

THE SCIENTIFIC ASSESSMENT OF ANIMAL WELFARE DURING PRE-SLAUGHTER MANAGEMENT

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Introduction

In order to be able to improve the welfare of livestock which are being handled or transported we must be able to measure their welfare when different procedures are used. The welfare of an individual is its state as regards its attempts to cope with its environment (Broom, 1986) so welfare refers to how much it has to do in order to cope and how well or how badly coping attempts succeed (see Broom, 1991). Different species and different individuals may use different methods when trying to cope and there are several consequences of failure to cope so it is necessary to use a range of measures when trying to assess how good or how poor the welfare is. One measure, such as growth or one kind of physiological or behavioural indicator, may not show that there is a problem but another measure may indicate that the animal is severely affected by the treatment. Any one measure can show that the welfare is poor.

The scientific assessment of welfare must be quite separate from any moral judgement. Welfare is a characteristic of an individual at the time of observation or measurement so it can be assessed in an entirely objective way. Once the range of measurements of the different welfare indicators has been made, people can judge whether welfare which is that poor is acceptable. Moral decisions of this kind can be made by anyone given the scientific results and guidance in how to interpret them. There is variation amongst people with respect to how poor the welfare of a farm animal has to be before they consider it to be intolerable. This variation is a consequence of the background, including the country of origin, of the person. However, there has been a substantial change in attitudes towards animals as research on the behaviour and physiology of animals has been publicised in the media and has revealed their complexity and similarity to man. Greater knowledge of the extent to which the welfare of animals can be poor because of pain, fear or other adverse effects of man and the environment which people impose on them has resulted in pronouncements by Protestant, Catholic, Muslim and Buddhist religious leaders about human obligations to animals which we use. New legislation is also being enacted in the European Community and elsewhere.

Welfare measures

1. Behavioural

The most obvious indicators that an animal is having difficulty coping with handling or transport are changes in behaviour which show that some aspect of

the situation is ... The animal may stop moving forward, freeze, back off, run away or vocalise. The occurrence of each of these can be quantified in comparisons of responses to different races, loading ramps, etc. Details of these and other welfare measures may be found in Broom (1988), Fraser and Broom (1990) and Broom and Johnson (in press). Examples of behavioural responses such as cattle stopping when they encounter dark areas or sharp shadows in a race and pigs freezing when hit or subjected to other disturbing situations may be found in Grandin (1980, 1982, 1989) and in various papers in this volume.

The extent of behavioural responses to painful or otherwise unpleasant situations varies from one species to another according to the selection pressures which have acted during the evolution of the mechanisms controlling behaviour. Man often elicits anti-predator behaviour in farm animals. Social species which can collaborate in defence against predators, such as pigs or man, vocalise a lot when caught or hurt. Species which are unlikely to be able to defend themselves such as sheep, vocalise far less when caught by a predator, probably because such extreme response merely gives information to the predator that the animal attacked is severely injured and hence unlikely to be able to escape. Cattle can also be relatively undemonstrative when hurt or severely disturbed. Human observers sometimes wrongly assume that an animal which is not squealing is not hurt or disturbed what is being done to it. In some cases, the animal is showing a freezing response and in most cases, physiological measures must be used to find out the overall response of the animal.

A further, valuable method of using behaviour studies to assess the welfare of farm animals during handling and transport involves using the fact that the animals remember aversive situations in experimentally repeated exposures to such situations. Any stock-keeper will be familiar with the animal which refuses to go into a crush after having received painful treatment there in the past or hesitates about passing a place where a frightening event such as a dog threat occurred once before. These observations give us information about the welfare of the animal in the past as well as at the present time. If the animal tries not to return to a place where it had an experience then that experience was clearly aversive. The greater the reluctance of the animal to return, the greater the previous aversion must have been. This principle has been utilised by Rushen (1986 a, b) in studies with sheep. Sheep which were driven down a race to a point where gentle handling occurred traversed the race as rapidly or more rapidly on a subsequent day. Sheep which were subjected to shearing at the end of the race on the first day were harder to drive down the race subsequently and those subjected to electroimmobilisation at the end of the race were very difficult to drive down the race on later occasions. Hence the degree of difficulty in driving and the delay before the sheep could be driven down the race are measures of the current fearfulness of the sheep and this in turn reflects the aversiveness of the treatment when it was first experienced.

2. Physiological

Physiological changes are often associated with the behavioural responses which indicate aversion. However, in those species which do not always show substantial behavioural responses, changes in heart rate and adrenal activity may

occur in the absence of obvious behaviour changes. The reverse can also happen in that animals can cope with a difficult situation by behavioural means with little or no physiological change.

Heart rate can decrease when animals are frightened but in most farm animal studies, tachycardia (increase in heart rate), has been found to be, associated with disturbing situations. van Putten and Elshof (1978) found that the heart rate of pigs increased by a factor of 1.5 when an electric prodder was used on them and by 1.65 when they were made to climb a ramp. Steeper ramps caused greater increases up to a maximum level (van Putten, 1982). Heart rate increase is not just a consequence of increased activity and heart rate can be increased in preparation for an expected future flight response. Baldock and Sibly (1990) obtained basal levels for heart rate during a variety of activities by sheep and then took account of these when calculating responses to various treatments. Social isolation caused a substantial response but the greatest heart rate increase occurred when the sheep were approached by a man with a dog. The responses to handling and transport are clearly much lower if the sheep have previously been accustomed to human handling. Heart rate is a useful measure of welfare but only for short-term problems such as those encountered by animals during handling, loading on to vehicles and certain acute effects during the transport itself.

Adrenal cortex changes occur in most of the situations which lead to aversion behaviour or heart rate increase but the effects take a few minutes to be evident and they last for 15 min - 2hrs or a little longer. Plasma corticosterone levels in hens at depopulation were three times as high after normal, rough handling than after gentle handling (Broom *et al.*, 1986) and those of broilers were three and a half times the resting level after two hours of transport and four and a quarter times higher after four hours of transport (Freeman *et al.*, 1984, see review by Knowles and Broom, 1990). Another example comes from work on calves by Kent and Ewbank (1986) and Trunkfield *et al.* (1991), see review by Trunkfield and Broom (1990). Plasma or saliva glucocorticoid levels gave information about treatments lasting up to two hours but were less useful for journeys lasting longer than this. The previous environment of the animals, as well as the treatment when handled and transported, affected the animals' adrenal cortex responses, calves reared in small crates being affected much more by loading and an hour's journey than calves reared in groups (Trunkfield *et al.*, *loc. cit.*).

A variety of other measurements of the levels of physiologically important substances in plasma have been studied in relation to the effects of handling and transport on animals. One of the most promising is the proportion of lactate dehydrogenase isomer 5 which Jones and Price (1992) found to increase in park deer after capture and to remain high for some hours in animals lying quietly with their heads covered.

A change which can be mediated by increased adrenal cortex activity and which may provide information about the welfare of animals during transport is immunosuppression. One or two studies in which animal transport affected

T-cell function are reviewed by Kelley (1985) but such measurements are likely to be of most use in the assessment of more long-term welfare problems.

3. Mortality, injury and carcass characteristics

The term welfare is relevant only when an animal is alive but death during handling and transport is usually preceded by a period of poor welfare. Mortality records during journeys are often the only record which give information about welfare during the journey and the severity of the problems for the animals are often only too clear from such records. The number of pigs which are dead on arrival at the slaughterhouse is 0.07% in the U.K. and in Holland at present although it has been worse than that level in the past, especially with the Pietrain and Landrace breeds. The level in Holland in 1970 was 0.7%. Recent estimates of the number of broilers and laying hens dead on arrival at U.K. slaughterhouses are 0.4% and 0.5% respectively, but mortality of laying hens has been reported to be up to fifty times higher on occasion (Knowles and Broom, 1990 b).

The most extreme injuries during transport are broken bones. These are rare in cattle, sheep, pigs or horses but poor loading or unloading facilities and cruel or poorly trained staff who are attempting to move the animals may cause severe injuries. It is the laying hen, however, which is most likely to have bones broken during transit from housing conditions to point of slaughter. Following up earlier studies, Gregory and Wilkins (1989) found that 29% of a sample of 315 end-of-lay hens from battery cages in the U.K. had at least one broken bone by the time they reached the stunner on the slaughter line. Hens from percherries or free range were less likely (10%) to have bones broken at this time (Gregory *et al.*, 1990) and it is clear from the work of Knowles and Broom (1990 a) that lack of exercise results in wing bones being only half as strong in battery cage hens as in hens from a perchery which could flap their wings. A combination of brittle bones and rough handling by the catching team causes the bone breakage. There is no doubt that for a hen, bone breakage must cause substantial pain and generally poor welfare.

Measurements made after slaughter can provide information about the welfare of the animals during handling, transport and lairage. Bruising, scratches and other superficial blemishes can be scored in a precise way and when carcasses are down-graded for these reasons, the people in charge of the animals can reasonably be criticised for not making sufficient efforts to prevent poor welfare. There is a cost of such blemishes to the industry, as well as to the animals, and this cost was calculated by Guise (1991) to be 3.34% for pigs. The mixing of pigs resulted in a 7.2% increase in the incidence of blemishes (Guise and Penny 1989). The cost, in both senses, of dark firm dry (DFD) and pale soft exudative (PSE) meat are even greater than this. DFD meat is associated with fighting in cattle and pigs but cattle which are threatened but not directly involved in fights also show it (Farrant, pers. comm.). PSE meat occurs more in

some strains of pigs than others but its occurrence is related in most cases to other indicators of poor welfare.

Welfare problem areas

Animals which are regularly and carefully handled and transported will show much less response to the procedures when subjected to them. The horse which is disturbed when first coaxed into a transport vehicle may show various signs of disturbance but most of these signs will disappear by, for example, the tenth time of transporting provided that the loading procedure and physical conditions, including space allowance, are appropriate for such an animal. However, most animals which are transported and those which are moved down races on a farm for the first time or the first time for a long period, are substantially affected by the procedures. Hence it is fair to say that, for other than the animal which is a frequent traveller, transport and associated handling always result in poorer welfare than no treatment of this kind. Hence they should be avoided whenever possible.

Loading and unloading cause the major problems for most animals so the procedures should not be carried out repeatedly with the same animals, especially for poultry or pigs, and should be carried out with care, irrespective of the value of the animals. Those responsible for animals tend to treat animals like old ewes or end-of-lay hens, which have little economic value, in a much rougher way than animals which will be used for breeding or animals with a high carcass value. It is quite wrong to treat animals in a cruel or inconsiderate way for such a reason. The idea that animals destined for slaughter do not have long to live so it does not matter what is done to them is also immoral. The welfare of each individual should be considered until the point at which it loses consciousness immediately prior to death.

Conditions during journeys are of great importance for the welfare of animals. Animals must be able to stand in their natural position with the roof well above their head and with the exception of very short journeys for cattle and sheep, all must be able to lie down at the same time. The idea that animals are protected in some way by being packed close together is erroneous unless the vehicle is driven badly. Quadrupeds prefer to stand with their legs somewhat spread out so that they will not stumble or fall when the vehicle moves. Hence they do not touch one another if they are able to avoid doing so. Poultry crouch down throughout most journeys. A rough guide to the minimum space requirement for animals can be based upon the formula $A = 0.021 \cdot w^{2/3}$ where A is the area in m^2 required by the animal and w is the animal's live weight in kg (modified after Esmay, 1978). This formula is based on the concept that the amount of space required by an animal is proportional to its surface area. Adequate ventilation and protection from temperature extremes are also very important in the avoidance of very poor welfare.

In general, journeys by road result in poorer welfare than journeys by rail, sea or air and longer road journeys result in more welfare problems than shorter

journeys (Hails 1978). Hence any road journey should be as short as possible and the option of slaughtering near the point of rearing and transporting meat should be taken wherever this is possible. The greatest problems arise when animals become dehydrated or energy depleted and this can occur after as little as 4-6 hours in domestic fowl and 6-8 hours in horses.

All animals should be fit for the intended journey and proper preparation for the journey should be carried out, both in terms of preparing the animals and planning the sequence of human actions. Animals should be handled early in life so that they are less disturbed by later handling. All staff who handle animals should have proper training before they are allowed to do so. A licensing scheme for animal handlers is needed so that, for new staff, adequate instruction is received and for all staff, the possibility exists for the license to be lost if cruelly or gross incompetence is demonstrated.

When vehicles carrying animals are driven in such a way that the animals are thrown around, poor welfare and economic losses will result. Drivers were found to be more careful in their driving if they were paid fuel economy bonuses (Guise, 1991).

Carcass characteristics are clearly important indicators of substantial problems for animals and welfare could be improved by paying people concerned with the handling and transport of animals going to slaughter in inverse proportion to the incidence of damage. In particular, those transporting hens could be penalised if (1) x-ray studies of a proportion of birds showed more than a very low level of broken bones, (2) levels of recent bruising or scratches on the carcass were too high or (3) level of DFD meat were too high. Some of these measurements can also be in evidence which can be used in a prosecution under the cruelty to animals acts.

Many of the above points apply to handling on farm as well as to handling associated with transport and slaughter. Properly designed animal handling facilities and adequately trained staff with an incentive to make the welfare of animals as good as possible are needed.

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