

## Prostředí jako významný faktor volivnější pohodu a produkční ukazatele hospodářských zvířat

Environment as a significant factor influencing the welfare and production of farm animals

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### 1. Welfare, production and needs

When attempting to determine what is an appropriate environment for an animal, most scientists involved in welfare research would agree with Appleby (1997) that a range of components of that environment, each of which is to some extent variable, should be considered. The environment is appropriate if it allows the animal to satisfy its needs. Animals have a range of functional systems controlling body temperature, nutritional state, social interactions etc. (Broom, 1981). Together, these functional systems allow the individual to control its interactions with its environment and hence to keep each aspect of its state within a tolerable range. The allocation of time and resources to different physiological or behavioural activities, either within a functional system or between systems, is controlled by motivational mechanisms. When an animal is actually or potentially homeostatically maladjusted, or when it must carry out an action because of some environmental situation, we say that it has a need. A need can therefore be defined as a requirement, which is part of the basic biology of an animal, to obtain a particular resource or respond to a particular environmental or bodily stimulus. As pointed out by Broom (1997), these include needs for particular resources and needs to carry out actions whose function is to obtain an objective (Toates and Jensen, 1991; Broom, 1996a). Needs can be identified by studies of motivation and by assessing the welfare of individuals whose needs are not satisfied (Hughes and Duncan, 1988a,b; Dawkins, 1990; Broom and Johnson, 1993). Unsatisfied needs are often, but not always, associated with bad feelings whilst satisfied needs may be associated with good feelings. When needs are not satisfied, welfare will be poorer than when they are satisfied.

Some needs are for particular resources, such as water or heat, but control systems have evolved in animals in such a way that the means of obtaining a particular objective have become important to the individual animal. The animal may need to perform a certain behaviour and may be seriously affected if unable to carry out the activity, even in the presence of the ultimate objective of the activity, for example rats and ostriches will work, in the sense of carrying out actions which result in food presentation, even in the presence of food. In the same way, pigs need to root in soil or some similar substratum (Hutson, 1989), hens need to dust-bathe (Vestergaard, 1980) and both of these species need to build a nest before giving birth or laying eggs (Branas 1980, Argy 1992). In all of these different examples, the need itself is not physiological or behavioural but may be satisfied only when some physiological imbalance is prevented or rectified, or when some particular behaviour is shown.

Some needs are associated with feelings, which might also be called subjective experiences, and these feelings are likely to change when the need is satisfied (Broom 1999a).

If the needs of animals are not met there will often be effects on production. However, the extent of this effect depends on the adaptability of the animal. In some situations, animals work very hard to adapt and welfare is poor but production is good because the animal partici-

ons sufficient energy to grow or reproduction. In other cases, the animal cannot adapt or is affected in a way which impairs adaptation, so production declines.

### 2. Stress, welfare and production

The word stress should be used for that part of poor welfare which involves failure to cope. If the control systems regulating body state and responding to dangers are not able to prevent displacement of state outside the tolerable range, a situation of different biological importance is reached. The use of the term stress should be restricted to the common public use of the word to refer to a deleterious effect on an individual (see Broom & Johnson, 1993 for more detailed information on this subject). A definition of stress as just a stimulation or an event which elicits adrenal cortex activity is of no scientific or practical value. A precise criterion for what is adverse for an animal is difficult to find but one indicator is whether there is, or is likely to be, an effect on biological fitness. Stress can be defined as an environmental effect on an individual which over-taxes its control systems and reduces its fitness or seems likely to do so. (Broom & Johnson, 1993, see also Broom 1983, Fraser & Broom, 1990). Using this definition, the relationship between stress and welfare is very clear. Firstly, whilst welfare refers to a range in the state of the animal from very good to very poor, whenever there is stress, welfare is poor. Secondly, stress refers only to situations where there is failure to cope but poor welfare refers to the state of the animal both when there is failure to cope and when the individual is having difficulty in coping. It is very important that this latter kind of poor welfare, as well as the occasions when an animal is stressed, is included as part of poor welfare. For instance, if a person is severely depressed or if an individual has a debilitating disease but there is complete recovery with no long term effects on fitness then it would still be appropriate to say that the welfare of the individual was poor at the time of the depression or disease.

Whenever an animal is stressed, production will be affected. The cause of the stress may be adverse temperature conditions, lack of food or water, social conflict, a disease condition or one of various other environmental effects. The point at which welfare is affected, for example by adverse temperature conditions, will be before that at which the animal is unable to cope. Production may sometimes be impaired by the interaction of a variety of environmental effects on the individual, none of which alone would have such an effect.

### 3. Effects on animal treatment

It is the people who design and build farm animal facilities and the people who own, manage and work on farms, transport operations and slaughterhouses who have the principal effects on animal welfare. The actions of these people may depend to some extent on expert advice, for example that of veterinary surgeons.

The architects, builders and equipment companies who provide accommodation and other facilities for those in the food animal production industry, depend upon their customers in the sense that their products would not be bought if they were not economically viable but they also have freedom to be innovative and they are perceived by the public and the farmers to have moral obligations to animals similar to those of the farmers themselves. Some of these moral pressures are not as immediate, however, so these companies are not always ready to acknowledge their responsibilities.

The possibility for the maintenance of good physical conditions must be considered when designing animal accommodation. In addition, good management of animals involves careful monitoring of physical conditions so that adverse conditions are avoided. This may be done

automatically or by careful human intervention. Any automatic system must be properly checked and maintained.

#### 4. Effects of housing design on welfare and production

##### Dry sow housing

Four examples of studies of how housing design affects the welfare of farm animals are mentioned here. The first concerns housing for dry sows. During the non-lactating period, sows may be kept in various conditions. Some sows are confined by leathers or by being kept in small individual stalls. Others are kept in large or small groups in buildings or in fields or woodland. When kept in groups, especially when limited space is available, sows can show damaging aggression to one another but with an appropriately designed feeding method and careful management, such aggression can be kept to a very low level. Confined sows show considerable abnormalities of behaviour, and sometimes of physiology and reproduction which indicate that welfare can be very poor during confinement. In the study described here, the welfare of sows was compared when they were kept in conditions which were as nearly as possible identical, except for being housed in stalls, small groups with individual feeding stalls or a large group with an electronic sow feeder. The sows were studied from birth until death. During the first four pregnancies there was no difference in productivity or in physiological indicators of welfare but the stall-housed sows became slightly smaller. The substantial difference between the animals in the different housing conditions was in the much higher level of abnormal behaviour in the stall-housed sows than in either of the group-housing conditions. Damaging aggression was absent in all conditions and the level of aggressive behaviour was highest in the stall-housed sows. Stereotypes, such as bar-biting and sham-chewing, and behaviour which included a substantial stereotyped component, such as drinker manipulation and rooting in the trough were much more common in the confined sows, (Broom et al 1995). When the sows were slaughtered, those in the stalls which could not exercise adequately had relatively smaller muscles, as expected from their poor ability to make precise lying movements, but they also had leg bones which were only 67% of the strength of those of group-housed sows (Marchant and Broom 1996).

##### Calf housing

Calves which are kept in confinement also have problems which result in abnormalities of behaviour and other indicators of poor welfare (Broom 1996b). Poor welfare resulting from lack of adequate stimuli, including lack of social contact, inability to show normal movements, and inadequacies of diet, are indicated by excessive sucking and licking (van Putten and Elshof 1978), stereotypes such as tongue-rolling (Webster et al 1985, Wierenga 1987, Ketelaar de Lauwere and Smits 1989), attempts to adopt normal lying postures which cannot be adopted (de Wilt 1985, Ketelaar de Lauwere and Smits 1989, 1991), abnormal social responses and social ability when put into a group (Broom and Leaver 1978, Broom 1982) and increased adrenal and other physiological responses (Friend et al 1985, Trunkfield et al 1991). The problems are considerably reduced in group-housed calves, which show much less aggressive behaviour than pigs, but they must be managed so as to minimise inter-sucking and to prevent disease transmission.

##### Dairy cow housing

When dairy cows are housed, their needs can be provided for quite well but prolonged tethering causes problems and some cubicle houses lead to other, but still serious, problems. Where the environment is heterogeneous, with some sections in the house being less desirable than

others, the possibility exists that some animals will spend much time in the least desirable places. One of the major problems of cubicle houses is lameness. A study by Galindo (Galindo and Broom 1993a, b, 2000, Galindo 1994) showed that those cows which were lower in rank were more likely to be standing in wet parts of the house and more likely to become lame. However, the adverse effects on the lowest ranking cows were considerably greater in poorly designed or managed buildings than in the best farms. Less lameness and fewer problems in total, are found in cattle at pasture or in well managed straw yards.

##### Piglet housing

A fourth example of the effects of housing conditions concerns the pens used for weaned piglets. Poor ventilation can lead to difficulties associated with ammonia or dust but the extent to which the young pig can control its environment and obtain the right stimuli also affect welfare substantially. If a young pig is chased, by another animal trying to show aggression or belly-nosing toward it, and can never hide then its welfare will be poor. McGlone and Curtis (1985) showed that if a piglet which can put its head in a „pophole“, a hole in the wall, then aggression is reduced. In a further, more practical, development Warran and Broom (1993) found that a solid barrier extending two thirds of the way across a pen housing a group of piglets, reduced aggression and resulted in better piglet growth. The major beneficial effect was on the piglets which were chased. A different way to improve the environment for piglets is to provide objects or materials which they find very attractive. Piglets like to root in earth or in straw (Wood-Gush and Beilharz 1983, Hutson 1989,) but they also like to manipulate deformable objects such as ropes or sticks with bark on them (Feddes and Fraser 1993) and to investigate a moveable ball which occasionally deposits food pellets (Young et al 1994).

In all of these examples, production can be adversely affected if inadequate conditions are provided. On some occasions, poor welfare is directly associated with lower production and lower profits. On other occasions, poor welfare occurs because of too high a stocking density or too barren an environment and to remedy the welfare problems costs money. The views of consumers need to be taken into account when deciding which method of production to use.

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