# VOLUNTARY ANIMAL WELFARE ASSESSMENT OF MASS-PRODUCED FARM ANIMAL HOUSING EQUIPMENT USING A STANDARDISED PROCEDURE

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**Abstract** *Animal Welfare 2003, 12*: 75-84

*Assessment of mass-produced animal-housing equipment can serve as a basis for improving animal welfare. A number of European countries have adopted various legal approaches to such assessment. In Germany, welfare assessment of housing equipment is voluntary, but minimum standards can be set by regulation for the assessment procedure and for the qualifications of the persons involved. From a scientific perspective, the time and resource constraints pose some problems, particularly as they apply to a voluntary procedure. For reasons of practicability, certain compromises will be required. Nevertheless, it is important to ensure that each assessment procedure is based upon scientific principles and considers animal welfare aspects to a sufficient extent. A proposal for the minimum standards of an assessment procedure has been elaborated by the Animal Welfare Committee of the German Agricultural Society (Deutsche Landwirtschafts-Gesellschaft, DLG), a shortened version of which is presented here. The animal welfare impact of such a regulated but voluntary procedure will be less than that of an obligatory assessment; however, the relatively flexible approach may still significantly contribute to the improvement of welfare aspects of livestock housing.*

**Keywords**: *animal welfare, animal welfare assessment, cattle, horses, pigs, poultry*

## Introduction

Improvements in farm animal welfare can be achieved in several ways. Provision of stockpersons with information and training (Hemsworth *et al* 1994) and introduction of financial incentives through special consumer demands or subsidies (Bennett 1997) can be

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complemented by legislative measures (Knierim & Jackson 1997). In the European Union, certain minimum welfare standards have been set for the keeping of calves, pigs and laying hens; most of these are concerned with general principles of housing and care, but they also include details such as space allowances or the permissibility of certain systems (eg tethers or cages). However, an attempt to regulate every aspect of husbandry not only limits flexibility, but is impossible to achieve. Although the physical environment of the animal is critical to its welfare (Appleby & Waran 1997), it is often too much to expect farmers to anticipate how new equipment will affect animal welfare, in addition to considering economic, labour and technical aspects. Ekesbo and Van den Weghe (1998) report that in Sweden in the 1950s it became apparent from routine veterinary surveillance that new environmentally induced diseases had arisen concomitantly with the introduction of modern housing methods and technology, which were often accompanied by a decline in hygiene. Therefore, after a three-year introduction period, it was decided in 1973 that official legal approval, based on a welfare assessment, would have to be acquired before Swedish farmers were allowed to use new housing systems or to install new types of equipment. In Switzerland (Wechsler *et al* 1997) and Norway (Bøe 1999), comparable approaches were adopted in 1981 and 1996, respectively. In these countries, mass-produced housing equipment must be approved with respect to animal welfare before it may be introduced to the market. The recommendations of the European Convention for the Protection of Animals Kept for Farming Purposes (1976) concerning different farm animal species contain this general statement:

> "New methods of husbandry, equipment or accommodation should be comprehensively tested from the point of view of health and welfare and, when tests are undertaken, shall not be put into commercial use unless found to be satisfactory."

In Germany, the implementation of this provision has long been discussed. Repeated but unsuccessful attempts have been made to introduce a requirement similar to that of the Swiss into the German Animal Welfare Act (Tierschutzgesetz). It has been argued that the Swiss authorisation procedure has proven effective for protecting farm animals and for increasing scientific knowledge of animal welfare (Wechsler *et al* 1997). However, counterarguments are that the procedure is time-consuming and expensive, that it cannot cover other important welfare factors such as management, and that it would hinder free trade and thus violate EC rules.

In 1998, a compromise was found to the effect that no mandatory approval of housing equipment is legally required but that, if manufacturers want to label their product as approved with respect to animal welfare, the certification shall presuppose a standardised welfare assessment. A new article (§ 13a) was inserted into the German Animal Welfare Act (Tierschutzgesetz 1998) that empowers the Federal Ministry of Agriculture (now the Federal Ministry of Consumer Protection, Food and Agriculture) to set, by regulation, procedural standards for voluntary animal welfare assessment regarding the criteria and methods of assessment, investigation size and expertise of the person conducting the assessment ('expert').

A further amendment of this article from the year 2001 allows the Ministry to require a compulsory animal welfare assessment before housing equipment may be used. However, it is likely that this empowerment will be applied only in highly contentious areas such as housing systems for laying hens. For all other areas a voluntary approach to assessment will probably be used.



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Whereas in Sweden, Switzerland and Norway only one or two scientific institutions are entrusted with welfare assessments, with the final decision being left to an administrative committee, in Germany theoretically any person fulfilling the criteria of the regulation can conduct welfare assessments and certify that equipment is consistent with good animal welfare. Therefore, it is particularly important to lay down clear principles which must be followed during a welfare assessment. One problem is the time required. According to Ekesbo and Van den Weghe (1998), the time required for the assessment lies between less than one year and more than five years. The latter time-span would hardly be acceptable for industry wanting to market a new product. Also, with new technology, it may be difficult to find a sufficient number of experimental or commercial farms in order to achieve an adequate sample size for investigation. Therefore, for reasons of practicability, certain compromises will be required. Nevertheless, it is important to ensure that any animal welfare assessment and certification satisfies the criteria of being reproducible and being based on scientific principles and knowledge.

One German organisation that has extensive experience of voluntary assessment of farm animal housing equipment is the German Agricultural Society (Deutsche Landwirtschafts-Gesellschaft, DLG). Performance tests of agricultural technology have been carried out under the auspices of this society for more than 45 years. In the case of housing equipment, animal welfare has always been included as one aspect of the testing, but in recent years it has been determined that this issue should be given much greater priority. Therefore, the DLG has appointed an Animal Welfare Committee to help promote a scientifically based welfare assessment within the DLG performance tests. This committee was asked by the Ministry of Consumer Protection to submit a scientific report (Hesse *et al* 2000) as a basis for the drafting of the regulation mentioned above (implementing article §13a). In the present paper we summarise the report of Hesse *et al* (2000), emphasising those items that in our view must be taken into consideration when determining an acceptable standard for such a procedure, and we use an example to outline how such an assessment may be carried out.

## Objectives and methodological approach for an animal welfare assessment procedure

The aim of an animal welfare assessment procedure concerning mass-produced housing equipment is to reproducibly evaluate the extent to which the equipment promotes the prevention of pain, suffering or physical damage to the animals, as well as ensuring their well-being. Animals' feelings, such as pain, suffering or well-being, can be assessed only indirectly, using parameters that serve as indicators. Physical damage, on the other hand, can be measured directly. For any parameter, however, it is necessary to establish a norm and to evaluate the importance of deviations from the norm for the animal. Both of these aspects are open to interpretation. It is generally accepted that animal welfare assessments should be based on a number of different, complementary parameters from ethology, animal health, physiology, performance, animal condition and hygiene, depending on the issue at hand, and including the following considerations.

### *Ethological parameters*

The chief assessment criterion is the influence of the equipment on the animals' behaviour, specifically the amount of deviation from behavioural norms typical of the species and the breed or line. Significantly deviant behaviour with no obvious function or with deleterious consequences for animals is regarded as indicating impaired well-being (Tschanz 1985; Fraser & Broom 1990). Examples are stereotypies, absence or significant reduction of comfort, exploratory or play behaviour, disruption of species-specific diurnal rhythms, and



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apathy (Fraser & Broom 1990; Baum *et al* 1998). However, behavioural deviations often originate from early ontogeny (eg Würbel & Stauffacher 1997; Johnsen *et al* 1998) and not only from the equipment being assessed. Moreover, management factors such as feeding may have an important influence (eg Appleby & Lawrence 1987; Terlouw *et al* 1991).

Tests of the animals' preferences for different structures or substrates often provide valuable information to supplement other methods (Sachser 1998). Preference tests must use adequate testing procedures and response measures, and must take into account the animals' sensory and cognitive abilities, their earlier experiences, relevant sources of variation, consideration of long-term versus short-term effects of choices, or the significance of minority choices (Dawkins 1983; Duncan 1978, 1992; Fraser & Matthews 1997).

Behavioural observations must follow scientifically recognised methods (eg Jensen *et al* 1986; Martin & Bateson 1993), and the observer must be familiar with the behavioural biology of the species and the observational methods. Sources of behavioural variation such as diurnal effects should be taken into account when selecting observation intervals or times. Checking of inter-observer reliability and agreement between recordings from videotape and direct observation is recommended.

***Pathological and physical condition parameters***

Pathological parameters are mortality, morbidity and housing-related injuries or diseases (technopathies) including injuries resulting from abnormal behaviour or social conflict. Data may include examinations at slaughter and post-mortem dissections.

Other physical conditions such as developmental or nutritional state and feather or hair condition may provide information on possible repeated harmful contacts with housing facilities or other animals. They may also indicate risks of disease or excessive heat loss. As a rule, the assessment can only be made using semi-quantitative measures on an ordinal scale.

All data recording must be carried out by a trained person according to a standardised, written and well-defined protocol, preferably with reference to published scoring systems. Ideally, the state of the animals prior to contact with the equipment should be recorded, and inter-rater agreement checked. Documentation should also include other potentially influencing factors such as feeding, breeds or lines, previous housing (eg of the young animals), medical treatments, and measures affecting the animals' immune status or performance.

Often, multiple factors are responsible for disease or injury; hence, the specific effects of the housing equipment may be difficult to establish. Moreover, it may not be possible to detect the full effects of the equipment on animal health within the available time. Injuries, disease and death are often signs of considerable strain persisting for some time.

***Physiological parameters***

Physiological parameters can sometimes be more sensitive than other measures (Stephens & Toner 1975; Fell & Shutt 1989; Holst 1998). However, the collection of physiological data can itself have major effects on the animals. These effects can be minimised by taking samples from more easily accessible substrates than blood, such as milk, urine, faeces or saliva, or by heart-rate measurement using telemetric instruments. Problems can also be overcome by familiarising the animals with the procedure.



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In the case of hormones, a sufficient number of measurements are required in order to take into account their episodic and pulsatile release pattern, and thus their circadian and ultradian variation (Ladewig 1987; Terlouw *et al* 1997; Holst 1998). Because many physiological changes are not specific to emotional states but also occur in connection with physical exercise, metabolic processes and other factors (Rushen 1986; Fraser & Broom 1990; Terlouw *et al* 1997), records must include the behaviour of the animals and the context in which the data were recorded. For voluntary animal welfare assessment procedures, it is likely that only limited use of physiological parameters will be possible because of high demands on laboratory resources.

***Performance parameters***

When comparing equipment in terms of performance (eg milk yield, laying rate, weight gain, reproduction rate), it is crucial to ensure that the two most influential factors on performance — the genetic origin of the animals and their feeding — are controlled. It is also advisable to avoid the isolated assessment of single performance parameters or of only short periods in the animals' lives. Unfortunately, it will rarely be possible to record longer-term and overall performance within the available time. Because a good average group performance does not rule out the possibility that individual animal welfare is severely compromised (eg through competition among the animals), data should be recorded at the level of the individual.

***Hygiene parameters***

Soiling of animals may indicate that resting or walking areas are not optimally designed. Animal well-being can be negatively affected by moisture and harmful effects of faeces and urine on the skin. Additionally, soiling can pose a risk of disease and promote infestation with parasites. For the scoring of soiling of animals or housing, the same principles apply as for the assessment of health and condition.

Regular cleaning and disinfection are necessary for animal health reasons. Hence, assessment of housing equipment must also consider ease of cleaning, maintenance and susceptibility to contamination. Assessment should also include any relevant effects of the equipment on housing climate (levels of gases, bacteria, dust, atmospheric humidity, temperature, air movement) and noise. During the investigation, any unusual climatic conditions that may affect results must be documented and considered in the interpretation.

## Requirements and general conditions of the welfare assessment procedure

Initially it must be determined on the basis of the product description whether the product meets the relevant minimum requirements of animal welfare legislation. The welfare assessment must be based on published scientific or practical knowledge and, where necessary, on practical investigation. It must consider all welfare aspects which may be affected by the equipment. The categorisation of animal behaviour into different functional classes (resting, locomotion, feeding, elimination, reproduction [including mother–offspring behaviour], social behaviour, comfort, exploration, play) can provide a suitable framework for this approach. Where the relation between certain characteristics of the animal's environment and its welfare are sufficiently well known, design variables may also be applied. A catalogue of ethological and health assessment variables, as well as design variables for cattle, horses, pigs and poultry, is given in Table 1. Relevant variables, which relate to those areas in which problems for the animals may arise because of the equipment,



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shall be selected from the list for each individual assessment procedure. However, the catalogue is provided only as a starting point and should not prevent the use of further variables. In addition, significant behavioural abnormalities (eg stereotypies, cannibalism, feather pecking) or health problems must be recorded whenever they are observed. The hygienic properties of the equipment and possible sources of injury or other damage are also of importance.

Although general observations by stockpeople may constitute an important additional source of information, they may not be used as the sole basis for the assessment. Methods for the collection of data must be based on recognised scientific principles, as explained above. In general, care must be taken to assess only the specific effects of the equipment under investigation rather than those of the environment as a whole. At the site used for the practical investigation (educational, experimental or practical farm, or laboratory), it must be possible to reliably control general conditions, document the relevant data and monitor the course of the investigation.

Investigations should use breeds or genetic lines of animals that are commonly kept and, as far as possible, should use common practices regarding the social composition and size of animal groups and management systems. Farm-specific and breed effects should be taken into consideration in the design of the investigation, for example by testing different variants of the equipment at one location, or by testing the same equipment at various locations and with different breeds or lines. Furthermore, the spatial positioning of the equipment (eg feeders) should be either standardised or varied systematically. A minimum of two replications should be carried out, and a greater number is desirable. The ultimate animal welfare assessment, based on available literature or results of a practical investigation, should be carried out by an expert or body of experts qualified by training and experience to plan a practical investigation according to scientific principles and to interpret results with reference to behavioural biology and veterinary medicine.

**Practical execution of an animal welfare assessment procedure**

As mentioned above, the DLG (German Agricultural Society) already carries out voluntary performance tests on housing equipment, one increasingly important part of which is the animal welfare assessment. These tests may serve as a model for the organising and designing of assessment procedures. The procedures involve a number of persons, including an engineer responsible for organising and executing the practical investigations, and a voluntary expert committee comprising experienced farmers, consultants and scientists including a member of the DLG Animal Welfare Committee. The committee selects the assessment variables, decides on methods and size of investigation, establishes tolerable levels for the variables and discusses the overall evaluation. There is no unequivocal scientific basis available for setting limits and weighting the different variables for the overall evaluation; this must necessarily involve a process of discussion and approximation towards what is nevertheless a somewhat arbitrary decision. This is an area on which the DLG and the Animal Welfare Committee plan to conduct some systematic work in the future.

Practical investigations are usually carried out partly under laboratory conditions and partly on farms, supplemented by surveys of farmers' experiences with the equipment. As an



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**Table 1** **Catalogue of ethological, health and design variables for the welfare assessment of housing equipment for cattle, horses, pigs and poultry.**

| Functional class | Assessment variables | |
|---|---|---|
| | **Animal-related** | **Design** |
| ***Resting*** | *Cattle, Horses, Pigs*: individual lying or resting times, lying positions, eg frequency of stretched lying on side (*cattle, horses*) or on side or belly (*pigs*);<br>*Poultry*: number of birds standing or sitting on perches during different lighting periods, extent of disturbance by conspecifics;<br>*Cattle*: lying down and getting up (eg frequency of abnormal getting up, duration of lying down), synchrony of lying or resting behaviour, extent of disturbance by conspecifics. | *All*: dimensions of lying or resting area, softness, heat conductivity, dryness, slipperiness, air quality;<br>*Horses*: possibility of visual contact with conspecifics during lying. |
| ***Locomotion*** | Frequency of slipping and of abnormal postures during locomotion, foot and limb health, bone-strength. | Space allowance, structuring of space, floor slipperiness, step safety, dryness, cleanliness. |
| ***Feeding*** | *All*: Individual feeding and drinking times, diurnal rhythm, synchrony of feeding behaviour;<br>*Cattle*: posture during ingestion (eg extent of pressure on limbs);<br>*Calves*: sucking behaviour (eg duration and frequency of sucking and inter-sucking), frequency of digestive disorders. | *All*: Dimensions, accessibility of drinking and feeding place, ratio of animals per feeding or drinking place, protection from competition, reliability and accuracy of automated devices, speed of water flow or food refill, functioning of medication devices (eg accuracy of doses), possibility of selective feeding;<br>*Cattle*, *Horses*: possibility to immerse muzzle into water during drinking;<br>*Horses*: possibility of feeding roughage at floor level. |
| ***Elimination*** | *Cattle*: frequency of abnormal postures;<br>*Pigs*: functional separation of dunging area from lying and feeding areas, cleanliness of animals. | *Horses*: possibility to urinate on littered area, floor slipperiness. |
| ***Reproduction, milking, egg-laying*** | | ***Cattle*: milking** |
| | Udder-health, strain on teats. | Parlour design: reliability of technical equipment, space allowance, floor slipperiness, dryness, cleanliness. |
| | | ***Poultry*: egg-laying** |
| | Frequency and duration of visits to nests, indications of conflict or frustration during pre-laying period, incidence of cloacal cannibalism. | Number of birds per nest, accessibility of nest, nest design. |
| | | ***Horses, pigs*: service area, service dummies, examination stalls** |
| | | *All*: Dimensions, slipperiness of floor;<br>*Pigs*: opportunities for contact between sow and boar. |
| | | ***Pigs*: farrowing and rearing of young** |
| | Duration of farrowing and interval between birth of individual piglets, frequency of crushing of piglets. | Possibility of nest-building, protection devices for piglets. |
| ***Social interaction*** | Number of agonistic or cohesive interactions, synchrony of behaviour. | Possibility of performance, possibility of retreat and avoidance of contact, group size and composition. |
| ***Comfort behaviour, exploration, play*** | Frequency of performance, integument condition. | Availability of stimuli and structures for thermoregulation, scratching, rolling, dust-bathing etc, presence of conspecifics, space allowances, slipperiness, cleanliness of floor, structuring of space. |



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example, some details of the variables, procedures and tolerable values are given in Table 2, based on an actual welfare assessment of mattresses for dairy cows in cubicle houses. The performance test also includes technical criteria such as durability, wear resistance and ease of installation. Usually, between nine and 18 months are required before the test engineer can draft a performance test report. All results are ranked independently on a five-point scale from + + to – – where 0 represents the standard. On the basis of this evaluation the expert committee decides for or against approval of the equipment. In the case of non-approval, the manufacturer is given the opportunity to make further improvements and can request additional tests. This occurs in around 80% of tests. In the case of approval, a test report is published and the manufacturer may market the equipment as 'DLG-approved'. The manufacturer has to pay about 3000 € for each test, with the remaining cost being subsidised by the Federal Ministry of Consumer Protection, Food and Agriculture.

**Table 2 Variables, methods and norm values for the welfare assessment of mattresses as cubicle floors for dairy cows.**

| Assessment variables | Method of investigation | Tolerable values, remarks |
|---|---|---|
| *Toxicological safety of material* | Declaration of manufacturer. | |
| *Elasticity, slipperiness* | Laboratory tests with 'artificial carpus' and 'artificial cow foot', direct observations at farms. | Penetration depth $\geq$ 2 mm, remaining distortion $\leq$ 50% Coefficient of friction $\mu > 0.45$ |
| *Cleaning propensities* | Declaration of manufacturer, laboratory tests, evaluations on farms. | Certain technical limits regarding durability under the effect of cleaning. |
| *Duration of standing and lying on the mattress in comparison to a standard (rubber mat)* | Small scale (n = 4) preference test on educational farm, continuous focal animal sampling from video recordings (168 h). | $\geq$ 40% of standing and lying time on mattress. |
| *Length of lying periods* | Continuous focal animal sampling from the same video recordings as above. | Supplementary information. |
| *Frequency and duration of abnormal getting-up behaviour* | 40 cases of getting-up behaviour on 2 farms, healthy cows, direct behaviour sampling. | Cubicle design and dimensions are taken into account, tolerable values under discussion. |
| *Prevalence of physical damage (including loss of hair, swelling, reddening or injuries) presumably caused by the floor* | Integument scoring of 75 cows from 3 farms at knees, tarsal, carpal joints and pasterns. | Cubicle design and dimensions are taken into account, tolerable values under discussion, presently $\geq$ 65% of scored locations without any physical damage. |
| *Survey on adaptation to mattresses, slipperiness, lying times, getting-up and lying-down behaviour, damage and further observations* | As many farms as possible, occasional visits and inspections. | Supplementary information. |

### *Animal welfare implications*

Establishing legal requirements for the procedure of voluntary welfare assessment of farm animal housing equipment is a compromise between an obligatory assessment of any new equipment, such as in Switzerland, Sweden and Norway, and a completely voluntary assessment with no standardised procedure. The proposed procedural minimum standards



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outlined above are meant to ensure that animal welfare assessment and certification is reached in a reproducible way on the basis of scientific principles and knowledge, and with sufficient consideration of potential animal welfare problems. Although such a voluntary procedure will not make it possible to comprehensively cover all equipment on the market or to prohibit equipment with inherent animal welfare problems, this approach will help farmers to make decisions for suitable housing equipment. Equipment may also be improved during the assessment procedure. Hence, voluntary welfare assessment may significantly contribute to improving welfare aspects of livestock housing.

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