

INDICATORS OF POOR WELFARE

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The welfare of an individual is its state as regards its attempts to cope with its environment. Coping can sometimes be achieved with little effort and expenditure of resources, in which case the individual's welfare is satisfactory. Or it may fail to cope at all, in which case its welfare is obviously poor. Or, if the individual does cope with the conditions it encounters, this may be easy, with little expenditure of resources, or may be difficult taking much time and energy, in which case welfare is deemed to be poor.

One approach to the improvement of welfare lies in the design of 'housing systems' on the basis of either what animals choose to do in semi-natural environments (Stolba & Wood-Gush, 1984), or their choice as to their preferred conditions in experimental situations (Baldwin & Ingram, 1967; Hughes, 1976; Dawkins, 1983).

The approach summarised here involves both the assessment of indicators of poor welfare, and the comparison of housing systems, or treatments, so as to recognise and excise the causes of poor welfare.

The indicators of poor welfare are of two general types, the one demonstrating that an individual has failed to cope with an environment, the other indicating the effort involved and the extent of an individual's attempts at coping.

Failure to cope with the effects of an environment may involve increased mortality, a reduction in the numbers of offspring surviving or a delay in the production of offspring. Sometimes these can be measured directly, but they may also be indicated by increases in the incidence of disease, reduced offspring size, reduced milk production or reduced growth rate.

When using such welfare indicators it is the welfare of each individual rather than that of the group as a whole, which must be assessed. For example, if either growth rate, or reproductive success, are being measured, a shortage of food might lead to effects on all the individuals present which would indicate a decrease in welfare. However, it is more common, when animals are in groups, for the welfare of some animals to be good but for social factors to result in others failing to obtain sufficient food or in their being adversely affected in other ways. Whilst average growth rate, or reproductive output may be normal, the welfare of some individuals may be poor; consequently, either the system should be changed, or alternative provision made for these individuals.

Although certain parasite and pathogen infections have little effect on the host, the welfare of most diseased animals is poor and disease reduction is a most important part of welfare improvement. In addition to providing direct information about welfare, disease

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state may indicate that the conditions are difficult for the animal. Mortality due to disease sometimes occurs independently of the quality of living conditions, but susceptibility to disease may be increased if difficult conditions result in impairment of immune system functioning. Surveys of disease incidence in housing systems, such as that of Bäckström (1973), can provide considerable information about welfare if interpreted with care.

Attempts to cope with difficult conditions of short duration, such as handling and transport, may be monitored by measuring heart-rate, adrenal products in the blood, and behaviour. Systems for attempting to cope with difficult conditions which last longer involve the adrenals, brain changes, and behaviour modification.

Frequent adrenal usage may result in adrenal hypertrophy and in high levels of adrenal enzyme activity. Though the maximum production of glucocorticoids in the blood following ACTH challenge can be measured (Friend *et al.*, 1977; Dantzer *et al.*, 1983), but the efficacy of this test is not yet known for the majority of animals. Another measurable effect of prolonged adrenal activity is deterioration in meat quality. For all physiological indicators of poor welfare, research on non-invasive sampling methods is necessary.

Behavioural attempts at coping with difficult conditions range from excessive amounts of normal regulatory behaviour to stereotypies and self-inflicted injury (Broom, 1983; Wiepkema *et al.*, 1983). Both abnormal excesses of certain activities and abnormal inactivity or lack of responsiveness, may be indicators of poor welfare. Behaviour is used to modify the motivational state and hence to help to remedy frustration, unpredictability or lack of control over the environment (Broom, 1985).

One way in which behaviour might have its effect is via the production of analgesic opiate peptides such as β -endorphin or enkephalins in the brain (Cronin *et al.*, 1985), however more work is needed before this can be demonstrated clearly.

Since individuals vary in the methods which they use to cope with difficult conditions (Duncan & Filshie, 1979; Duncan, 1985) *any single indicator can show that welfare is poor*. One consequence of this is that in the assessment of systems for keeping animals, a wide range of welfare indicators should be used. Another consequence is that the absence of one particular indicator of poor welfare, for example when growth rate is good, cannot be taken to mean that there is no welfare problem.

REFERENCES

- BÄCKSTRÖM, L. (1973). *Acta Veterinaria Scandinavica*, Suppl. 41, 1.
- BALDWIN, B. A. & INGRAM, D. L. (1967). *Physiology and Behavior*, 2, 15.
- BROOM, D. M. (1983). *Current Topics in Veterinary Medicine and Animal Science*, 23, 81.
- BROOM, D. M. (1985). In *Proceedings of the Second European Congress on Poultry Welfare*, ed. R. M. Wegner, p. 72. Celle: World Poultry Science Association.
- CRONIN, G. M., WIEPKEMA, P. R. & VAN REE, J. M. (1985). *Neuropeptides* 6, 527.
- DANTZER, R., MORMÈDE, P., BLUTHÉ, R-M. & SOISSONS, J. (1983). *Reproduction, Nutrition et Développement*, 23, 67.
- DAWKINS, M. (1983). *Animal Behaviour*, 31, 1195.
- DUNCAN, I. J. H. (1985). In *Proceedings of the Second European Congress on Poultry Welfare*, ed. R. M. Wegner, p. 96. Celle: World Poultry Science Association.
- DUNCAN, I. J. H. & FILSHIE, J. H. (1979). In *A Handbook on Biotelemetry and Radio Tracking*, ed. C. J. Amlaner & D. W. MacDonald, p. 579. Oxford: Pergamon.

- FRIEND, T. H., POLAN, C. E., GWAZDAUSKAS, F. C. & HEALD, C. W. (1977). *Journal of Dairy Science*, **60**, 1958.
- HUGHES, B. O. (1976). *Applied Animal Ethology*, **2**, 155.
- STOLBA, A. & WOOD-GUSH, D. G. M. (1984). *Annales des Recherches Vétérinaires*, **15**, 287.
- WIEPKEMA, P. R., BROOM, D. M., DUNCAN, I. J. H. & VAN PUTTEN, G. (1983). *Abnormal Behaviours in Farm Animals*. Brussels: Commission of the European Communities.

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