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# Factors influencing the attitudes of cattle veterinarians, farmers, and claw trimmers towards the pain associated with the treatment of sole ulcers and the sensitivity to pain of dairy cows

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## ABSTRACT

This study assessed the attitudes of personnel involved in therapeutic claw trimming of dairy cattle in Switzerland towards pain associated with sole ulcers and their treatment. Data from 77 farmers, 32 claw trimmers, and 137 cattle veterinarians were used. A large range of factors were associated with whether the respondents thought that anaesthesia during the treatment of sole ulcers was beneficial; these included year of graduation, work experience, attitude to costs of analgesia, perception of competition between veterinarians and claw trimmers, estimation of pain level associated with treatment, estimated sensitivity of dairy cows to pain, knowledge of the obligation to provide analgesia, and whether the respondent thought lesion size and occurrence of defensive behaviour by the cow were important.

Respondents' estimation of the pain level associated with sole ulcer treatment was linked to frequency of therapeutic claw trimming, age, farmers' income, estimated knowledge of the benefits of analgesia, and estimated sensitivity of dairy cows to pain. The latter factor was associated with profession, frequency of therapeutic claw trimming, capability of pain recognition, opinion on the benefits of analgesia, knowledge of the obligation to provide analgesia, and self-estimation of the ability to recognise pain. Improving the knowledge of personnel involved in therapeutic claw trimming with regard to pain in dairy cows and how to alleviate it is crucial if management of pain associated with treatment of sole ulcer and the welfare of lame cows are to be optimised.

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## Introduction

Claw lesions are among the most important causes of lameness in dairy cattle (Weaver et al., 1981), which means that painful therapeutic claw trimming is a frequent intervention. Although lameness has a significant impact on well-being and productivity (Whay et al., 1997; Green et al., 2002), the prevalence of lameness is still high across much of Europe and North America with prevalences of >30% reported in several studies (Amory et al., 2008; Bicalho et al., 2009; Dippel et al., 2009). In Switzerland, lameness prevalence seems to be lower than these reports, with Becker et al. (2014) reporting a mean prevalence of 15% based on a survey of 1449 cows from 78 dairy farms.

The most commonly identified claw horn lesion in Swiss dairy cows is the sole ulcer, which was found in 12% of all investigated cows (Becker et al., 2014). Treatment of sole ulcers consists of removal of the undermined horn in the area of the ulcer with a hoof

knife with the aim of preserving as much of the pododerm as possible. However, in most cases, the pododerm at the border of the ulcer is severed, causing both immediate and postoperative pain as well as local bleeding.

In Switzerland, there is a requirement for analgesia to be provided by an appropriately trained person during any painful intervention in animals (Anonymous, 2005a, 2005b). Thus, analgesia has to be administered by a veterinarian for any painful intervention involving the pododerm. In a previous study evaluating therapeutic claw trimming in Switzerland (Becker et al., 2013) compliance with this regulation was shown to be low. In more than half of the herds, painful therapeutic claw trimming was always performed without veterinary involvement, i.e. without analgesia, and most claw trimmers (84.4%) treated sole ulcers without consulting a veterinarian. Even when the veterinarian was involved, compliance remained low with only 33% of Swiss cattle veterinarians stating that they always used local anaesthetic when they treated sole ulcers. This lack of compliance diverges not only from Swiss law, but also from the expectation of strict compliance with animal welfare legislation within Swiss society

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(Brandenberg, 2007), and the farmers' opinion in regard to the importance of reducing pain to the lowest possible level (Becker et al., 2013).

Pain management in farm animals has not made the same rate of progress as in companion animals (Anil et al., 2005). The chief difficulty is that the pain experienced by an animal can only be adequately alleviated if it has previously been identified and assessed (Anil et al., 2005), and adequately recognising and evaluating pain in cattle remain a challenge (Phillips, 2002). Furthermore, adequate tools for exact measurement of pain (particularly chronic pain) in this species are still lacking (Anil et al., 2005; Viñuela-Fernández et al., 2007). As our previous analysis (Becker et al., 2013) showed, adequate pain management in farm animals, particularly in relation to lameness, requires close collaboration between farmers, claw trimmers, veterinary technicians and veterinarians.

In order to better understand the factors influencing the decisions made in regard to pain management during therapeutic claw trimming, data from the questionnaire reported by Becker et al. (2013) were analysed, focussing on the factors associated with the attitudes of the respondents towards pain management during a commonly performed painful intervention in the area of the feet, i.e. the excision of tissue around a sole ulcer.

## Materials and methods

### Data assessment

A detailed description of the scope of the questionnaires, the data assessment and the main descriptive results has already been reported (Becker et al., 2013). In brief, from June 2010 until February 2011, claw trimmers belonging to the Swiss Federation of Claw Trimmers and their farmer clients were personally interviewed, while Swiss veterinarians whose workload was >50% farm animals (of which >80% had to be cattle) were invited to fill in an online questionnaire. This resulted in data from 137 Swiss veterinarians, 32 claw trimmers and 77 farmers.

This analysis focused on the treatment of sole ulcers involving the pododerm and on the respondents' estimation of the sensitivity to pain of dairy cows, in order to identify the factors potentially associated with the attitudes of the respondents to (1) the benefit of local anaesthesia during sole ulcer treatment; (2) the level of pain caused by this intervention (without analgesia); and (3) the sensitivity to pain of dairy cows. For (1), the analysis was based on whether the respondent answered 'yes, it is reasonable' or 'no, it is not reasonable'. For (2), the level of pain was scored using a scale from 1 (no pain) to 10 (most severe pain possible), but the data were analysed on the basis of whether the respondent scored the pain as >5/10 or ≤5/10. For (3), a 1 (no sensitivity) to 10 (highest sensitivity) scale was used.

### Statistical analyses

Data were analysed with NCSS 2007 using logistic and multiple regression models. Each question of interest was examined for each group (i.e. veterinarian, farmers, and claw trimmers) separately as well as together (see [Supplementary data](#) for variables examined for each group). The association between each variable and the response variable was evaluated initially using a univariable model. In a second step, those variables where  $P < 0.25$  were further investigated in a multivariable model. To build the final model, variables were eliminated using forward selection until all variables retained were significant ( $P < 0.05$ ) or identified as being confounders that needed to remain in the model (Hosmer and Lemeshow, 2000).

## Results

**Benefit of local anaesthesia during the excision of sole ulcers ('Is the administration of local anaesthesia reasonable during this intervention or not?' 'Yes, it is', 'No, it is not')**

### All professions

The following factors were associated with an attitude supporting the administration of local anaesthesia: (1) importance of defensive movements occurring in the cow under therapy during decisions about whether to administer anaesthesia or not (Cat 2: OR = 6.38,  $P = 0.005$ ; Cat 3: OR = 6.17,  $P = 0.003$ , respectively); (2) a higher estimated sensitivity to pain (OR = 1.53,  $P = 0.002$ ); and (3) a higher estimated level of pain caused by the excision of a sole ulcer without analgesia (OR = 1.68,  $P < 0.0001$ ).

Respondents who did not agree with the statements 'withdrawal times of analgesics drugs are a large concern for farmers' (OR = 4.16,  $P = 0.002$ ), and 'if there are no defensive movements, there is no need for analgesia during treatment of claw lesions involving the pododerm' (OR = 5.08,  $P < 0.0001$ ), also considered local anaesthesia as reasonable more frequently (it was only possible to agree or disagree with each statement). The longer the respondents had worked with dairy cows, the less frequently they supported the administration of local anaesthesia during the intervention of interest (OR = 0.22,  $P = 0.001$ ).

### Veterinarians

Knowledge of the obligation to provide analgesia for painful interventions during therapeutic claw trimming (OR = 5.0,  $P = 0.023$ ), a higher estimated sensitivity to pain of dairy cows (OR = 2.78,  $P = 0.001$ ), and a higher estimated level of pain caused by the excision of a sole ulcer if performed without analgesia (OR = 1.71,  $P = 0.012$ ) were associated with a supportive attitude to the benefit of local anaesthesia. Veterinarians who felt they were in competition with the claw trimmers (OR = 0.1,  $P = 0.005$ ), and those who had graduated longer ago (OR = 0.09,  $P = 0.004$ ) disagreed more frequently with the benefit of administering local anaesthesia during the excision of sole ulcers.

### Farmers

Farmers who estimated a higher level of pain caused by this intervention if performed without analgesia more frequently considered the administration of local anaesthesia during this intervention as reasonable (OR = 2.07,  $P = 0.001$ ). Respondents who considered only categories of <16 CHF<sup>1</sup> as an acceptable cost of managing pain whilst excising sole ulcers, judged local anaesthesia during this intervention less frequently reasonable (OR = 42.43,  $P < 0.0001$ ).

### Claw trimmers

The more respondents used the diameter of lesion as a decisive criterion whether to call for the veterinarian to administer local anaesthesia or not (OR = 13.62,  $P = 0.035$ ), the more frequently they had a supportive attitude. Furthermore, those who disagreed with the statement 'withdrawal times of analgesic drugs are a large concern for farmers' (OR = 34.93,  $P = 0.012$ ) were more frequently of the opinion that local anaesthesia during this intervention was reasonable.

Table 1 contains more detailed information on the factors associated with the respondents' opinions towards the benefits of local anaesthesia during the excision of sole ulcers.

**Pain caused by the excision of a sole ulcer if performed without analgesia estimated from a scale from 1 (none) to 10 (most severe)**

### All professions

Respondents who judged the sensitivity to pain of dairy cows to be generally higher, estimated the level of pain caused by the excision of a sole ulcer to exceed 5/10 more frequently (OR = 1.64,  $P < 0.0001$ ).

### Veterinarians

Respondents who estimated the sensitivity to pain of dairy cows to be generally higher (OR = 1.85,  $P = 0.008$ ), performed the excision of sole ulcers less frequently (OR = 8.11,  $P = 0.03$ ), and those of lower age (OR = 10.15,  $P = 0.037$ ) judged the level of pain caused by the excision of a sole ulcer more frequently to exceed level 5/10.

### Farmers

A higher estimated sensitivity to pain of dairy cows (OR = 1.46,  $P = 0.04$ ) as well as an income by dairy farming of less than 50%

<sup>1</sup> 1 CHF = approx. UK£0.70, US\$1.06, €0.81 at 13 July 2013.

**Table 1**

Final logistic regression model for the attitudes of veterinarians, farmers, and claw trimmers towards the benefit of local anaesthesia during the excision of sole ulcers.

Variable	Odds ratio	Lower 95% CL	Upper 95% CL	P-value
<i>Among all professional groups</i>				
Years working with dairy cattle Cat 2 $\geq 20 < 40$ years	0.21742	0.09190	0.51435	0.00051
Sensitivity to pain of dairy cows	1.53056	1.17355	1.99618	0.00168
Level of pain	1.67597	1.34027	2.09577	0.00001
Importance of defensive movements Cat 2 = 4–7	6.37879	1.73730	23.42082	0.00523
Importance of defensive movements Cat 3 = 8–10	6.17492	1.85971	20.50304	0.00295
Problem of withdrawal times Cat 2 = 'no'	4.15977	1.67151	10.35211	0.00218
No analgesia if defensive movement missing Cat 2 = 'no'	5.07949	2.26207	11.40602	0.00008
<i>Within veterinarians</i>				
Year of graduation Cat 2 = 1990 or older	0.08991	0.01774	0.45560	0.00362
Knowledge of obligation Cat 2 = 'correct'	5.00083	1.24567	20.07620	0.02322
Sensitivity to pain of dairy cows	2.77535	1.52334	5.05639	0.00085
Level of pain	1.70699	1.12546	2.58899	0.01187
Importance of competition Cat 2 > 1	0.09773	0.01941	0.49206	0.00480
<i>Within farmers</i>				
Level of pain	2.06867	1.32913	3.21970	0.00128
Category of costs Cat 2 $\geq 16$ CHF	42.42837	6.66722	270.00274	0.00007
<i>Within claw trimmers</i>				
Importance of diameter Cat 2 = 4–7	13.61900	1.20065	154.48118	0.03507
Importance of diameter Cat 3 = 8–10	3.87511	0.35148	42.72382	0.26867
Problem of withdrawal times Cat 2 = 'no'	34.93200	2.20901	552.39429	0.01165

CL, confidence limit; Cat, category.

(OR = 16.36,  $P = 0.021$ ) was positively associated with an estimated pain level exceeding level 5/10.

#### Claw trimmers

Respondents who performed routine claw trimming on more than 1500 dairy cows per year considered the provoked pain less frequently to exceed level 5/10 (OR = 0.12,  $P = 0.036$ ). Those who disagreed with the statement '*I lack information about the possible benefits of pain management*' considered pain more frequently to exceed level 5/10 (OR = 12.83,  $P = 0.015$ ).

More detailed information about the factors associated with the estimates of pain caused by the excision of a sole ulcer if performed without analgesia is presented in Table 2.

*Sensitivity to pain of dairy cows estimated from a scale of 1 (no sensitivity) to 10 (highest sensitivity)*

#### All professions

Respondents who considered themselves less good at recognising pain in dairy cattle also considered the sensitivity to pain of

dairy cows to be lower (RC =  $-0.62$ ,  $P = 0.003$ ). Farmers (RC =  $-1.18$ ,  $P < 0.0001$ ) and claw trimmers (RC =  $-1.14$ ,  $P = 0.0002$ ) considered the sensitivity to pain to be lower than did veterinarians.

#### Veterinarians

Respondents who had knowledge of the obligation to provide analgesia during painful interventions in the feet considered the sensitivity to pain to be higher (RC = 0.66,  $P = 0.011$ ).

#### Farmers

Respondents who performed painful interventions in the feet of their dairy cows more frequently by themselves considered the pain sensitivity to be lower (Cat 2: RC =  $-1.14$ ,  $P = 0.011$ ; Cat 3: RC =  $-0.99$ ,  $P = 0.03$ , respectively).

#### Claw trimmers

Respondents who recognised more pain indicators in lame cows considered the sensitivity to be higher (RC = 0.33,  $P = 0.034$ ). Those who disagreed with the statement '*the general condition of dairy*

**Table 2**

Final logistic regression model for the respondents' estimation of the pain level caused by the excision of a sole ulcer if performed without analgesia to exceed level 5/10, estimated on a scale from 1 (none) to 10 (most severe).

Variable	Odds ratio	Lower 95% CL	Upper 95% CL	P-value
<i>Among all professional groups</i>				
Sensitivity to pain of dairy cows	1.64164	1.31969	2.04214	0.00001
<i>Within veterinarians</i>				
Age Cat 2 = 40 years old at maximum	10.14813	1.15635	89.05995	0.03652
Frequency of intervention Cat 2 = 'often'	3.52335	0.67591	18.36641	0.13492
Frequency of intervention Cat 3 = 'sometimes'	8.10906	1.23119	53.40907	0.02954
Frequency of intervention Cat 4 = 'seldom, very seldom, never'	2.65537	0.43468	16.22117	0.29021
Sensitivity to pain of dairy cows	1.85486	1.17192	2.93578	0.00836
<i>Within farmers</i>				
Income by dairy farming Cat 2 = 90–50%	2.10567	0.51540	8.60269	0.29976
Income by dairy farming Cat 3 < 50%	16.35610	1.51212	176.91826	0.02143
Sensitivity to pain of dairy cows	1.46260	1.01814	2.10108	0.03966
<i>Within claw trimmers</i>				
Cattle per year Cat 2 $\geq 1500$	0.12304	0.01739	0.87060	0.03584
Lack of information Cat 2 = 'no'	12.82918	1.62836	101.07613	0.01540

CL, confidence limit; Cat, category.

cattle recovers faster after using analgesics' estimated the sensitivity of dairy cows to be lower ( $RC = -3.05$ ,  $P = 0.029$ ).

More detailed information about the factors associated with the estimated sensitivity to pain of dairy cows is presented in Table 3.

## Discussion

A range of factors associated with respondents' attitudes towards pain management as well as towards the sensitivity to pain of dairy cattle were identified. In particular, the perception of pain level and sensitivity were strongly associated with the respondents' attitude to the value of local anaesthesia during treatment of sole ulcers.

Our analysis suggests that one crucial reason for a negative attitude towards the benefit of local anaesthesia during the treatment of sole ulcers is the misrecognition of provoked pain. Respondents of all professional groups who gave higher pain scores for sole ulcer treatment were more often in favour of administering local anaesthesia. This is consistent with the findings of Huxley and Whay (2006) who found similar associations between the pain scores assigned to various interventions and routine usage of analgesics, and concluded that an unwillingness or inability to appreciate the level of pain that cattle are experiencing could be a reason for inappropriate pain management.

The respondents' views of the importance of defensive movements (e.g. kicking, twitching) in the cow under treatment was associated with their attitude towards local anaesthesia. However, a focus on obvious defensive movements may lead to a misinterpretation of the pain that cows experience during treatment of sole ulcers, especially when they are fixed in a trimming chute, which restricts possible movements to a minimum. Cattle are less likely to show obvious signs of pain but tend to remain stoic and motionless as injured animals are more prone to predation (Short, 1998; Phillips, 2002; Underwood, 2002; Fitzpatrick et al., 2006).

Our results indicate that more effort to improve the recognition and assessment of the pain provoked by therapeutic claw trimming would enhance the use of local anaesthesia. This is further supported by the finding that respondents who estimated the sensitivity of dairy cattle to pain higher also had a higher likelihood of considering the use of anaesthesia to be reasonable. Better training of all personnel involved in the treatment of lame cows in regard to the sensitivity of cattle to pain could significantly enhance the use of analgesia in lame cows.

Similarly, further training about the obligations of personnel treating lame cows using painful procedures could also enhance

the use of local anaesthesia. Veterinarians who understood that there was a requirement to provide analgesia were more likely to be in favour of using analgesia.

This analysis found a positive association between a veterinarian's year of graduation and whether analgesia use was favoured. This has also been found in other studies on veterinarians' attitudes to the use of analgesics (Raekallio et al., 2003; Thomsen et al., 2010; Fajt et al., 2011). Similarly, among all respondents, those with longer work experience less frequently considered local anaesthesia to be reasonable. This could be due to a possible emotional blunting towards such interventions, or, the finding might be confounded with age.

Claw trimmers who considered that lesion size was an important factor were more likely to judge anaesthesia use as reasonable. This may be because of a perception that larger lesions need more time to treat and thus result in a longer duration of pain. Thus, these claw trimmers may use lesion size to differentiate between what is (in their opinion) a 'simple' painful intervention and those that are more invasive. However, such reasoning is not valid as small lesions could also have affected deeper structures of the foot, which would increase the time needed for therapeutic trimming. Furthermore, Swiss regulations require any intervention that affects the pododerm to be treated with analgesics, regardless of its diameter.

The perceptions of the respondent as to the cost of analgesics were associated with their attitudes towards the benefits of anaesthesia, especially within veterinarians and claw trimmers. Respondents who considered the withdrawal times of analgesic drugs to be a large concern for farmers tended to consider anaesthesia to be reasonable less frequently. However, there are several analgesic drugs licensed in Switzerland with short withdrawal times, and the short-term cost of analgesia are probably outweighed by the long-term cost of prolonged pain in most cases. Farmers in our study who considered a minimum of 16 CHF acceptable as cost for pain management whilst excising a sole ulcer were more frequently in favour of local anaesthesia. This amount is adequate to cover the cost of pain management (single injection) during this intervention. Furthermore, the cost of pain management was much less of a major concern for farmers with only 11% of farmers expressing concern compared to 47% of veterinarians and 33% of claw trimmers (Becker et al., 2013).

Competition between claw trimmers and veterinarians was an important factor, even though the working fields of cattle veterinarians and claw trimmers are strictly separated by Swiss law (with claw trimmers only allowed to perform routine functional

**Table 3**

Final multiple regression model for the attitudes of veterinarians, farmers, and claw trimmers towards the sensitivity to pain of dairy cows, estimated on a numerical scale from 1 (no sensitivity) to 10 (highest sensitivity).

Variable	Regression coefficient	Lower 95% CL	Upper 95% CL	P-value
<i>Among all professional groups</i>				
Recognition of pain Cat 2 = 'rather good', 'rather/very/absolutely bad'	-0.6195	-1.0191	-0.2200	0.0025
Professional group Cat 2 = farmer	-1.1790	-1.6167	-0.7413	<0.0001
Professional group Cat 3 = claw trimmers	-1.1418	-1.7407	-0.5430	0.0002
	Regression coefficient	Lower CL	Upper CL	P-value
<i>Within veterinarians</i>				
Knowledge of obligation Cat 2 = 'correct'	0.6580	0.1565	1.1595	0.0105
	Regression coefficient	Lower 95% CL	Upper 95% CL	P-value
<i>Within farmers</i>				
Percentage of interventions Cat 2 $\geq$ 1% < 25%	-1.1390	-2.0041	-0.2739	0.0106
Percentage of interventions Cat 3 $\geq$ 25%	-0.9886	-1.8823	-0.0950	0.0306
<i>Within claw trimmers</i>				
Capability in recognition of pain indicators	0.3261	0.0272	0.6251	0.0336
Analgesia improves general condition of cow Cat 2 = 'no'	-3.0529	-5.7741	-0.3318	0.0293

CL, confidence limit; Cat, category.



claw trimming). Nevertheless, veterinarians who felt in competition with claw trimmers were less likely to consider anaesthesia reasonable, probably because they were of the opinion that farmers expected fast and cheap therapeutic treatment of lame cows, and, if this was not provided, would call the claw trimmer to treat further cases of lameness. However, under the Swiss system only veterinarians are allowed to provide and are advised to offer pain management during therapeutic claw trimming, and the results of our study indicate that discussion with the farmer about the pain resulting from sole ulcer treatment and the actual short and long-term costs of analgesics would certainly result in more agreeing to provide anaesthesia. Leach et al. (2010) also found that the costs of treating lameness were far less important to the farmers than the effects of lameness on pain, milk production, fertility and body condition, and that pride in a healthy herd and 'feeling sorry for' lame cows were the top two motivations to reduce lameness. Vaarst et al. (2002) emphasised the importance of communication and understanding between farmers and their veterinarians in the effective treatment of dairy cattle.

Our analysis showed that respondents' estimation of the pain associated with treatment of sole ulcers was a major factor in their attitude to analgesia during such treatment. Consequently, the data were further analysed to look at factors which were associated with pain score given to sole ulcer treatment. One key association was the attitude of the respondent to pain sensitivity in the dairy cow. Across the whole dataset and within veterinarians and farmers, increased sensitivity was associated with an increased likelihood of scoring the pain of sole ulcer treatment at  $>5/10$ . This effect was also reported by Kielland et al. (2010) who found that farmers who agreed with the statement '*animals experience physical pain as humans do*' scored pain in cattle higher on a visual analogue scale.

Claw trimmers who felt that they had sufficient information about the benefits of pain management were more aware of the pain provoked by treatment of sole ulcers, again supporting the conclusion that training personnel in pain and pain management would improve pain perception and, thereby, analgesic use.

Year of graduation for veterinarians was associated with an increased probability of estimating the level of pain from sole ulcer treatment as  $>5/10$ . Other studies have found significant associations between a veterinarian's year of graduation and higher pain scores for conditions and interventions of animals (Raekallio et al., 2003; Huxley and Whay, 2006; Laven et al., 2009). This may be an age or a training effect but our study also showed that the awareness of pain may decrease as the frequency with which a painful intervention is performed increases. For veterinarians, the number of cases of sole ulcer they treated per year was negatively associated with the likelihood that they scored the pain of sole ulcer treatment as  $>5/10$ . Similarly, claw trimmers who trimmed more than 1500 dairy cows per year were less likely to assign a score of  $>5/10$  to sole ulcer treatment. The fact that the claw trimmers and veterinarians who were responsible for a larger number of claw trimming procedures perceived that the pain associated with sole ulcer treatment was lower is a cause of concern. The problem is exacerbated by the high percentage of claw trimmers (85%) who treated sole ulcer in at least 95% of cases without consulting a veterinarian (Becker et al., 2013).

Farmers who gained  $<50\%$  of their income from dairy farming scored the pain associated with sole ulcer treatment as  $>5/10$  more frequently. This may be because they have greater empathy with the affected cow rather than being focused only on its productivity (Kielland et al., 2010). Additionally, as such farmers are likely to have cows with a lower milk yield, which may thus have a lower risk of lameness (Rutherford et al., 2009), they may experience claw lesions less frequently and therefore be less inured to the pain associated with sole ulcer treatment.

Estimates of the sensitivity to pain of dairy cows were strongly associated both with the pain scores assigned to the treatment of sole ulcers and with the attitudes toward the benefit of local anaesthesia during ulcer treatment. The data were, therefore, further analysed to identify the factors associated with the estimates of cattle's sensitivity to pain.

Similar to pain scoring, farmers who performed painful therapeutic claw trimming less frequently scored the sensitivity of cattle to pain higher. Again this indicates that habituation reduces empathy and pain perception. Higher pain sensitivity scores were given by veterinarians than either claw trimmers or farmers. Veterinarians are specifically trained in the field of pain and pain management so this finding suggests there should be greater focus on pain and its management in the training of claw trimmers and farmers and that veterinarians should intensify their discussions with those groups in regard to claw management.

Other individual factors were also associated with estimates of pain sensitivity. For veterinarians, knowledge that analgesia was required for painful interventions increased such estimates, while claw trimmers who recognised more signs of pain in lame dairy cattle and who were of the opinion that the general condition of dairy cattle recovered faster if analgesic drugs were given, also scored the sensitivity to pain higher. This again suggests better training in pain and pain management will improve the response to painful interventions and improve animal well-being.

## Conclusions

A wide range of factors were found to be associated with the attitudes of personnel involved in therapeutic claw trimming. These should be taken into account during discussions between the farmers, claw trimmers, and veterinarians and in developing training programs. Furthermore, it is clear that improving the training and knowledge of personnel involved in treating lame cows is essential if the use of analgesics and local anaesthesia during painful claw trimming procedures is to be increased and the welfare of lame cows optimised.

## Conflict of interest statement

None of the authors of this paper has a financial or personal relationship with other people or organizations that could inappropriately influence or bias the content of the paper.

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## Appendix A. Supplementary material

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.tvjl.2014.01.016>.

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