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## **ON-FARM WELFARE ASSESSMENT IN CATTLE FROM BASIC CONCEPTS TO FEASIBLE ASSESSMENT SYSTEMS**

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### **1. INTRODUCTION**

Public concern about farm animal welfare has steadily grown during recent years. In this context, welfare assessment has many roles such as identifying current welfare problems, checking farm assurance and legislative requirements have been met, indicating risk factors leading to a welfare problem, testing the efficacy of interventions, formulating a product information/labelling system, or research tool for evaluating and comparing production systems, environments, management systems, animal genotype, etc. (Whay, in press).

Improvements in animal welfare may be achieved through:

- assessment of animal welfare,
- identification of risk factors potentially leading to welfare problems, and,
- interventions in response to the risk factors.

This paper focuses on the first step taking recent developments in approaches and techniques used to assess cattle welfare into account.

### **2. THE RATIONALE OF ON-FARM WELFARE ASSESSMENT**

Operational on-farm welfare assessment tools must involve measures that are valid and reliable, be easily operated by trained people, and require limited time. Animal welfare refers to the state of an animal and it relates to the animal's feelings as well as to its bodily state (e.g. Broom, 1996, Duncan, 1996). Traditionally, farm animal welfare assessment has focused on the measurement of resources provided to the animal such as housing and design criteria (Bartussek, 2001; Bracke *et al.* 2002). The use of such indirect resource-based criteria (Figure 1) is attractive because their measurement is mostly quick, easy and reliable. Other husbandry aspects that affect animal welfare are management practices and the human-animal relationship; their measurement is often less easy. However, the provision of good management and environmental resources does not necessarily

result in a high standard of welfare. As shown in figure 1, direct animal-related parameters such as health or behaviour can be taken as indicators of the animals' feelings and as measures of the bodily state. Welfare assessment should therefore primarily be based on such animal-related parameters. It is however challenging, to select and develop reliable and at the same time feasible measures for on-farm assessment protocols; this will be further discussed below. In practice, resource or management-based parameters may also be included in on-farm assessment protocols when they are closely correlated to animal-related measures and because they can form the basis for the identification of causes of welfare problems.

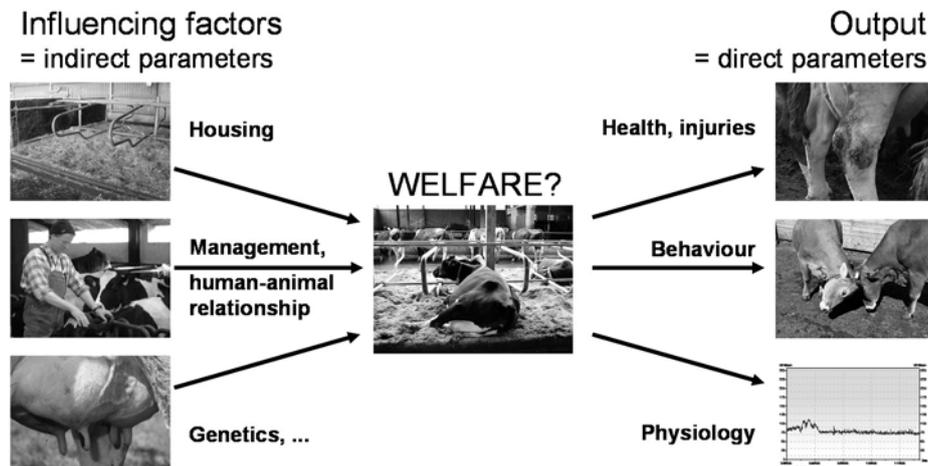


Figure 1. **Influencing factors and animal-based parameters in relation to the animal's welfare state**

Attempts to create an operational welfare assessment protocol primarily relying on animal-related parameters have mainly been made with regard to dairy cows (e.g. Capdeville & Veissier, 2001; Main *et al.* 2003; Whay *et al.* 2003a; Whay *et al.* 2003b). However, considerable efforts are currently made in further developing valid, reliable and feasible systems for several cattle categories.

### 3. VALIDITY AND RELIABILITY OF SELECTED ANIMAL-RELATED PARAMETERS IN CATTLE

Animal-based measures for on-farm welfare assessment can be roughly divided in behaviour and health parameters; physiological indicators are mostly not available for feasibility reasons. Besides the overall validity of the measures, i.e. what information they provide about the animal's welfare state, the robustness of the measures with regard to e.g. inter-observer reliability or feasibility will be shortly discussed in the following sections.

Disturbances of the behaviour around resting may be associated with insufficient recuperation, frustration, reduced rumination, increased risk for lameness and alterations or injuries regarding hair, skin and joints. The assessment of time budgets such as total duration of lying is not suitable for short-term monitoring systems. However, parameters related to lying down or rising (time needed, frequencies of abnormal, altered or impaired movements) and lying and standing in the cubicles can be quantitatively or qualitatively recorded also during shorter periods using continuous behaviour sampling and/or scan sampling (e.g. Cow Comfort Index; Cook *et al.* 2004).

In horned cows, the frequency of agonistic social behaviour elements is positively correlated with the occurrence of skin injuries (Menke *et al.* 1999) and it is likely that also in dehorned cows aggressive interactions result in less obvious lesions such as hematomas. Although already suggested for (Whay *et al.* 2003a) or applied in on-farm welfare assessment protocols (Capdeville

& Veissier, 2001), relatively little is known about the minimum duration or the time frame of observations in order to get a representative picture of a given farm. Pilot studies in dairy herds have shown that agonistic interactions can be reliably recorded during the first hours after feeding showing the highest inter-day repeatability for this period of the day. However, short-term recordings of social behaviour should be restricted to interactions involving physical contact (Winckler *et al.* 2002).

Abnormal behaviours can be distinguished in redirected behaviours and stereotypies. In cattle, mainly abnormal oral behaviours such as tongue playing/tongue rolling, sucking at objects or cross-sucking have been described (Scientific Veterinary Committee, 1995). These behaviours occur to a different extent in calves, heifers, dairy cows and fattening cattle. Due to the low incidence, continuous behaviour sampling has to be applied for recording, which reduces feasibility. However due to the fact that the behaviours are linked with oral behaviour and the motivation to feed or suck, it may be possible to check these behaviours during specific periods for example after feeding.

Lameness indicates a painful state and discomfort and is regarded as one of the most serious welfare problems in cattle. Whereas the examination of the claws provides detailed information on pathological findings, this procedure is not applicable for routine on-farm assessments. There is a variety of feasible lameness scoring systems which basically rely on gait recording. In general, each animal is assigned a score on a 4 (Breuer *et al.* 2000) to 9 point scale (Manson & Leaver, 1988) according to gait-related behaviour patterns such as short-striding, difficulty to put weight on limb or difficulty in turning when walking on a hard floor. Locomotion scoring systems revealed significant correlations with claw lesion scores (Winckler & Willen, 2001) or other behavioural measures such as speed, tracking and head position (O'Callaghan *et al.* 2002). Training and practical experience is important to reach satisfactory inter-observer repeatability (Engel *et al.* 2003; March *et al.* in press).

Other health disorders such as mastitis or metabolic disorders are undoubtedly welfare relevant, but require sophisticated diagnostic effort or long-term data recordings due to their rather low prevalence. Farm records often suffer from insufficient book keeping, mistakes in data collection and transfer or lack of treatment of sick animals. Therefore reliable information seems to be difficult to obtain in many cases. Nevertheless, since disease parameters are so important the possibility to use (standardized) farm records should be further investigated.

In (dairy) cattle, both undernutrition and overnutrition can be regarded as a (potential) welfare problem, since cows which are overconditioned at drying off are more likely to develop cystic ovarian disease and lameness. Severe body condition loss from the dry to near calving period increased the occurrence of retained placenta. In addition, too thin animals may be regarded as welfare relevant per se, since they have obviously not been able to meet their physiological demands and may suffer from prolonged hunger. Body condition scoring (BCS) can be performed using a variety of scales and systems. Inter- and intra-observer reliability has been evaluated for a number of systems (Ferguson *et al.* 1994).

Soiled skin and hair may induce itching, reduce skin function with regard to thermoregulatory properties and anti-germal defence and may cause inflammations of the skin. Relationships with mastitis incidence have also been postulated (Valde *et al.* 1997). Faye & Barnouin (1985) developed a cleanliness index for dairy cattle using a five-point scale in five body areas. Since only from severe soiling (thick > 1 cm and cohesive soiling) negative effects are to be expected, recording may focus on these two scores.

Skin lesions, injuries and swellings reflect the impact of the surrounding environment on the animal's body (Ekesbo, 1984). Alterations result for example from contact with hard floors,

pressure against feed racks or hits against cubicle partitions. The main body areas at risk are the carpal, fetlock, hock and stifle joint, neck/withers, shoulderblade, dewlap, hip and ischial tuberosity. Likewise, infestation with ectoparasites leads to pruritus, pain and reduced welfare depending on the causative organism. Existing scoring systems refer to the different body areas, severity (hairless spots, scabs, wounds) and size of the lesions and swellings, respectively (Wechsler *et al.* 2000).

Surgical treatments such as dehorning, tail docking or castration are welfare relevant for various reasons. They cause pain during and after the procedures, may result in reduced function (e.g. increased fly numbers in tail-docked cattle) (Eicher *et al.* 2002) and impair the animal's integrity in general. The percentage of affected animals, time and type of procedure can be used as parameters. The animal's relationship to humans has been shown to have a significant impact on animal health, production and welfare. Approach and avoidance reactions can be used to assess the animal-human relationship in loose housed dairy cows (Waiblinger *et al.* 2003). The avoidance distance towards an unknown person in the home environment (e.g. barn/pen) correlated significantly with the milker's behaviour (Waiblinger *et al.* 2002). However, the reliable assessment of avoidance distance requires a relatively large sample size and thus appears to be less feasible. In tied dairy cattle, measures of animal-human relationship have only been developed in experimental research but there is no experience with on-farm recordings.

Whereas most approaches to welfare assessment are based on indicators of reduced welfare, it seems to be promising to put more emphasis on indicators of good welfare in future. Environmental control and positive social relations may be considered as main components of good welfare. It has often been suggested to use social and non-social play as an indicator of a good welfare state since young animals in particular are only motivated to play if their primary needs are satisfied (Lawrence, 1987). In calves, play is mainly expressed as locomotor and social activities as well as activities directed towards the environment. However, playing is only rarely observed in adult animals and therefore probably restricted to an indicator in calves. In adult cattle, affiliative behaviour such as social licking appears to be a promising indicator of long-term positive affective states. Beneficial effects may be expected in terms of reinforcing and stabilising social relationships and because of the rewarding function at least for the receiver (Sato, 1984; Sato *et al.* 1991).

In addition to quantitative parameters, the qualitative assessment of cattle behaviour for animal welfare assessment purposes has been discussed in recent years (Wemelsfelder *et al.* 2001). This approach focuses on the judgement of "body language" and might be helpful to detect states such as "apathy" or positive affective states which are commonly considered as welfare relevant.

#### **4. TOWARDS FEASIBLE ASSESSMENT SYSTEMS: THE EU PROJECT WELFARE QUALITY**

The decision which parameters and measures are finally included in on-farm welfare assessment protocols depends on various factors such as the purpose, the time available for data recording and the skills and knowledge of the assessors. Up to now, only few monitoring schemes for dairy cattle have been suggested and applied in the on-farm context (Capdeville & Veissier, 2001; Whay *et al.* 2003); there are no systems available for other cattle categories such as dairy or veal calves, dairy heifers or beef cattle.

It is one of the goals of the EU project Welfare Quality ([www.welfarequality.net](http://www.welfarequality.net)) to develop feasible monitoring systems to assess the welfare of cattle, pigs and chickens. 12 areas of concern such as "absence of injuries" or "expression of social behaviours" have been identified, that should be covered in the assessment of welfare. At present, numerous potential measures are being evaluated or newly developed with regard to validity, reliability and feasibility. A full monitoring scheme is expected to be tested in practice on commercial farms (dairy, veal, beef cattle) in several

EU countries in 2007. The main objectives of the final monitoring system are to give advice back to the farmer and/or the veterinarian and to inform consumers about the welfare status of the animals from which they buy products. This project also addresses in a comprehensive way the integration of information by means of a multicriteria evaluation of animal welfare.

## **5. CONCLUSIONS: ON-FARM WELFARE ASSESSMENT AND BOVINE VETERINARY PRACTICE**

On-farm welfare assessment will increasingly play an important role in cattle production and therefore also in bovine veterinary practice. One of the many purposes is to detect welfare problems in a herd and to identify risk factors for impaired welfare which may then be taken into account for intervention measures. However, not only the welfare state per se but also the role it plays in the multidimensional nature of many production diseases is of interest. Welfare assessment systems may therefore also be included in herd health plans in future.

## **6. SUMMARY**

Public concern about farm animal welfare has steadily grown during recent years. Likewise, the need for scientifically based on-farm welfare assessment systems for, amongst others, advisory or certification purposes has increased. Whereas traditional welfare assessment has centred on resource-based measures, recent approaches to on-farm welfare assessment focus on animal-based welfare parameters. The selection of such parameters must be based on validity, reliability and feasibility criteria. Animal-based parameters for cattle comprise behaviour around resting, agonistic social behaviour, abnormal behaviours, lameness, disease incidence, body condition, cleanliness, injuries, integrity of the animal, animal-human relationship and indicators of positive welfare. Operational protocols for on-farm use are currently being developed. Welfare assessment, however, represents only the starting point for achieving sustained improvement in animal welfare.

## **7. KEY WORDS**

Dairy cattle, welfare assessment, animal-based parameters.

## **8. RESUME**

Le bien-être des animaux d'élevage est un sujet de préoccupation du grand public depuis quelques années. Parallèlement, il existe le besoin d'un développement de systèmes de mesure de bien-être animal en élevage basé sur des fondements scientifiques, afin entre autres de répondre à la demande de certification des élevages. Traditionnellement, l'évaluation du bien-être se fait à partir des mesures des ressources (logement, dimensions, ...). Depuis peu, les efforts de recherche se concentrent sur des mesures au niveau de l'animal. La sélection des mesures pour un système d'évaluation doit être basé sur la validité, la répétabilité et la faisabilité des mesures en question. Les mesures basées sur l'animal concernent, pour les bovins, le comportement de repos, le comportement social et agonistique, les comportements anormaux, le niveau des boiteries, l'état sanitaire, l'état corporel, l'état de propreté, les blessures, l'intégrité de l'animal, la relation homme-animal et les indicateurs positifs de bien-être. Des protocoles opérationnels pour une utilisation en ferme sont actuellement en cours de réalisation. Toutefois, l'évaluation du bien-être animal n'est que le point départ pour améliorer d'une manière durable le bien-être réel des animaux en élevage.

## **9. MOTS CLES**

Vaches laitières, évaluation du bien-être, paramètres niveau animal.

## 10. ZUSAMMENFASSUNG

Tierschutz in der Nutztierhaltung steht zunehmend im Blickpunkt der Öffentlichkeit. Wissenschaftlich fundierte Beurteilungssysteme für Tiergerechtheit/Wohlbefinden sind daher notwendig, die zum Beispiel für Beratungszwecke oder zukünftig auch zur Kennzeichnung von Lebensmitteln tierischer Herkunft verwendet werden können. Während die Beurteilung bisher überwiegend auf technischen Kriterien des Haltungssystems beruhte, zielen neuere Ansätze auf die Verwendung tierbezogener Parameter. Die Auswahl solcher Parameter muss dabei Validität, Reliabilität und Durchführbarkeit berücksichtigen. Tierbezogene Parameter für Rinder umfassen das Ruheverhalten, agonistische soziale Interaktionen, Verhaltensstörungen, Lahmheit, Krankheitsinzidenzen, Körperkondition, Sauberkeit der Tiere, Verletzungen und Schäden, Unversehrtheit der Tiere, Tier-Mensch-Beziehung sowie positive Indikatoren des Wohlbefindens. Praxistaugliche Beurteilungssysteme werden derzeit entwickelt. Die Beurteilung der Tiergerechtheit stellt jedoch nur den ersten Schritt hin zu einer nachhaltigen Verbesserung der Situation der Tiere dar.

## 11. SCHLÜSSELWÖRTER

Milchvieh, Beurteilung der Tiergerechtheit, tierbezogene Parameter.

## 12. RESÚMEN

La preocupación general sobre el bienestar animal, y en particular de los animales de granja, ha aumentado en los últimos años. Asimismo, la necesidad de sistemas de evaluación de bienestar animal con base científica se ha incrementado tanto para consultoría como para certificaciones. Mientras que los sistemas tradicionales de evaluación del bienestar animal han estado utilizando medidas de los recursos disponibles por el animal, los recientes trabajos se han interesado más por los parámetros directos de bienestar en el propio animal. La selección de estos parámetros debe basarse en criterios de validez, fiabilidad y viabilidad. Los parámetros de bienestar animal en ganado abarcan desde el comportamiento en el descanso, agresividad social, comportamiento anormal, cojera, incidencia de enfermedades, condición corporal, higiene, heridas, integridad del animal, relaciones animal-ganadero hasta indicadores positivos de bienestar. Protocolos de manejo en granja se están desarrollando. Los sistemas de evaluación de bienestar, sin embargo, sólo son el punto de partida para conseguir una mejora sustancial en el bienestar animal.

## 13. KEY WORDS

Vacuno lechero, evaluación del bienestar, parámetros animales de bienestar.

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