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ON-FARM ANIMAL WELFARE ASSESSMENT AND WELFARE IMPROVEMENT IN DAIRY CATTLE

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Abstract

Animal welfare is of multi-dimensional nature, and its assessment should be based on a variety of measures. Traditionally, farm animal welfare assessment has focused on ‚inputs' such as resources and management practices provided to the animals. Especially during the last decade, however, the use of animal-based ‚outcome' measures has been advocated since they are considered to directly reflect the animals' state and experience. Considerable efforts have been made and are still being made to develop such mainly animal-based assessment schemes for different farm animal species (e.g. Welfare Quality®, Bristol Welfare Assurance Programme, AWIN). Comprehensive, scientifically sound (i.e. at least valid as judged by experts) assessment protocols are thus available. Potential applications include farm assurance, legislative and/or voluntary certification, use as a farm management tool or research with the different uses partially requiring different approaches. In the second part, this paper addresses selected concerns regarding dairy cattle welfare and provides approaches to welfare improvement: 1) Production-related diseases such as lameness are regarded the most important welfare problem in the dairy industry. Farm individual intervention strategies taking the major factors such as housing and management etc. into account have been shown to effectively reduce lameness prevalence. 2) Restrictions of movement and behaviour around resting. Access to pasture is typically considered positive for cattle welfare but becomes less common. Cows in zero-grazing production systems have to cope with more confined housing conditions in terms of space allowance, social stress, floor properties etc. Of crucial importance are the effects of barn design and management on standing and lying behaviour such as stocking rate, provision of bedding and dimensions and configuration. 3) Painful procedures such as disbudding of calves. Disbudding causes tissue damage and subsequent experiences of pain, which may be assessed using physiological and behavioural indicators. These effects should be alleviated as far as possible, preferably by a combination of sedation, local anaesthesia and anti-inflammatory treatment.

Keywords*: animal welfare, dairy cattle, disbudding, lameness, on-farm assessment.*

INTRODUCTION

Animal welfare refers to the state of an animal and it relates to the animal's feelings as well as its bodily state (e.g. Broom, 1996; Duncan, 1996). For a long time, farm animal welfare assessment has focused on the measurement of resources provided to the animals such as housing or design criteria (Bartussek, 2001). The use of such so-called indirect parameters of welfare is attractive, because in most cases they may be easily, quickly and reliably recorded. However, the provision of certain environmental resources and management procedures does not necessarily guarantee a high standard of welfare. Valid welfare assessment should therefore focus on direct animal-based parameters such as health and behaviour, because they better reflect how animals actually are able to cope with the given set of husbandry conditions.

ANIMAL-BASED WELFARE ASSESSMENT

Considerable efforts have been made and are still being made to develop mainly animal-based assessment schemes for different farm animal species. For example, one of the first attempts is the Bristol Welfare Assurance Programme (Main et al., 2007). The even more comprehensive Welfare Welfare Quality® assessment protocols for cattle, pigs and poultry (Welfare Quality, 2009) were developed to allow for welfare-specific product information and may therefore also be used for

farm certification. These protocols follow four welfare principles and twelve criteria; for each criterion one or several mainly animal-based measures have been selected (see Table 1 for the general structure of the Welfare Quality® assessment protocol for dairy cows). Currently, further animal-based assessment protocols are being developed within the EU-project AWIN (www.animal-welfare-indicators.net).

Table 1. Welfare principles, criteria and measures in the Welfare Quality® protocol for dairy cattle (Welfare Quality®, 2009)

Welfare principle	Welfare criteria	Welfare measures
Good feeding	Absence of prolonged hunger	Percentage of very lean animals (Body condition score)
	Absence of prolonged thirst	Water provision, water flow, cleanliness and functioning of water points
Good housing	Comfort around resting	Time needed to lie down, animals colliding with housing equipment during lying down movement, animals lying partly or completely outside lying area, cleanliness of udder, lower hind leg and upper hind leg
	Ease of movement	Presence of tethering, access to outdoor loafing area or pasture
Good health	Absence of injuries	Lameness, alterations of the integument (hairless spots or lesions/swellings)
	Absence of disease	Coughing, nasal discharge, ocular discharge, hampered respiration, diarrhoea, vulvar discharge, milk somatic cell count, mortality, dystocia, downer cows
	Absence of pain induced by management procedures	Procedures used for disbudding/dehorning, tail docking
Appropriate behaviour	Expression of social behaviours	Incidence of agonistic behaviours
	Expression of other behaviours	Access to pasture
	Good human-animal relationship	Avoidance distance at the feed bunk
	Positive emotional state	Qualitative behaviour assessment

Comprehensive, scientifically sound (i.e. at least valid as judged by experts) assessment protocols are thus available. Potential applications include farm assurance, legislative and/or voluntary certification, use as a farm management tool or research with the different uses partially requiring different approaches.

WELFARE CONCERNS IN DAIRY CATTLE

Dairy farming in Europe is characterized by a wide range in herd sizes and production systems from low input pasture-based milk production to high input/high output dairy systems. The major concerns regarding dairy cattle welfare are to a certain extent independent from the production system: 1) production-related diseases such as lameness, mastitis or metabolic disorders, 2) restrictions of movement and behaviour such as resting and social behaviour and 3) painful procedures such as disbudding of calves. In the following section, I will address selected issues and discuss approaches to improve welfare in respective regards.

LAMENESS

Lameness is the behavioural manifestation of painful conditions in the cow's locomotory system (Whay et al., 1997; Rushen et al., 2007). In most cases, the source of pain is lesions of the claw, but also alterations of the joints may result in lameness. Mainly due to the pain involved in gait aberrations, lameness is often recognized as the top priority welfare problem in dairy cattle (Whay et al., 2003a). But even if in some animals pain may not play a role, impacts on welfare can be expected

from impaired mobility, which restricts the access to resources or reduces the ability to cope with agonistic encounters. Reported average lameness prevalences, i.e. cows being assessed as lame at a time, vary between studies and locomotion scoring systems used but usually range between 20 and 40% (e.g. Whay et al., 2003b; Dippel et al., 2009; Rouha-Mülleder et al., 2009; Brinkmann and March, 2012). Lame cows do not only feel pain, but produce less (Amory et al., 2008), are less fertile and are more likely to be culled (Collick et al., 1989; Alawneh et al., 2011) and therefore cause considerable financial losses (Bennett et al., 1999). Despite its importance, farmers often under-perceive lameness prevalence (Whay et al., 2002; Sarova et al., 2011).

Tackling lameness means tackling a multifactorial problem. Claw lesions and lameness are influenced by a variety of factors including housing (e.g. design and maintenance of cubicles, floor properties), management (e.g. removing of slurry, claw trimming) and intrinsic cow factors (e.g. conformation of legs, claw horn quality) (for review see for example Vermunt, 2004; Figure 1). The existing knowledge on both risk factors and the farmers' motivation to induce changes (Leach et al., 2010) may therefore be used to reduce lameness in dairy farming.

In the light of the body of knowledge on risk factors, there are surprisingly few lameness intervention studies. However, it has been shown that reduction of lameness using farm individual intervention measures related to management and housing conditions can be achieved in commercial farms (Brinkmann and March, 2012). In the latter study, 40 cubicle housed herds were locomotion scored; housing and management was also assessed. In 21 farms, intervention measures (e.g. improvement of bedding, claw trimming) were suggested and discussed with the farmer; 19 farms served as control group. The most frequent measures implemented in the intervention farms refer to regular claw trimming (10 farms), improvement of cubicles (bedding, maintenance, design; 11 farms), cleaning of floors in the alleys (12 farms) and grip of floors in the alleys (7 farms). In order to evaluate the effectiveness of these intervention measures all herds were re-visited multiple times in the following four years.

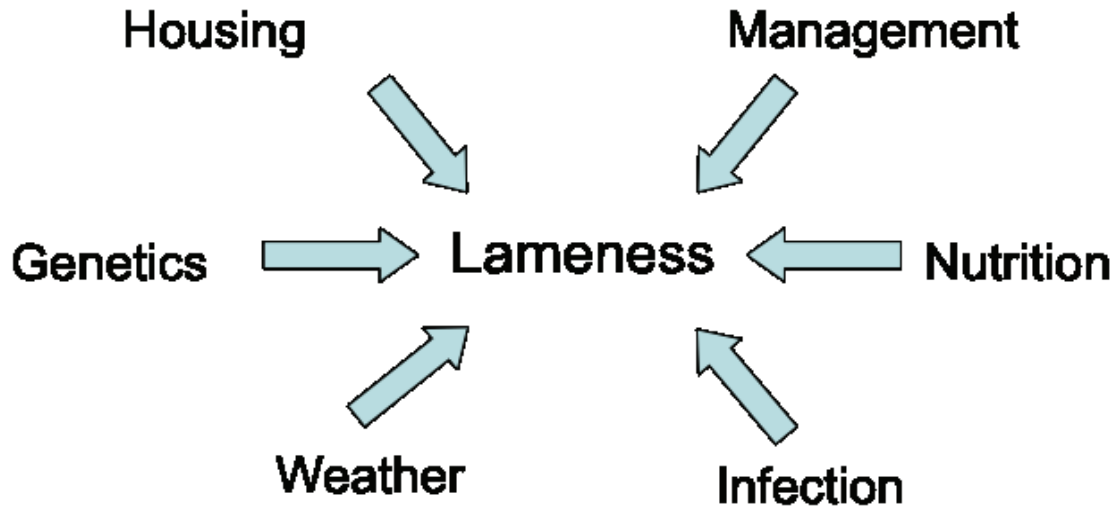

Figure 1. Major factors affecting lameness in dairy cattle

The baseline lameness prevalence was 33 ± 13% (mean ± SD) in intervention and 19 ± 12% in control farms. Lameness prevalence was significantly and consistently reduced on the intervention farms by more than 50%. Already after one year, there was no significant difference in lameness prevalence anymore and final prevalence was 15 ± 11% and 15 ± 10%, respectively, after four years. The prevalence of limb injuries was also reduced when specific measures to improve the cubicle surface were introduced. The results are therefore promising pointing at effective improvement strategies.

COMFORT AROUND RESTING

Access to pasture is typically considered positive for cattle welfare. In general, pasture provides cattle with abundant space, fewer agonistic interactions, and cows on pasture have the freedom to perform natural behaviours such as grazing or exploration. Keeping cows on pasture is also thought to increase the frequency of affiliative behaviours and self-grooming and access to pasture can improve health aspects. For example Hernandez-Mendo et al., (2008) showed that lame cows provided pasture significantly improved in gait after several weeks.

When provided a choice between pasture and indoor housing, cows showed both a partial preference to be indoors (Charlton et al., 2011a) as well as outdoors (Legrand et al., 2009; Charlton et al., 2011b). Preferences appear to be associated with nutritional demands, environmental factors such as ambient temperature, time of day and presumably also previous experience. However, even a partial preference to be indoors does not mean that pasture is not important for the welfare of dairy cows (Charlton et al., 2011a).

Despite the obvious benefits of access to pasture, zero-grazing production systems become increasingly common, mainly for reasons of balanced feed rations. Cows in such systems therefore have to cope with more confined housing conditions in terms of space allowance, social stress, floor properties etc. Of crucial importance is the lying/resting area. In dairy cows resting mainly occurs during lying. Lying is a high priority behaviour as shown by operant conditioning experiments (Munksgaard et al., 2005). Cows may spend up to 14 h per day lying with about half of the resting period ruminating. Disturbances of resting may result in insufficient recuperation, frustration (Munksgaard and Simonsen, 1996) and increased risks for health problems such as lameness or lesions (Bowell et al., 2003; Norring et al., 2008).

The effects of barn design and management on standing and lying behaviour have been considerably investigated in recent years. Overstocking at the cubicles (i.e., insufficient lying places for the number of cows) reduced lying time, increased the time spent standing in the alleys, and increased the number of displacements from the cubicles (Fregonesi et al., 2007). Similar effects on lying and standing in the alleys have been reported when stocking density was increased in both cubicles and feeding places (Krawczel et al., 2008; Hill et al., 2009). Cows prefer lying surfaces with ample bedding (Tucker et al., 2003) and spend more time lying down in well-bedded cubicles with dry, well-maintained bedding. Also dimensions and configuration influence lying times and standing inside the cubicle. For example, cows spend more time standing fully in the cubicle and less time with the front feet on the cubicle surface only when provided stalls that are wider and with the neck rail position higher above the stall surface and further from the rear curb. Appropriate neck rail position, which allows the animals to fully stand in the cubicles also has been shown to improve lameness (Bernardi et al., 2009).

On the other hand design and management of the cubicle and the lying surface can affect cow hygiene. Cows are more likely to defecate onto the surface of larger cubicles, especially those that allow cows to stand fully in the cubicle (Tucker et al., 2005; Bernardi et al., 2009).

DISBUDDING OF CALVES

A recent survey revealed that more than 80% of the EU dairy cattle population is disbudded/dehorned with a somewhat lower prevalence in some Eastern European countries (ALCASDE, 2009). Disbudding describes the removal of the horn bud of calves at an age of up to three months. It is usually carried out using a hot iron, caustic paste or by surgical removal. Thermocautery through hot iron is most frequently applied. Dehorning describes the removal of the horns, which is carried out in older animals. Dehorning is much more painful than disbudding and should therefore be avoided as far as possible.

The main reason for keeping hornless animals is easing the management of cattle. Hornless cattle are considered less dangerous with regard to stockperson safety since normal head movements or purposefully conducted attacks cause less harm. Another reason for disbudding/dehorning, especially when the

animals are kept in loose housing systems, is to reduce bruises and injuries resulting from horn thrusts exerted on other animals (Menke et al., 1999).

Disbudding causes tissue damage and subsequent experiences of pain, which may be assessed using physiological and behavioural indicators. Both thermocautery and caustic paste disbudding cause a significant rise in plasma cortisol, which reaches baseline levels after about three to four hours (Faulkner and Weary, 2000). Violent struggling of calves is usually seen during hot iron disbudding, while application of caustic paste does not lead to an acute behavioural response. However, pain related postoperative behaviours (such as restlessness, head shaking, ear flicking, head rubbing) are not different between hot iron and caustic paste disbudded calves and these responses have been described to last for at least six hours after disbudding to about 24 hours (for review see EFSA, 2012).

These effects should be alleviated as far as possible, preferably by a combination of sedation, local anaesthesia and anti-inflammatory treatment. Injection of local anaesthetics reduces the acute cortisol distress response and pain-related behaviours, but effective pain control is only reached when additionally a NSAID is used. Sedation allows an easier administration of the local anaesthetic. However, it should be noted that sedation alone using for example xylazine does not provide sufficient analgesia and may simply mask the signs of pain as opposed to provide pain relief (Stilwell et al., 2010).

As alternatives to disbudding/dehorning, the introduction of the polled gene and/or the keeping of horned cattle in loose housing systems may be taken into account. The latter requires special attention with regard to appropriate housing facilities and management strategies as well as improvement of the human-animal relationship.

CONCLUSIONS

Dairy farming faces a range of welfare concerns across production systems. However, as described above for selected welfare issues, welfare improvement (and often concurrent increase in productivity) is possible when:

- taking the existing knowledge on both risk factors and the farmers' motivation to induce changes into account;
- providing housing and management conditions that have been designed from the cow's point of view;
- implementing effective pain control measures in farming routines.

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