SELECTION OF PARAMETERS FOR ON-FARM WELFARE-ASSESSMENT PROTOCOLS IN CATTLE AND BUFFALO

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Abstract *Animal Welfare 2003, **12**: 619-624*

On-farm welfare-assessment protocols should be based on valid, reliable and feasible indicators which reflect the animal's state in the context of the housing and management system. This paper focuses on the selection of parameters for cattle and buffalo from welfare research, from assessment protocols used in different European countries and from the literature. Three groups of parameters are described: (1) parameters which can readily be included, such as lameness, injuries, body condition score, cleanliness, getting up/lying down behaviour, agonistic social behaviour, oral abnormal behaviours, human behaviour toward the animals and measures of the animal–human relationship; (2) parameters which require more information on reliability, such as indicators of good welfare and housing factors; and (3) parameters which are regarded as important but so far lack reliability in most countries, such as the incidence of clinical diseases and mortality.

Keywords: *animal-based parameters, animal welfare, buffalo, cattle, on-farm welfare assessment*

Introduction

Public concern about farm animal welfare has steadily increased during recent years. Likewise, the need for scientifically based on-farm welfare-assessment systems, for example for certification or advice purposes, has increased. The parameters that have so far been used for on-farm welfare research or operational assessment tools (Bartussek 1997; Hörning 2001) can be divided into two groups: first, environmental features describing the housing and management situation; and second, animal-based parameters such as behaviour, health and

physiological traits. Because welfare refers to a characteristic of the animal rather than something given to it (Broom 1996), its assessment should be based on such animal-related parameters. To date, only limited attempts have been made to create an operational welfare assessment protocol primarily relying on animal-related parameters (eg Capdeville & Veissier 2001). Such on-farm approaches face the problems that they rely on a 'snapshot' at only a certain time, that appropriate methodologies are often lacking, and that only a limited time is available on-farm for the assessment to be carried out.

In this paper, we focused on the selection of parameters for on-farm welfare assessment in cattle and buffalo with the aim of proposing a scientifically accepted assessment tool in the framework of a (single) farm visit. Criteria for parameter selection were validity, reliability and feasibility. For this purpose, welfare research protocols and existing (concepts for) on-farm assessment tools from different European countries as well as from the literature were evaluated. The potential parameters differ substantially with regard to the above-mentioned criteria and, therefore, were divided into three groups comprising: (1) measures which already fulfil these requirements and can readily be included in operational welfare-assessment tools; (2) parameters which require further information, for example on reliability; and (3) parameters which are regarded as important but lack reliability and/or feasibility in most countries (Table 1). Although the parameters are thought to be applicable to all cattle and buffalo categories, the following explanations will be restricted to dairy cattle and milk buffaloes.

Table 1 **Overview of potential on-farm welfare assessment parameters with regard to the fulfilment of different requirements for inclusion into a protocol.**

Group	Parameter	Inclusion	Validity	Reliability	Feasibility
1 Included	Lameness	Yes	+	+	+
	Injuries	Yes	+	+	+
	Body condition score	Yes	+	+	+
	Cleanliness	Yes	+	+	+
	Getting up/lying down behaviour	Yes	+	+	+
	Agonistic social behaviour	Yes	+	+	+
	Oral abnormal behaviour	Yes	+	?	+
	Animal–human relationship	Yes	+	+	+
	Stockmanship	Yes	+	+	+
2 Further information required	Indicators of good welfare	?	+	– [1]	+
	Housing factors	?	? [2]	+	+
3 Not included	Disease incidence/mortality	No	+	– [3]	–

[1] cohesive interactions
[2] partially +
[3] in most countries

Parameters to be readily included (Group 1)

Lameness

Lameness indicates a painful state and discomfort and is regarded as one of the most serious welfare problems in cattle. Although examination of the claws provides detailed information on pathological findings, this procedure is not applicable for routine on-farm assessments (it is time-consuming and requires expertise). However, several practical lameness scoring systems exist which rely on gait recording. In general, each animal is assigned a score from a

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four- (Breuer *et al* 2000) to nine-point scale (Manson & Leaver 1988) according to gait-related behaviour patterns such as short-striding, difficulty in putting weight on a limb, or difficulty in turning when walking on a hard floor. Locomotion scoring systems have 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). Inter-observer repeatability ranged between 68/98% (agreement/near agreement, 5-point-scale, three observers; Winckler & Willen 2001) and 37/81% (two observers; O'Callaghan *et al* 2002). On three farms, de Rosa *et al* (2003, see pp 625–629, this issue) obtained an intra-observer consistency between 43% and 66% at about fortnightly intervals.

Injuries

Skin lesions 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. Existing scoring systems refer to the different body areas, severity (hairless spots, scabs, wounds) and size of the lesions and swellings (eg Wechsler *et al* 2000).

Body condition score (BCS)

BCS systems should be used to detect welfare-relevant malnutrition or undernutrition — mainly cows that are too thin. Thus, the scoring systems need not be too detailed. Feasible systems are already available, mostly for Holstein cows, but development and/or adaptation for specific breeds is still necessary.

Cleanliness

Soiled skin and hair may induce itching, reduce skin thermoregulatory properties and anti-microbial defence, and cause inflammation of the skin. Relationships with mastitis incidence have also been postulated (Valde *et al* 1997). Faye and Barnouin (1985) developed a cleanliness index for dairy cattle using a five-point scale in five body areas. Inter-observer reliability was high (80–90%; Haidn *et al* 1997). We propose to consider only the two highest scores (ie large soiled areas) and thick (>1cm) and cohesive soiling, because negative effects are to be expected from this type of soiling.

Getting up/lying down behaviour

Difficulties in lying down and rising behaviour may cause injuries, discomfort and reduced resting times. Chaplin and Munksgaard (2001) used five categories to describe rising behaviour in tied cows, but did not consider lying-down behaviour. We therefore propose to record abnormal (prolonged) durations of getting-up and lying-down behaviours (>7 s), stepping before lying down and interrupted lying-down attempts, horse-like rising and, where applicable, forceful hits against cubicle partitions, in a representative sample of cows. These parameters may be combined into a difficulty index.

Agonistic social behaviour

In horned cows, the frequency of agonistic behaviour elements correlates positively with the occurrence of skin injuries (Menke *et al* 1999), and it is likely also that in dehorned cows, aggressive interactions result in less-obvious lesions such as haematomas. On the other hand, social licking is known to have a tension-reducing effect and to stabilise the social structure

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of a herd (Sato *et al* 1991). Agonistic interactions can be reliably recorded during the first few hours after feeding, showing the highest inter-day repeatability for this period. However, short-term recordings of social behaviour should be restricted to interactions involving physical contact (Winckler *et al* 2002).

Oral abnormal behaviour

In addition to horse-like rising, the main types of abnormal behaviour occurring in cattle are oral behaviours such as tongue playing/rolling and intersucking. Although, because of low prevalence and limited time, only a small number of measurements can be obtained, the recordings may be combined with social behaviour observations.

Animal–human relationship

The avoidance distance (AD) toward an unknown person in the home environment (eg barn/pen) correlates significantly with the milker's behaviour (Waiblinger *et al* 2002). In comparison with the approach test or flight distance in a test arena (Breuer *et al* 2000; Hemsworth *et al* 2000), the highest correlations with human behaviour have been found for this measure. In a pilot study, de Rosa *et al* (2003, see pp 625–629, this issue) reported Kendall's *W* coefficients between 0.43 and 0.70 for repeated recordings of AD on three dairy and two buffalo farms.

Stockmanship

Stockmanship acts on animal welfare in two different ways. The frequency, type (vocal, acoustic, tactile) and quality (positive, neutral, negative) of human behaviour toward animals in the milking parlour or during handling has been shown to directly influence animal behaviour, physiological correlates, and productivity (Lensink *et al* 2001; Waiblinger *et al* 2002). Also, indirect parameters describing herd management and handling practices correlate with cow behaviour (Menke *et al* 1999). Waiblinger *et al* (2002) reported a high test–retest reliability when observing the milkers on two successive evening milkings (r_s = 0.84; n = 19).

Parameters which require additional information (Group 2)

Indicators of good welfare

Whereas most approaches to welfare assessment are based on indicators of reduced welfare, it seems promising to put more emphasis on indicators of good welfare in future. Self-licking at caudal parts of the body, allogrooming, play behaviour and diversity of lying positions are potential parameters. However, almost no data exist as yet on reliability within the on-farm context.

Housing factors

Although pre-existing tools often rely on housing factors (eg Bartussek 1997), these parameters suffer from lack of validity and/or reliability. For example, the validity of design criteria such as floor or cubicle dimensions which can be reliably and feasibly recorded has only partially been demonstrated within the multifactorial farm situation. If, for example, epidemiological studies demonstrate close relationships between housing features and animal-related parameters, however, such criteria may be included in future. On the other hand, poor climatic conditions are likely to lead to reduced welfare, but reliable

measurements require expensive equipment and long-term recordings. However, for advisory purposes (weak-point analysis) it may be useful to take housing criteria into account.

Parameters which should be included but lack reliability in most countries (Group 3)

Disease incidence/mortality

Health problems such as mastitis or metabolic disorders, as well as mortality rate, are relevant to welfare but, because of their rather low prevalence, require sophisticated diagnostic efforts or long-term data recordings. Farm records often suffer from insufficient book keeping, errors in data collection and transfer, or lack of treatment of sick animals. As reliable information is only obtainable in countries with well-developed health-recording systems (eg most Scandinavian countries), this important criterion can be included in these countries. It seems advisable to implement such systems in other countries also.

Conclusions and animal welfare implications

The parameters discussed here may comprise a first step toward generating a scientifically accepted assessment tool. We think that sufficient scientific evidence exists relating to the parameters we presently agree upon inclusion (group 1). However, besides detailed descriptions of the appropriate methods, additional information is still required regarding reliability (eg physiological correlates), methodology (eg sample size and selection of a representative sample within the farm context, procedures for short-term behaviour observations) and minimum level of observer training. Furthermore, the range of useful parameters may be extended by future studies. We believe that special emphasis should be given to development of recording schemes that allow the reliable consideration of highly welfare-relevant states, such as clinical mastitis.

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