum feet and leg conformation is required and consists of straight, distant front legs, proving good chest width for strong heart and capacious lung accommodation, with rear legs desirably strong, straight from the rear view and almost perpendicular from hock to pastern when examined from the side. Furthermore, good heel depth is required to promote toes striking the ground during movement, encouraging the hoof wear and subsequently reducing the tendon and ligament strain associated with overgrown feet.

The National Bovine Data Centre (NBDC) has therefore conducted research into the associations between optimum feet and leg conformation and increased production and longevity.

MATERIALS AND METHODS

The data set consisted of pedigree registered heifers classified from January 2000 to December 2002. All lactations completed up to September 2013 were utilised in the analysis with animals only being included if they had completed at least one lactation. This resulted in 97,850 animals being used with an average number of lactations of 3.6.

Feet & Leg Optimum Scores

Feet and leg conformation scoring is conducted by a team of trained Classifiers and scored on a linear scale of 1-9. The scale describes the degree of the trait and not its desirability. Table 1 outlines the optimum feet and leg scores for improved production and longevity.

Table 1 Feet & Leg Optimum Scores

Trait	Optimum Score
Feet & Leg Composite	EX
Rear Leg Side View	4/5
Foot Angle	6
Locomotion	9

Feet & Leg Conformation and Production

This piece of research shows that heifers classified with excellent feet and legs produce an extra 17,451kg more over their lifetime than those classified poor. When broken down by individual linear traits the optimum score 4/5 in rear leg side view can encourage the increased lifetime yield of 10,697kg than those scoring 9 whilst a score 6 for foot angle, can yield an additional 8,954kg than those scoring 1. Furthermore, those scoring 9 for locomotion yield some 16,885kg more over a lifetime than those scoring 1.

Therefore, indicating that improved feet and leg conformation can increase the productivity of heifers throughout their lifetime. This could, in part, be due to the increased longevity of those optimum scoring heifers.

Feet & Leg Conformation and Longevity

Feet and leg conformation has long been associated with an animal's ability to last in the herd. This piece of research concurs in saying that animals scored EX for the feet and leg composite around 1.6 years longer completing an additional 0.9 lactations compared to their graded poor counterparts. When broken down to individual linear traits heifers scoring 5 for rear leg side view lived an average of 1.1 years longer, completing 0.9 lactations more than those heifers scoring 9. Whilst those heifers scoring 6 for foot angle live on average 0.9 years longer completing 0.8 lactations more than those heifers scoring 1. Finally, those animals scoring 9 in locomotion live on average 1.7 years longer, producing for an additional 1.2 lactations than their poorer scoring counterparts at locomotion score 1.

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KICKING OUT DIGITAL DERMATITIS: AN ON-FARM CASE STUDY

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SUMMARY

Digital dermatitis (DD) is a common problem within the UK's dairy herd and a constant challenge on many farms. As our knowledge of DD has grown in the last decade it is now not only possible to bring infections under control but also to keep them under control in the long-term. The aim of this case study was to apply the latest evidence base in terms of the treatment and control of DD to a protocol that can be practically implemented on farm, whilst ensuring the responsible use of antibiotics. The case study was the focus of the recent producer workshops that were run by Kite Consulting as part of the Arla Dairy Farming Strategy.

INTRODUCTION

Since its discovery in 1974 digital dermatitis (DD) has spread rapidly worldwide and is estimated to be present in over 95% of the UK's dairy herds. It is often an ongoing grumbling problem leading to reduced herd performance due to reduced yields, infertility (Argaez-Rodriguez et al., 1997) and an increased susceptibility to other causes of lameness due to changes in hoof conformation (Gomez et al., 2015). It is also a great welfare concern.

Whilst there are still many unanswered questions surrounding DD, there is sufficient evidence base to allow us to control it to low levels on farm. Our greater understanding of the DD cycle with categorisation into the M stages (Döpfer et al., 1997; Berry et al., 2012) has enabled us to identify the key protocols that need to be implemented on farm to break the cycle and achieve control.

The aim of the case study was to present an approach that was not only effective but also practically achievable on farm. Rather than being conducted as a controlled research study, the case study was implemented as it would have been on any farm wishing to follow the protocol, thus allowing for the influences of both farmer (and animal) compliance and the limitations and challenges of applying protocols in a farm situation.

As the protocol itself was aimed at farmers, a simplified version of the M stages was used to define the different lesion stages. Where Active lesions are discussed these refer to the M1 and M2 stages, Healing to M3, Dormant to M4 and Recurring to M4.1 lesions.

The protocol itself had four main components:

1. IDENTIFCATION of all cows with an active/recurring DD lesion
2. BLITZ TREATMENT of infected cows
3. PREVENTION of recurrence/new cases through footbathing and addressing hygiene
4. MONITORING

The aim was to achieve long term control of DD with a target of <1 active or recurring case/100 cows/month.

EVIDENCE BASE FOR THE TREATMENT OF DIGITAL DERMATITIS

The infected cow herself is thought to be the main reservoir of infection when it comes to DD and therefore cows with active or recurring lesions (M1, M2 and M4.1) are considered to be the main infection risk to uninfected cows. Whilst slurry is a very effective transmission medium, it only acts as a very short term reservoir since the survival time of treponemes within the slurry is relatively short (<24 hours at 17°C; Carter, personal communication). Therefore, given the long period of time it takes for an active lesion to develop (Krull et al., 2016) if individual cows with DD are treated 'ad hoc' when lesions are very obvious and the cow is lame, it is likely that the environment will be continuously fed with treponemes, thus constantly maintaining the environmental reservoir.

The aims of 'blitz' treatment i.e. identification and treatment of all cows with active lesions at the same time, is to rapidly reduce infection levels in the environment and thus the risk to uninfected cows. At an individual cow level the aims of treatment are to quickly resolve the infection, whilst minimising the pain to the cow, using antimicrobials responsibly and reducing the risk of further encysting of bacteria. It is well documented that the treponemes that cause DD do not just colonise the surface of the skin, but burrow deeper into the skin, encysting and creating a chronic carrier state. Therefore, following treatment a true bacteriological cure is unachievable in the majority of cases and the aim is to resolve the secondary infection that develops on the skin surface, thus resolving the pain for the animal and also reducing transmission risk.

There are a multitude of different treatments that have been and are currently used for the treatment of DD, however, many of the more commonly used treatments do not satisfy all of the treatment objectives.

Antibiotic footbaths

The footbath has often been viewed as a 'treatment' for digital dermatitis and antibiotic footbaths have commonly been used on farm to bring infections under control, however, the increasing drive to reduce antimicrobial use and consider more responsible use means that they cannot be justified as part of routine treatment/control protocols. Their use falls under prophylactic use of antimicrobials and in addition, the antimicrobial products used in footbaths are not licensed and therefore carry a statutory 7-day milk withhold. Disposal is also a concern due to environmental contamination and a recently reported tool for assessing antimicrobial use on farm demonstrated that their use has the potential to contribute to a large proportion of a farm's overall antibiotic usage (Hyde et al, 2017). For example, using a monthly antibiotic footbath would add 25mg/kg (mg of antibiotic used per kg of livestock) to a farms usage over a year. The overall target per farm is <50mg/kg, therefore, footbathing alone would account for half of this.

Systemic treatment

Although systemic treatment may be more convenient to deliver than local treatment, evidence remains ambiguous as to its benefits (Laven and Logue, 2002). It has been hypothesised that systemic treatment is more likely to result in a bacteriological cure, however, if compared to the treatment of treponeme infections in humans (for example, syphilis and Yaws) it is likely that a true bacteriological cure will only be achieved through very high antimicrobial doses for a prolonged period of time (Evans et al., 2016). Currently the only licensed systemic antimicrobial in the UK is cefquinome and as it is a 4th generation cephalosporin and therefore a Critically Important Antibiotic, whilst licensed, it must be considered whether it's use in the treatment of DD can be considered responsible.

Bandaging

Bandages are commonly used in the treatment of DD with the aim of either keeping a product in contact with the lesion or to keep the area clean and away from slurry contamination. However, there are a number of disadvantages to bandaging: cost, time/inconvenience in removal, risk of injury if not removed, risk of chemical burn if the cow is passing through a caustic footbath, ability for the ideal environment to be created for DD to thrive once the product is no longer active and the inability to visually inspect the lesion to determine if healing is occurring. However, despite these disadvantages and their widespread use, a comparative trial has shown no benefit to bandages when it comes to a successful outcome (Higginson Cutler et al., 2013).

Another consideration when bandaging is why it is necessary. In some instances they may be used to keep a product on the lesion that is either unlicensed (e.g. antibiotic powders) or caustic e.g. copper sulphate pastes. Caustic products such as those containing copper sulphate or zinc sulphate pastes are widely used, however, they are painful for the cow and can be damaging to the raw skin and therefore do not fulfil the treatment objectives. It is also thought that they can encourage the DD bacteria to go deeper into the skin and encyst, creating a chronic carrier state (Döpfer, personal communication).

Topical antibiotic treatments

Whilst many products are used ‘off-label’ for DD, such as tylosin, erythromycin, amoxicillin or lincocin powder, none are licensed in cattle and carry at statutory 7-day milk withhold. Whilst this may be considered ‘low risk’ from a milk contamination perspective, recent research by Cramer and Johnson (2015) suggests otherwise. They found the application of even small quantities (2g) of antibiotic powder to DD lesions results in both contamination of the teats and the milk with antibiotics. Often off-label antibiotics are reached for when the alternative is not deemed to be successful – in this case licensed topical antibiotic sprays e.g. oxytetracycline. When used correctly the licensed topical antimicrobial aerosols fulfil all of the treatment objectives and therefore were the product of choice for use in the case study.

EVIDENCE BASE FOR FOOTBATHING PROTOCOLS

Footbathing has often been seen as a way of treating DD, however, it’s role is very much in prevention; preventing dormant lesions recurring and preventing new lesions forming. Despite the widespread practice of footbathing in the control of DD, there is relatively little evidence to indicate which products are most effective, the ideal frequency for footbathing and also the most effective footbath design. Some of the main points will be summarised below, however, for a full evaluation of the evidence surrounding footbath protocols the author refers you to Bell (2016).

Chemical

Despite the growing list of products available for use in footbaths, there remains very little robust scientific evidence behind the vast majority and where evidence is present it is often focused on treatment rather than control. It is beyond the scope of this paper to systematically evaluate all of the available literature, however, both Bell et al. (2014) and Evans et al. (2016) provide thorough reviews on the subject. As discussed by both, it is difficult to compare studies due to a lack of standardised study design, introducing confounding factors such as frequency of footbathing, randomisation of groups and foot bath design.

Copper sulphate and formalin remain the products for which there is most evidence base and are also the most commonly used on farm in the UK (author's own data). Anecdotally both are deemed effective in the control of DD when used at concentrations of 1-5% for formalin and 2-5% for copper sulphate. It should be noted that formalin was upgraded to a category 1b carcinogen from 1st January 2016 and therefore training must be provided to all of those handling it and stringent health and safety measures implemented.

Footbath Design

The aim of the 'optimal' footbath design is to ensure maximum contact with the disinfectant, minimise disruption to cow flow and minimise contamination. Despite the importance of design in the effectiveness of the footbath (and farmer compliance in ensuring it is carried out), no studies that have evaluated the effect of design on the control of DD. There are conflicting views as to whether footbaths should be long and narrow to increase the number of foot immersions (Cook et al., 2012) or short and wide to maximise cow flow (Chesterton, 2013). However, in the author's experience both increased immersions and good cow flow are achievable with a long and narrow bath, maximising the effectiveness of the footbath whilst reducing the amount of solution required, and therefore cost.

THE PLAN IN ACTION: CASE STUDY AT MARCROSS FARM

Farm Background

Marcross farm is located in the Vale of Glamorgan, South Wales and consists of 150 Holstein adult cows with followers. The milking herd is divided into high and low yielders and both are housed all year round in cubicle housing on mattresses and sawdust with automatic scrapers fitted in both the feed and cubicle passageways. The herd is milked twice a day and averages 9,000 litres/cow/year.

DD had been an ongoing problem on the farm for a number of years and despite the farmer's best efforts it continued to be a background issue for the herd and was the most common lesion recorded by the foot trimmer.

1. Identification of cows with DD

In mid-August 2016, a DD score was carried out in the parlour to identify all adult cattle (lactating and dry) with a DD lesion. Due to difficulties in accurately staging lesions in the parlour this was carried out on a yes/no basis. Hind feet were first washed with a low-pressure hose and then visually inspected with use of a torch and mirror.

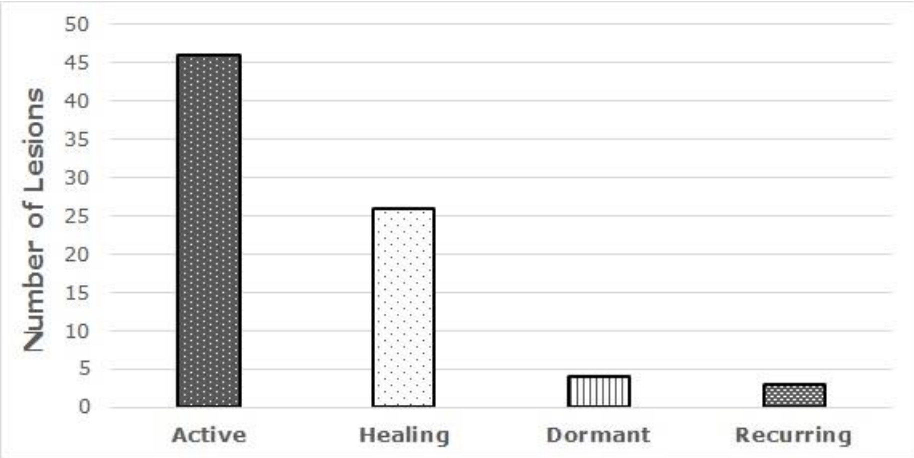
2. Blitz treatment of infected cows

All cows that had been identified as having a DD lesion during the parlour score were subsequently examined in a foot trimming crush on the same day. Both hind feet were inspected, regardless of whether they had been identified as having a lesion on one or both hind feet. Lesions were classified as active, healing, dormant or recurring. The results were as follows:

- 37% of the adult herd had a DD lesion (active, healing, dormant or recurring)
- 27 cows had a lesion on just one hind foot, 26 cows had lesions on both hind feet

- Of the 79 lesions present the breakdown by stage was (Figure One):
  - 46 Active
  - 26 Healing
  - 4 Dormant
  - 3 Recurring
- 1 in 6 (17%) hind feet had an active or recurring lesion

Figure One: Lesions present at the start of the case study.



All active and recurring lesions were treated with topical oxytetracycline spray (Engemycin Spray 25mg/ml, MSD Animal Health) following the protocol below:

1. Lesion washed with clean water (including interdigital space).
2. Lesion gently dried using swabs.
3. Lesion thoroughly sprayed with licenced topical oxytetracycline spray.
4. Left to dry for 30 seconds.
5. Lesion sprayed again and foot lowered.
6. Following treatment cows returned to cubicle housing.

Treated cows were re-examined in the foot trimming crush for two further consecutive days with repeat treatments given if necessary. Footbathing was not carried out during the 3-day treatment period. At the end of the treatment period 8 of the initial 49 lesions had not progressed fully to the healing stage and the farmer was advised to continue daily treatment for a further 3 days and to ensure that these individual cows did not go through the footbath whilst they were still being treated.

3. Prevention of recurrence: Footbathing and hygiene

The farm's original footbath was 2m long and cows were only achieving 2 full immersions of one hind foot and one immersion of the other hind foot. The bottom of the footbath was slightly raised from ground level and as a result cows were hesitant to pass through it resulting it being heavily contaminated at the end of each use and it was also difficult to clean out in between. Prior to the start of the study the milking herd was being foot bathed four times a week in 5% formalin and once a week in a 1% sodium hypochlorite solution. Dry cows were not foot bathed.

In order to maximise the number of foot immersions whilst minimising the amount of chemical used, a long narrow footbath design was preferred. A new permanent concrete footbath was built on the exit of the parlour according to The Dairyland Initiative

Footbath Blueprint. It was 4m long and 60cm wide with a 26cm high entrance and exit step. The base of the footbath was at the same level as both the entrance and exit levels. To aid emptying a 4 inch drain pipe was set into the exit step and a 4 inch drain bung was used to seal this during use. An overflow pipe was set at 10cm from the base of the footbath as a filling guide so the footbath could never be overfilled and thus diluted. It was also recommended that sloping sides were placed along the side of the bath to ensure that cows did not walk along the sides of the bath and that stock boarding was placed along the race sides to encourage cow flow.

After the initial 3-day treatment period footbathing was initiated again. Formalin was the product of choice on the farm due to cost and familiarity with its use. Daily footbathing of the milking herd with 2.5% formalin was recommended, however, the farmer wished to continue with 5% formalin. Twice weekly footbathing of dry cows was also recommended.

Hygiene was improved through more thorough scraping around water troughs and cross over points and by increasing the amount of sawdust applied to the cubicles.

4. Ongoing monitoring

To identify new or recurring lesions repeated monitoring during milking at 4-6 week intervals was recommended.

THE OUTCOME AT MARCROSS FARM

To evaluate the long-term effectiveness of the outlined protocol the herd was reviewed 6 weeks after the initial treatment period (September 2016) and then again at 5 months (January 2017). At each review a DD score in the parlour was undertaken and the following day all cows that had previously had a DD lesion were inspected, as well as any suspected new cases.

6 week review

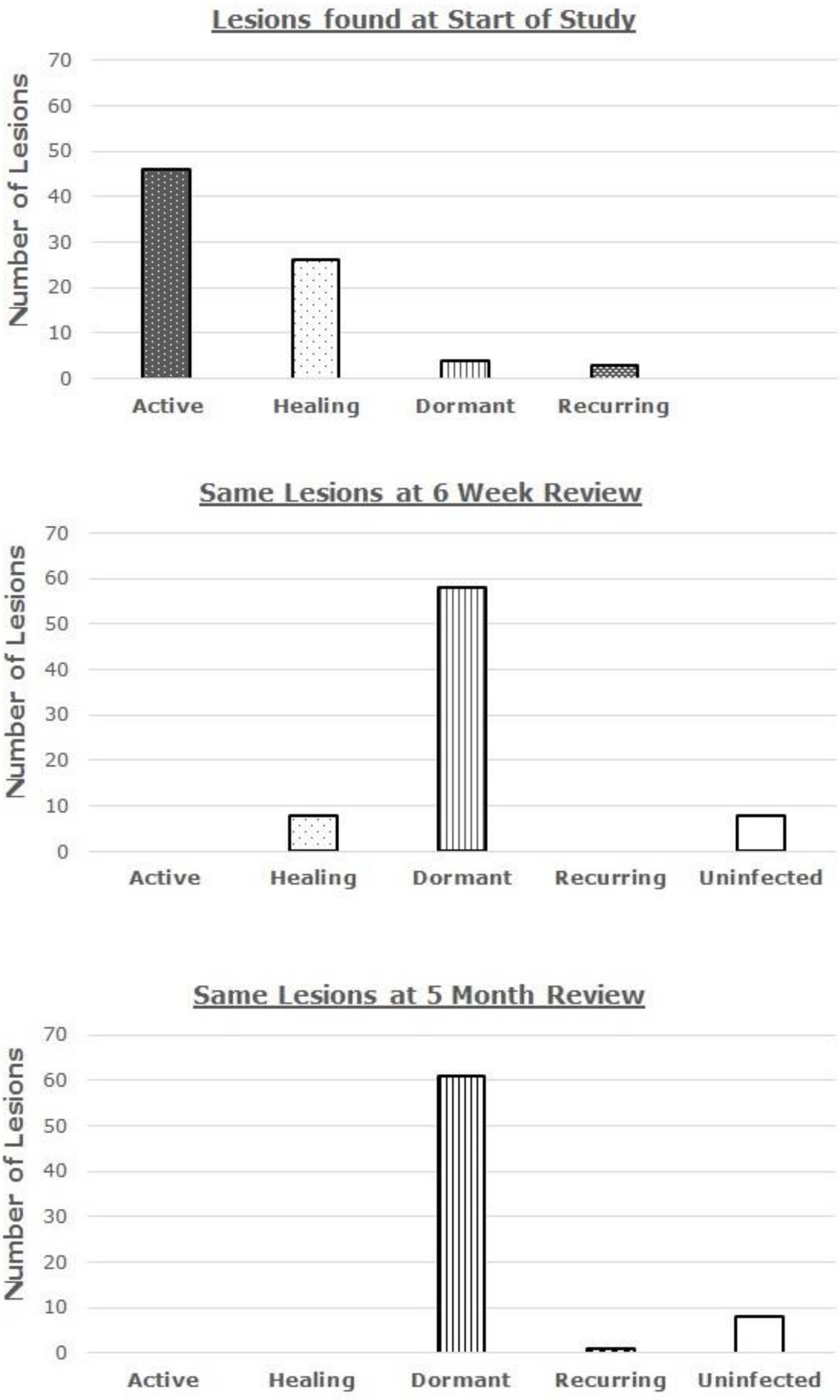
All cows that had previously had active or recurring lesions had progressed to a healing, dormant or uninfected stage. No active or recurring cases had been identified either during the regular parlour monitoring or by the foot trimmer during his fortnightly visits. However, three new active lesions were identified on previously uninfected cows, two of which had recently calved. Although footbathing of dry cows had been recommended, it had not yet been instigated due to time pressures.

5 month review

One recurring lesion was identified in the group of cows that had previously had lesions at the start of the case study. No new cases were identified in previously uninfected cows and no active or recurring cases had been identified during the regular parlour monitoring or by the foot trimmer during his fortnightly visits.

Figure Two shows the lesion stages present at the start of the case study and then the same lesions at both the 6 week and 5 month reviews. Table One shows the number of active and recurring lesions at each visit.

Figure Two: Stages of lesion found at initial inspection and then at each review.



NB: At each review some cows were not presented because they had either recently calved or left the herd.

Table One: Number of active and recurring lesions found at each visit.

	Number of Active or Recurring Lesions	Number of Cows with Active or Recurring Lesions	% of Hind Feet with Active or Recurring Lesions
Start of Study: Day 1	49	37	17%
6-week Review: Day 44	3	3	1%
5-month Review: Day 142	1	1	0.3%

CONCLUSIONS

DD is a constant challenge for many farms and as well as being a welfare concern it impacts on productivity of the herd. By tacking a systematic approach to the identification and blitz treatment of all cows with active lesions infection levels can be rapidly reduced. Appropriate measures must then be put in place to improve hygiene and ensure effective footbathing for long-term control.

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METATARSAL EXOSTOSES – ANOTHER POTENTIAL CAUSE OF CHRONIC LAMENESS IN CATTLE

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INTRODUCTION

The concept of exostoses being associated with lameness was first proposed by Rusterhotlz (1920) in relation to sole ulcers. Exostoses on the pedal bone have been associated with age and chronic lameness (Zantinga 1973; Greenough 1981; Blowey 2012a) and cows with sole ulcers were found to have a greater thickness at the flexor tuberosity of the pedal bone (Blowey 2012a). Others have followed up this work using CT scanning (Newsome et al., 2016). More extensive exostoses have been associated with so called 'non-healing' lesions associated with chronic digital dermatitis infections of hoof lesions (Blowey 2012b). The current study discusses the development of exostoses on the caudal aspect of the metatarsal bone.

MATERIALS AND METHOD

Feet were cleaned, boiled for 8 hours, gently lifted out of the water (to prevent disintegration) and then cooled. Once cooled soft tissues were removed, allowing detailed examination of the bones beneath. This was the method used to identify previously reported P3 exostoses; that pedal bone size varied considerably between cows; and the need to allow a longer dorsal wall (Blowey and Inman 2012). The current preliminary survey of exostoses on metatarsal bones was conducted on a selection of cows of unknown history but with pronounced pathology within the foot.

RESULTS AND DISCUSSION

The metatarsal exostoses were found only on the caudal aspect. No cows were identified with exostoses on the cranial aspect of the metatarsal.

Exostoses were less common close to the fetlock joint, and often first appeared 50 – 70mm above the epicondyles. They were more pronounced on the lateral as opposed to the medial aspect. The flexor tendons are encased in a tendon sheath as they pass over the posterior aspect of the fetlock joint and distal end of the metatarsal (Konig and Liebig 2004) and so it is hypothesised that the exostoses are associated with either infection and/or inflammatory mediators tracking up the tendon sheaths from infected or inflamed pedal bones. Where the tendon sheath has ended, 'unsheathed' tendon passing over rough exostoses is likely to cause chronic pain. We propose that this is a further reason to promote early and effective treatment of hoof lameness.

This is therefore a potential welfare issue and another important reason why lameness should be prevented. Any treatment that might potentially reduce the development of metatarsal exostoses, for example NSAID's, should be administered to cows affected by chronic conditions of the foot such as infected sole ulcers. NSAID's are used in the treatment of 'heel spur', a similar condition of the metatarsal bone in man (Davis et al., 1994). The higher prevalence and greater severity of the exostoses present on the lateral aspect of the caudal mid shaft presumably reflects the greater frequency of infection of the lateral compared to medial digit, although the lateral and medial flexor tendons are joined at the proximal metatarsal region. We hypothesise that the absence of exostoses on the cranial aspect of the metatarsal is due to ascending infection of the extensor tendon being less common. We are unaware of previous reports of metatarsal exostoses.

ACKNOWLEDGEMENTS

Sharon Cooksey, who drew our attention to the anatomy of the tendon sheaths.

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BOVINE ISCHAEMIC TEAT NECROSIS: ANOTHER ROLE FOR DIGITAL DERMATITIS TREPONEMES?

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INTRODUCTION

There have been increasing numbers of reports of digital dermatitis (DD) treponemes having been identified at different sites in cattle (Sullivan *et al* 2014a) and in different species such as CODD in sheep (Demirkan *et al* 2001) and goats (Sullivan *et al* 2014b), tail biting in pigs (Clegg *et al* 2014a) and feet in Elk (Clegg *et al* 2014b). In cattle, lesions of ischaemic teat necrosis (Blowey 2004), have been shown to be infected with DD treponemes (Clegg *et al* 2016) and there have recently been anecdotal reports of an increase in reported cases.

LESION DESCRIPTION

Typical cases start as an area of dry, thickened and encrusted skin on the medial aspect of the base of the teat, where the teat joins the udder, in some cases with a foetid odour. The erosion spreads down the teat, often causing intense irritation, which in turn leads to more severely affected animals removing the entire teat by self-trauma. The condition appears to be more common in higher yielding first lactation animals in early lactation, with some herds reporting a loss of up to 20% of their heifers each year. Due to the severity of ITN and the substantial economic costs to the industry, studies are required to identify effective targeted preventive measures

CURRENT STUDIES

There are currently two ongoing studies in the UK to investigate this disease. Al Manning at the Royal Veterinary College and Hayley Crosby-Durrani at the University of Liverpool.

The aims of these studies are:

- To find the risk factors involved in the development of the disease
- To categorised the pathology of the disease
- To find the potential cause(s) of the disease
- Investigate potential treatment/control methods

Help is needed to identify and investigate further cases on farm. If you think you have a case please contact the authors:

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initially with pictures to confirm the diagnosis. Sampling instructions and further study details will then be supplied.

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NON-HEALING LESIONS: FACT OR FICTION?

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OBJECTIVE

To describe a cases series in which cows perceived as having 'non-healing claw lesions' are therapeutically trimmed and then observed for a minimum period of 8 months to assess healing, improvement in mobility and survival in the herd.

CASE DEFINITION

A total of 9 cows from two farms that were identified by the farmer as either being chronically lame (>4 weeks duration) or having been repeatedly treated with no or limited success.

TREATMENT PROTOCOL

1. All cows were trimmed according to the 5-step Trimming Method.
2. Anaesthesia of the affected limb was achieved through intravenous regional anaesthesia (IVRA).
3. All loose horn was removed from around the lesion and, where necessary, necrotic tissue removed. The margins around the lesion were thinned so that they were supple.
4. The lesions were treated with topical antibiotics (oxytetracycline spray).
5. A pressure bandage was applied for a maximum of 6 hours for haemostatic purposes only.
6. The partner claw was blocked, with a single or double block used as necessary to achieve complete rest of the affected claw.
7. Non-steroidal anti-inflammatory (NSAID) cover was provided for 72 hours.

RESULTS

In all cases the lesion healed, defined by new healthy horn production over previously exposed corium and/or pedal bone. At end of observation period the previously affected wall horn of all wall ulcers and axial wall cracks appeared to have fully repaired with no visible weaknesses and no recurrence in the lesion. All cows showed a marked clinical improvement in mobility. One cow was culled during the observation period due to non-lameness related factors.

CONCLUSION

All cows enrolled in the case series showed a clinical improvement in lameness. These cows will continue to be observed for future lesion development and the pedal bones examined for abnormal bone growth/damage when the cows leave the herd. Amputation is an alternative treatment for these lesions and further case comparison between treatment options is required to determine which is more preferential when recovery time, cost of treatment, future production and survivability are taken into account.

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MAINTAINING STANDARDS: FIELD AUDITS FOR PROFESSIONAL CATTLE FOOT TRIMMERS

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BACKGROUND

Cattle foot trimmers are an integral part of the team in maintaining claw health on farm. Despite this there remains no formal requirement to undergo training or achieve a certain standard before becoming a professional cattle foot trimmer. There are two recognised qualifications in the UK which trimmers can voluntarily work to achieve: the Dutch Diploma and the City & Guilds NPTC Level 3 in Certificate of Competence in Cattle Foot Trimming. However, having obtained one or both qualifications, there is no field auditing process to ensure that these standards are maintained, or updated in line with latest research findings.

An audit is a 'systematic, independent and documented process for obtaining evidence and evaluating it objectively to determine the extent to which required criteria are fulfilled' (International Organization for Standardization, ISO). Field audits are a more robust way of determining habitual practices in comparison to an examination situation where behaviours may be more selective and not reflect day-to-day practices. In the veterinary field a dual assessment and field audit approach is used to achieve and maintain consistent standards for TB testing by the Animal Plant & Health Agency (APHA).

MATERIALS AND METHODS

An enhanced field audit programme of cattle foot trimming was introduced in September 2016 by the Cattle Hoof Care Standards Board (CHCSB). A set of Standards for Professional Foot Trimmers was produced based on evidence base whenever possible and incorporated biosecurity, professionalism, health and safety, communication with the farm team and preventive and therapeutic trimming. Those participating in the field audit programme were members of the CHCSB who already obtained the Dutch Diploma and/or the NPTC Level 3 Qualification.

Participants were asked to provide a week's diary in advance and audits took place unannounced during this time with prior consent from the farmer. The same City & Guild NPTC Level 3 Certified Assessor undertook all of the audits (NJB). The Assessor was present on farm for approximately 1.5 hours in order to ensure that all areas of The Standards could be assessed. Assessment of record keeping and confidential farmer feedback in the form of a questionnaire also formed part of the auditing process.

The results of the audit itself was recorded on an assessment sheet with scores given for individual elements of The Standards: 1= critical problem, 2 = deficient, 3 = minor, 4 = meets or exceeds expectation with no faults detected. At the end of the audit, all elements were discussed with the trimmer and a written appraisal provided, detailing any issues raised during the audit. The overall outcome of the audit was given as a Pass or Fail. Should a trimmer fail to pass the audit then a further assessment would be undertaken at an interval of no less than 3 months.

RESULTS

Between October 2016 and March 2017 a total of nine field audits were undertaken. The auditor was present on farm for approximately 1.5 hours enabling full evaluation of all relevant aspects of The Standards in a field situation. The auditing process took place with permission of owner, added some time to the trimmer's expected time on farm as cows trimmed earlier were retrieved and examined. None-the-less, the field auditing programme was well received by the farmers involved with no farmers refusing to allow the auditing process to take place on their farm. All participants achieved the level required as detailed in The Standards.

CONCLUSION

There is a requirement in the UK for a more formal and robust regulation of foot trimming to ensure that all trimmers not only are qualified to a recognised standard, but maintain this. This is even more important as the evidence base for foot trimming increases to ensure that all farmers (and their cows) benefit from a foot trimmer who is not only qualified but is also updating their practices according to the latest research recommendations on preventive and therapeutic trimming.

Previously there has been no field audit system for trimmers in the UK. The field auditing programme being undertaken by the CHCSB offers an in depth and practical way of assessing cattle foot trimming in the trimmer's own environment, with assessment of a greater range of areas than can be assessed during an examination situation.

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International Organization for Standardization www.iso.org.uk

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LELY METEOR – A TOTAL HOOF HEALTH APPROACH FOR AUTOMATIC MILKING SYSTEMS

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SUMMARY

In this abstract the effect of a new approach for improving hoof health on farms with automatic milking systems is evaluated. The study shows that Lely Meteor is effective for reduction of Digital Dermatitis.

INTRODUCTION

Hoof health has an impact on cow behavior and this impact is often underestimated by the dairy farmer. Currently poor hoof health is one of the main reasons for culling dairy cows. In 2016 Lely developed a total hoof health approach for farms with an automatic milking system. The approach, called the Lely Meteor, consists of various aspects; hoof treatment, hoof spraying- for cleaning and disinfection in the milking robot and a mobile sprayer for young stock and dry cows. The approach initially focusses on curing the present lesions and thereafter on the prevention.

RESEARCH TOPIC AND STRATEGY

The aim of this study is to demonstrate the effect of Lely Meteor on Digital Dermatitis under milking cows for 1) Hoof treatment in the treatment box and 2) The effect of the total approach over time. Data was analysed with statistical software package R (R 3.2.4, R Core Team (2016), Austria). A difference in proportions test was used to determine the changes in percentage of milking cows with Digital Dermatitis between the first trimming session and the treatments.

RESULTS

For the first objective, a group of 99 milking cows was trimmed and inspected for Digital Dermatitis. All lesions were treated with Lely Meteor balm and bandages applied. Treatment was actioned according to 0-tolerance strategy whereby all lesions including very small ones were treated. After 7 days the lesions were re-examined. Treatment was repeated until all lesions were successfully cured. The percentage of cows with Digital Dermatitis reduced by 40% in the first week and within a month all lesions were cured.

For the second objective a study was carried out from November 2015 until December 2016 on 3 dairy farms with 2 automatic milking systems (Lely Astronaut A4) all with a herd size of approximately 120 milking cows per farm. The automatic sprayers were put into operation after the first hoof trimming session. At the beginning of the experiment all cows were trimmed, treated and scored in the same way as for the first objective. All cows were checked again after 4 months. The proportion of rear hooves with Digital Dermatitis reduced, varying between 16% and 44%. Two farms were checked again after a year, resulting in a reduction of 13% - 34% Digital Dermatitis cases compared to before installation of the Lely Meteor. For 1 farm, an increase in Digital Dermatitis cases was observed after 1 year, compared with the first 4-month observation. The increase could be explained by changes in the management strategy of this farm, even though the effect of the Lely Meteor is clearly observed by farmer and hoof trimmers. For hoof health it is important to stay critical on other influencing factors to keep Digital Dermatitis under control.

CONCLUDING REMARKS

Lely Meteor shows a significant effect on curing Digital Dermatitis lesions. By cleaning and disinfecting in the milking robot you can control the long-term effects of herd hoof health. The approach is an effective solution for improving hoof health on dairy farms with automatic milking systems, keeping in mind the multifactorial approach.

USING YOUR HERD AS A MOBILITY MONITOR

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Being able to use herd software to capture and interpret data is a key element of any producer's day to day farm management. With this in mind the Cattle Information Services (CIS) YourHerd program has the capability to record individual animals' mobility score along with any lameness incidences and treatments, routine trims and actions.

Using the AHDB Dairy Mobility Score of 0 -3 the value of inputting the scores on a regular basis comes with then using the data – going back to the mantra of if you measure it you can manage it – the same is true of mobility. Scores can be inputted as routinely as the producer wishes, with the option of also recording other welfare measures such as cleanliness and Body Condition Score.

Action lists for hoof trimmers and vet visits can be produced, while tracking of trends and recovery times can also be achieved via the report menus. All resources which relate to mobility and lameness are delivered under the banner of Mobility Monitor – as we are all aware it is when the data is used that the value increases.

ACCESS TO INFORMATION

As with all aspects of the YourHerd program, producers have the option to allow those who work alongside them to manage the health and welfare of the herd, including vets, breeding advisors and nutritionists, to view the data and reports. Again, this can aid with the use and value of the data to the health of the herd. The option to plot mobility against differing parameters, such as yield or parity, can give insight into areas where further investigation of management practices may be needed.

By ensuring that producers can marry all information back to individual animals while also allowing for herd 'pictures' to be seen is a key deliverable for the program and in turn this will benefit the health of the national herd.

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