ANIMAL WELFARE AT TRANSPORT AND AT SLAUGHTER OF LIVESTOCK AND POUTRY

Manteca i Vilanova, F.X.

School of Veterinary Science, Universitat Autònoma de Barcelona, 08193 Bellaterra (Barcelona) Spain; xavier.manteca@uab.es

Scientific interest in animal welfare has rapidly grown in recent years. This has been largely due to the fact that consumers demand that animals are reared, transported and slaughtered in a humane way (Appleby and Hughes, 1997). If progress is to be made in this area, animal welfare has to be defined in a way that it can be scientifically assessed. Animal welfare can only be properly assessed if several measured are taken into account. The objective of this talk is to illustrate some of the main issues related to the welfare of animals at transport and slaughter by reviewing the main measures that can be used to assess welfare and the variables that have been shown to affect them.

Transport and slaughter are critical from an animal welfare standpoint. During transportation animals are exposed simultaneously to a variety of stressors in a relatively short period of time (Grandin, 1993). Such stressors include fasting and water deprivation, mixing of unacquainted individuals, handling by humans, exposure to a novel environment, noise and vibration, forced physical exercise and extremes of temperature and humidity (Sainsbury and Sainsbury 1988). All these factors contribute to activate the stress response through different physiological pathways. The stress response is known to be additive, i.e., the higher the number of simultaneous stress factors, the bigger the response.

Some of the main parameters used to assess welfare during transport are mortality, injuries, plasma levels of glucocorticoids, heart rate, acute phase proteins and behavioural changes. Mortality is a clear measure of poor welfare, not only because animals that die have obviously failed to cope, but also because high losses in a given environment show that even those individuals that do not die may have serious difficulties to cope. Mortality has been often used as an indicator of welfare problems during transport and studies looking at mortality have provided useful information. For example, it has been shown in pigs that halothane gene frequencies have a major effect on mortality during transport and lairage. In one study, out of 107 pigs that died during transport or lairage, 71% were nn and 24.3% were Nn. The frequency of death within the NN, Nn and nn genotypes was 0,02%, 0,09% and 2,29% respectively. Thus, according to this study, removing Nn and nn pigs from the population would result in an eleven-fold reduction in mortality rate during transport and lairage (Fàbrega et al., 2002).

Other studies have looked at the effect of journey duration and conditions on mortality rates. In broilers, for example, longer journeys to processing plants seem to be associated with higher mortality and in one study it was found that mortality was 80% higher in journeys exceeding 4 hours in duration than in those shorter than 4 hours (Warriss et al., 1992).

Injuries also provide information about the welfare of the animals during handling, transport and lairage. Skin damage on the carcass is assessed by visual inspection at the slaughter line. There are several scales that can be used to carry out such an assessment (Barton-Gade *et al*., 1996). Assessment of skin lesions at the slaughter line not only helps to determine number of marks on the carcass, but also may recognize the source (fighting, rough handling, overcrowding or poor facilities design) according to the anatomical location and damage type. Old wounds may

be recognised as scars, and may be indicative of some animal welfare problem on the farm. Fresh wounds may indicate damage due to fighting during transport and lairage.

Broken bones in laying hens are amongst the most painful injuries during transport and are therefore an important welfare concern (SCAHAW, 2002). In all species, bruising, lacerations and blemishes can be scored on the carcasses and used to assess welfare during transport and lairage (Guise and Penny, 1989). Creatine kinease is released into the blood when there is muscle damage and can be used in conjunction with other indicators as a welfare measure (SCAHAW, 2002). Both dark, firm and dry (DFD) and pale, soft and exudative (PSE) meat are often related to poor welfare conditions (Tarrant, 1989).

Although plasma levels of glucocorticoids have been widely used as measures of welfare (e.g. Dantzer et al., 1983; Dantzer and Mormede 1983; Moberg, 1985), interpretation of results has several problems that have to be taken into account (Mason and Mendl, 1993; Rushen, 1986, 1991). Nevertheless, plasma levels of glucocorticoids are useful to assess welfare problems and they have provided important insights into the effects of transport upon the animals, often in combination with other measures. For example, Broom et al. (1996) studied the hormonal effects of a 15 hour road journey in sheep and showed that the major changes in plasma levels of cortisol and prolactin occurred in the first 3 hours of transport while, during the remaining 12 hours, the stimulatory effect of transport was present but small. This would suggest that welfare may be particularly poor when animals are loaded and shortly afterwards.

Heart rate can be a useful measure of the response of an animal to environmental challenge (Broom and Johnson, 1993). It has been shown, for example, that when sheep are transported by road, the movements of the vehicle caused by poor driving or bad road conditions caused an increase in heart rate that can not be explained solely in terms of increased physical activity of the animals. This result would suggest that sheep find this situation aversive. Further, transport conditions leading to an increase in heart rate also caused an increase in the incidence of DFD meat (Ruiz-de-la-Torre et al. 2001).

Acute phase proteins (APP) are proteins produced in the liver that increase or decrease in serum concentration by at least 25% in the first 7 days after tissue damage (Kushner, 1982). APP can be used to study the effects of transport and handling on the welfare of the animals. In pigs, at least two APPs (haptoglobin and Pig-MAP) increase after a 6 hour transport, whereas they do not increase after a 1 hour transport (Saco et al., 2003).

Behavioural measures can also provide useful information. Although there are many other parameters, the amount of fighting that animals show is of particular interest, as fighting may cause both injuries and stress. Fighting occurs as a consequence of social mixing rather than of transport itself, and the amount of fighting depends on the species, sex, age and transport conditions (Ruiz-de-la-Torre and Manteca, 1999; SCAHAW, 2002).

Stunning before slaughter is a legal and humanitarian requirement to ensure the insensibility of the farm animals to any noxious stimuli. Electrical stunning is one of the most widely used methods in several species, including sheep and pigs, and it consists of passing electricity through the brain to produce an instantaneous insensibility. Stunning is achieved by eliciting a tonic/clonic epileptic seizure, effectively preventing any pain stimulus from being processed in the central nervous system.

The electrical activity of the brain has been used to assess the state of sensibility of animals during slaughter. It has been shown, for example, that the physical activity of lambs after head-only electrical stunning includes one tonic phase and two clonic phases, and the recording of cortical electrical activity suggests that the animals are unconscious during the tonic phase and the first clonic phase, whereas during the second clonic phase the return of some conscious function

begins. Further, this study showed that the return of spontaneous breathing is the safest indicator that the animal is close to recovering consciousness (Velarde et al., 2002).

REFERENCES

1. Appleby M C and Hughes B O (1997) Introduction. In: M C Appleby and B O Hughes (eds.) Animal Welfare. Wallingford: CAB International.
2. Barton-Gade P A, Warriss P D, Brown S N and Lambooj E. (1996) Methods of improving welfare and meat quality by reducing stress and discomfort before slaughter – methods of assessing meat quality. In A. Schutte (ed.) New information on welfare and meat quality of pigs as related to handling, transport and lairage conditions. Proceedings EU-seminar, Landbauforschung Volkenrode, Sonderheft 166, Denmark. 55: 97–106.
3. Broom D M and Johnson K G (1993) Stress and animal welfare. London: Chapman & Hall.
4. Broom D M, Goode J A, Hall S J, Lloyd D m and Parrott R F (1996) Hormonal and physiological effects of a 15 hours road journey in sheep: comparison with the responses to loading, handling and penning in the absence of transport British Veterinary Journal 152: 593–604.
5. Dantzer R, Mormède P, Bluthe R M and Soisson J (1983) The effect of different housing conditions on behavioural and adrenocortical reactions in veal calves Reproduction, Nutrition and Development 23: 67–74.
6. Dantzer R and Mormède P (1983) Stress in farm animals: a need for reevaluation Journal of Animal Science 57: 6–18.
7. Fàbrega E, Diestre A, Carrión D, Font J and Manteca X (2002) Effect of the halothane gene on pre-slaughter mortality in two Spanish commercial pig abattoirs Animal Welfare 11: 449–452.
8. Grandin, T. 1993 Introduction: management and economic factors of handling and transport. In: Grandin, T. (ed.) Livestock handling and transport. CAB International, Wallingford.
9. Guise J and Penny R H C (1989) Factors affecting the welfare, carcass and meat quality of pigs Animal Production 49: 517–521.
10. Kushner I (1982) The phenomenon of the acute phase response Annals of the New York Academy of Sciences 389: 39–48.
11. Mason G and Mendl M (1993) Why is there no simple way of measuring animal welfare? Animal Welfare 2, 310–319.
12. Moberg G P (1985) Animal Stress Bethesda: American Physiological Society
13. Ruiz de la Torre J L and Manteca X (1999) Behavioural effects of social mixing in prepuberal lambs Animal Welfare 8: 117–126
14. Ruiz de la Torre J L, Velarde A, Diestre A, Gispert M, Hall S J G, Broom, D M and Manteca X (2001) Effect of vehicle movement during transport on the stress response and meat quality in sheep Veterinary Record 148: 227–229
15. Rushen J (1986) Some problems with the physiological concept of stress. Australian Veterinary Journal 63, 359–361.
16. Rushen J (1991) Problems associated with the interpretation of physiological data in the assessment of animal welfare. Applied Animal Behaviour Science 28, 381–386.
17. Saco, Y., Docampo, M. J., Fàbrega, E., Manteca, X., Diestre, A., Lampreave, F., Bassols, A. 2003 Effect of stress transport on serum haptoglobin and pig-MAP in pigs Anim. Welfare, 12, 403–409.
18. Sainsbury, D., Sainsbury, P. 1988. Livestock health and housing. Baillière Tindall, London.
19. Scientific Committee on Animal Health and Animal Welfare (SCAHAW) (2002) The Welfare of Animals During Transport (details for horses, pigs, sheep and cattle). Brussels: European Commission
20. Tarrant P V (1989) The effects of handling, transport, slaughter and killing on meat quality and yield in pigs – a review Irish Journal of Food Science and Technology 13: 79–107.
21. Velarde A, Ruiz de la Torre J L, Rosello C, Diestre A & Manteca X (2002) Assessment of return to consciousness after electrical stunning in lambs Animal Welfare 11: 333–341.
22. Warriss P D, Bevis E A, Brown S N and Edwards J E (1992) Longer journeys to processing plants are associated with higher mortality in broiler chickens British Poultry Science 33: 201–206