Criteria for Welfare Assessment

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Welfare of animals involves their subjective feelings. Hence it cannot be directly assessed. It is generally accepted that welfare comprise the morphological, physiological, behavioural and mental status of the animals, and most indicators are related to these scientific disciplines. Welfare is defined as “normal” morphological development and undisturbed physiological, behavioural and mental status of the animals. It is expected that this status allows the animals to successfully cope with the prevalent environmental conditions. The definition of “normal” or “abnormal” status of domestic animals is a crucial problem in assessing welfare. Genetic selection for morphological, behavioural and production traits has changed the phenotypical appearance and the physiological background of the domestic fowl. At the same time the environmental conditions have been changed dramatically. Attempts to use the Bankiva fowl under natural conditions as a base line for normality have failed so far, and welfare indicators for the domestic fowl are focussed on mechanisms which allow the specific breeds to cope with their environment.

Morphological changes in body shape (crests, dwarfism), feathering (curled, silky, naked neck and scalelessness) have been suspected to impair the welfare of the birds. It is argued that these breeds may not be fit to survive under natural or quasi natural conditions. Morphological changes per se cannot be taken as indicators unless it is established that these characteristics lead to suffering as stated by physiological or behavioural indicators.

Selection for high egg production has been related to potential risks of osteoporosis and high growth rate resulted obviously in reduced locomotor ability, leg disorders, ascites and sudden death syndrome. The interrelationships between production traits and welfare are complex and the discussion on this topic is controversial. Stress, diseases and metabolic disorders in general impair growth and egg production. Therefore normal production rates are considered as indicators for welfare by poultry keepers. In some cases, however, there are welfare problems despite high productivity, and low productivity may not have negative effects on welfare. It is important to collect information from various scientific disciplines. This information may not be consistent, and indicators of good and poor welfare arise within the same bird. The assessment of welfare in this case requires balancing of positive and negative aspects. There is no generally accepted solution for this problem so far.

Key words: welfare; indicator; genetics; management

Introduction

The perception welfare in general and animal welfare in particular has evolved concomitantly with the philosophical, ethical and economical progress of the human population. In the past the interrelationship between humans and animals was controlled by traditions. The traditions provided fixed rules on the treatment of animals and were controlled by the social communities. Traditions, however, do not give general rules for the treatment of animals, but regulate cases which are specific for different animal species and specific situations. There has been considerable variation of the traditions concerning the treatment of animals among and within ethnic groups, which still persists in some areas (e.g. fox hunting, bull and cock fighting). Even within individuals there is often no consistent trend in the declared opinion and real decisions concerning animal welfare. While the overwhelming part of the consumers in Northern European countries express their concern about
caging of hens, eggs from this system still represent the major chair on the market (Trinh, 1997). The causes for this divergence are manifold and have been dealt with by EU (2005). While contacts and experience of the urban populations with farm animals disappeared, the number of pet animals increased. This development has contributed to changes in the status of animals in relation to human beings and stimulated the discussion on the animals’ psychological needs and feelings. In this context the caged laying hens have become the focal point of the animal welfare debate (Harrison, 1964; Brambell, 1965), since the gap between the expectation of the population on welfare friendly management systems and the reality was larger than in any other farm animals. It is generally accepted that welfare of animals comprises morphological, physiological, behavioural and mental mechanisms. The status of welfare is the result of the subjective appraisal of the animal of the above mechanisms. Hence welfare cannot be directly addressed, and indicators are sought which are linked to welfare. The link between the indicators as measurable criteria and welfare is based on theoretical concepts. In the following we will discuss the commonly used indicators of welfare in laying hens.

**Indicators of welfare**

In the following the main criteria of welfare are listed in 5 categories, productivity, health, morphological, physiological and behavioural conditions.

**Productivity**

Egg production, body weight, feed intake, feed conversion rate and mortality are the main characteristics of performance in the domestic fowl. High egg production in layers is an indicator of undisturbed physiological function of the reproductive tract. The absence of stressors, which are known to reduce egg production, such as heat stress; stocking density, social strife (Robinson, 1979; Mashaly et al., 1982; Reynard et al., 1996) is a prerequisite for high productivity throughout the laying period. The same has been reported for growth rate and feed conversion on broilers. It has been reported episodically that birds showed high production rate despite serious wounds, diseases or stress challenges. But it is unlikely that laying hens or broilers will maintain high production rates after extended periods of stress. Sub-optimal production, however, does not indicate lack of welfare. Low protein or/and high fibre/low energy diets, short lightning periods may reduce productivity without obvious welfare problems. The welfare status in broilers may even be improved by reducing the early growth rate through reduced incidence of leg problems (Reiter and Bessei, 1998). Therefore the interpretation of production traits in regard to welfare requires consideration of the other aspects.

**Health**

Good health is considered a prerequisite for welfare. Despite, or because, the influence of diseases on the welfare conditions of animals is generally acknowledged, “health” is explicitly addressed in a few of the definitions only. Rushen (2003) expressed his concern about the underestimation of health aspects in the welfare discussion. Since health problems are closely related to the morphological, physiological and psychological conditions of the animals, it may be understood as a part of the other categories. With regard to the specialised knowledge which has been elaborated and published on the interrelationship between health and welfare, this aspect will be retained as a separate category. In order to appraise the extent of welfare problems caused by diseases it would be necessary to record the type and duration of disease as well as number of diseased birds. The duration of suffering highly depends on the type of disease, culling practice and quality of medical care. With regard to the work and laboratory capacity which is required to generate such data under practical conditions we have to rely on indirect criteria. Changes in feed and water intake are directly linked with bacterial and viral infections. Since water intake can be easily recorded, it may not only serve as an early warning system for the outbreak of a disease (Bessei and Günthner, 2006), but also as a means to measure the incidence and duration of the disease on a flock basis.

**Morphological conditions**

There are various changes in the morphological conditions which are obvious signs of impaired welfare. The frequencies and intensities of morphological damages in layers and broilers can easily be recorded on the farm or in the slaughter house. There exist scoring systems for the feather and foot
conditions of layers and broilers (Tauson et al., 2006; Berg, 1998). Fragility of bones hens in laying hens bears the risk of bone breakage. While fresh breakages are frequently found in caged laying hens after depopulation, healed fractures are found in layers of non-cage systems. Lack of exercise in caged hens reduce bone strength and increase the risk of breakage, mainly of the humerus, through rough handling (Gregory et al., 1993). Although the bones of hens from non-cage systems are stronger, the higher risk by the movement to perches and nest boxes leads to higher incidence of breakages of the keel bones and the furculum (Gregory et al., 1990). While the bone breakage obviously implies suffering, the effect of other morphological damages, such as keel bone deformation, broken claws, feather damages and bumble feet on welfare are not well studied. Bumble feet and foot pad lesions are the result of injuries and infections and hence direct indicators of impaired welfare. There is no information on the relevance of keel bone deformation on welfare. Minor deteriorations of the feather structure is brought about by gentle feather pecking and may not be connected with pain and suffering. Plucking of feathers, however, is considered temporarily painful.

Physiological conditions

It is generally acknowledged that the intact organism disposes of particular physiological mechanisms to cope with adverse environmental conditions, e.g. the fight and flight syndrome and the general adaptation syndrome (Siegel, 1987). The central criteria in this context are related to the General Adaptation Syndrome (Selye, 1956), e.g. corticosterone, heterophile : lymphocyte ratio, adrenals (Gross and Siegel, 1983; Rushen, 1991; Maxwell, 1993). Corticosterone and related hormones are also involved in basic metabolic functions. In order to differentiate between normal metabolic activity such as low ambient temperature, increased exercise, and stress response it is essential to study the basal level as well as the dynamic response to challenges. Physiological criteria usually return to normal levels within a given time after challenge. The persistence of high levels of corticosterone, for example, indicate lack of ability of adaptation and are considered as indicators of reduced welfare. The physiological criteria of the Hypothalamus-Pituitary-Adrenal axis have failed to produce consistent results in regard to welfare in laying hens (Guémené et al., 2005).

Collection of physiological data requires special equipment, laboratory methods and controlled environmental conditions. The criteria may not be applicable under practical husbandry conditions.

Behaviour

The deviation from “normal” behaviour is generally considered to indicate welfare problems. This raises the question on differentiation of “normal” and “abnormal” or “disturbed” behaviour. There are different approaches to determine “normal” behaviour. Some authors propose the behaviour of animals in a quasi-natural environment should be the baseline (Stolba, 1981). The deviation of the behaviour under commercial husbandry conditions, from the quasi-natural reference system, may be used as measure of welfare problems. It is assumed in this model that the welfare state of the birds is at maximum level in the reference system, and any changes in behaviour indicate deterioration of the state of welfare. A similar approach is given by the index of animal welfare (TGI) which allocates bonus points to housing systems which allow the expression of natural behaviours (Sundrum, 1997). The assumption that the environment which allows the expression of the full inventory of natural behaviours ensures maximum of welfare has to be questioned. It is also difficult to identify the limits where the change of behaviour exceeds the range of normal adaptation responses. Furthermore this system does not take into consideration that, under artificial husbandry conditions, the animals may develop alternative behavioural patterns, which may successfully maintain the state of welfare. In some cases the sequence of behavioural patterns rather than durations and intensities, are affected by adverse environmental conditions.
These problems have to be considered, when differences in the duration and frequency of common behaviours, such as preening, walking, eating, are being used to appraise welfare. The interpretation of differences in these behaviours needs to be supported by the knowledge of the underlying motivation.

The interrelationships between behaviour and welfare are easier to interpret when the behaviour leads to obvious mutilations of the birds themselves, or, of their group mates. This is the case in feather pecking, cannibalistic pecking and aggression. Welfare problems are also obvious when the behaviour of the animals leads to serious behavioural disturbances (e.g. stereotypies). Behavioural stereotypies, once they have been developed, often persist even though the causal factors have disappeared. In these cases the occurrence of abnormal behaviours may not reflect the welfare situation at the time of observation.

A special problem is the lack of occurrence of behaviours either for the lack of space (wing-flapping), structure (roosting), or lack of eliciting stimuli (flight). The non-occurrence as such may only be considered with regard to welfare if the causes of the effect are known. Behavioural observations are time consuming and require particular training of the personnel. The interrelationships between behavioural changes and the state of welfare will rely on observation under controlled conditions. Hence on-farm observations of are not considered useful to appraise the welfare conditions.

Based on the analogy of animals and humans in their anatomical and physiological system it is generally acknowledged that higher animals have feelings and emotions. As far as well-being is related to health, production, reproduction and physiological traits there exists a basis of measurable characteristics which make the definitions accessible to established methods of natural sciences. Definitions related to subjective feelings, however, require special theoretical and experimental approaches. While Wemelsfelder et al. (2000) is of the opinion, that humans may recognise the animals’ wellbeing or suffering intuitively by observation, there are attempts to approach the animals’ feelings and emotions experimentally. With this regard tests for preferences, fear, avoidance and frustration and operant conditioning techniques have been used extensively to uncover the emotional state and motivation of animals under welfare-related conditions. The problems of the experimental designs and the interpretation of the results with regard to well-being have been discussed extensively by Duncan (1978). Assuming that animals – like humans – prefer pleasant experiences, preference tests can provide interesting information of the animals’ subjective ranking of environmental conditions on the hypothetical scale of welfare (Dawkins, 1976). Since symptoms of poor welfare are easier to identify than symptoms of positive states of emotions the former part of the scale has been explored extensively. Frustration, fear and avoidance tests have proved to be particularly useful to explore the area of poor welfare (Jones et al., 1982; Koene, 1993). The state of positive experiences, however, is more difficult to identify. The consumer demand function has been used to investigate this area. The elasticity of demand (as expressed by the slope of the demand plotted against increasing “price” or work load) is considered an indicator of the motivation to obtain particular rewards (Houston, 1997).

The above mentioned tests have extended our knowledge on the relative importance and on priorities of environmental inputs, such as floor space (Faure and Lagadic, 1994), height (Nicol, 1987) and nest and scratching area (Guesdon et al., 2004). The results have also shown that they must be interpreted with care. Choice tests, for example, highly depend on the design of the test and the criteria which are being observed. In operant conditioning tests it is important to choose techniques which are adequate with respect to the species and the particular motivation to be investigated.

**Conclusions**

Considering that welfare is the result of morphological conditions and physiological, behavioural and psychological mechanisms, which influence liveability, growth, reproduction, health and behaviour, considering further that environmental conditions influence the above mentioned criteria in different directions, the actual state of welfare of an animal is the result of the integration of the above mentioned processes. Limiting morphological space of indoor systems, for example, restricts freedom of movement, but reduces the risk of predators. Litter-less husbandry systems impair scratching and foraging behaviour, but may improve the health conditions. Choice tests and operant conditioning techniques will be helpful to establish a scale of priorities and to develop weights within the categories of indicators. But there is no experimental design so far that allows weighting the different aspects of
welfare across the categories (e.g. health against freedom of movement). There are new technologies under development, which may be helpful to overcome these problems. The functional Magnet-Resonance Imaging technique visualises the activity of particular areas of the central nervous system. It is known that, depending on the emotional state of the animal, e.g. fear, frustration, aggression, etc., specific areas are activated (Montague and Berns, 2002). This may allow determining the emotional reaction of the animal’s response to complex environmental conditions.

References


