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Effects of disease on farm animal welfare

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Abstract

Health is an important part of welfare and whenever an animal is diseased, welfare is poorer than when there is no disease. This point is often not recognised adequately by those studying animal welfare. Also, the full extent of the effects of clinically diagnosed disease on the welfare of the animal is seldom quantified. This quantification of the extent of poor welfare during disease is important for farm animals because of our general obligations to the animals. In order to fully evaluate the impact of housing conditions and management procedures on the animals and then decide what is acceptable, disease must be taken into account. One example of clinical disease conditions which are very significant causes of poor welfare concerns leg disorders such as tibial dyschondroplasia and femoral head necrosis in broiler chickens. A second example is the dairy cow in which the major welfare problems result from the various leg disorders and mastitis. A third example, in which there has been some quantification of effects on welfare, is sheep scab. For farm animals, other animals which we use, and for humans the evaluation of the extent of poor welfare during clinical disease is a major research area which needs to be developed.

1. Introduction

Since the welfare of an animal is its state as regards its attempts to cope with its environment (Broom 1986) and pathogens are amongst the environmental factors which affect individuals, attempts to cope with pathogens and the effects of pathogens are aspects of welfare. Indeed, health is an important part of welfare. Other aspects of welfare include good and bad feelings and various physiological and behavioural changes. Many of those who study animal welfare pay insufficient attention to disease as a welfare problem. The relationships between welfare and health, feelings, stress and needs are discussed by Broom (1988, 1996, 1998) and Broom and Johnson (1993).

The principle links between health and other aspects of welfare are: firstly, that whenever an individual is diseased welfare is poorer than when there is no disease and secondly, that poor welfare usually leads to greater susceptibility to disease because of effects on immune system function of having to contend with difficult conditions. However, most of this paper concerns the extent of the effects of disease on welfare. How severe are these effects? How poor is welfare when disease is diagnosed by a veterinary surgeon as being clinically slight, moderate, severe, or very severe? The recently developed techniques of quantitative assessment of animal welfare should be applied to studies of clinical disease in order to answer this.

Three clinical conditions will be considered here as examples, two of them briefly and one at greater length because more extensive data on welfare are available. The most widespread disease conditions among animals kept by man are those associated with leg weakness in chickens kept for meat production. Another common leg disorder is that which occurs in dairy cows during housing and much metabolic disease occurs in dairy cows. A third condition with significant effects on welfare, which is common in sheep in several countries, is sheep scab.

2. Leg disorders in broiler chickens

One of the great successes of the animal production industry during the last fifty years has been the transformation of the chicken from a luxury food to a widespread and cheap source of meat. This has been achieved by gaining a better understanding of the genetic make-up and nutrition necessary for such birds to grow fast and to have efficient feed conversion. However, the change from maturation to a weight of 2 kg in ten weeks in the 1960s to such maturation in 5 weeks now has had consequences for the welfare of the birds (Broom 2001). Most of these adverse effects are a consequence of genetic selection. Some of the problems which have arisen in the very fast growing birds are those associated with the cardiovascular disorders which lead to ascites. A larger proportion of the problems are those leg disorders which result in reduced ability to walk, for example tibial dyschondroplasia, femoral head necrosis and valgus-varus syndrome (Thorp et al 1993, Lynch et al 1992). Reduced ability to walk or stand often results in breast blisters and hock burn because the bird has to spend a long time crouching on poor quality litter. The dermatitis seen in such birds is painful in itself but the effects of inability to walk are much more severe. It is important to discover more about the degree of pain and the overall impact of these conditions on welfare.

3. Metabolic disease in dairy cows

Dairy cows have also been selected for greater and greater milk production and for efficient feed conversion. Many receive food with protein proportions and energy

inputs which are far in excess of the levels which they could obtain from their natural herbage diet.

The major welfare problems of dairy cows are leg disorders and mastitis with reproductive disorders and behaviour restriction of somewhat less importance (Webster 1993, Greenough and Weaver 1996, Broom 1999, Galindo and Broom 2000). In high producing herds there are about 40 cases of leg disorders and lameness per 100 cows per annum. These disease conditions are affected by the environmental conditions but are also considerably affected by the metabolic pressures on the individual. Cows which produce very large quantities of milk are much more likely to be overtaxed metabolically and hence to have such problems. The positive correlations between milk production and disease prevalence in a large scale study of dairy cows are shown in Table 1.

Table 1 - Positive correlations (+s.e) between milk production level and indicators of poor welfare

Milk production level from 33,732 lactation records was significantly correlated with::

calving interval	0.50 ± 0.06
days to first service	0.43 ± 0.08
mastitis	0.21 ± 0.06
foot problems	0.29 ± 0.11
milk fever	0.19 ± 0.06

(after Pryce *et al* 1997)

4. Sheep scab as a welfare problem

In a detailed study of the relationships between a disease condition and welfare, sheep with sheep scab were monitored using scientific studies of welfare. Sheep scab is caused by infestation with the mite (Acari) *Psoroptes ovis*. The disease is common in the United Kingdom and other countries and is often lethal (Corke 1997, Corke and Broom 1999). The means of assessing welfare and the most useful correlates to severity of effect are shown in Table 2.

Table 2 - Welfare assessment in sheep with sheep scab

1. Means of assessing welfare :	clinical examination
	behavioural assessment
	nociceptor response

	physiological assessment
	immune system function
2. Variables affecting welfare :	body condition score
	lesion dimensions
	mite numbers
	skin sensitivity
	body temperature

The protocols used in experimental studies were as follows. Protocol 1 involved examining and marking uninfected sheep on day 1, observing behaviour and experimentally infecting on day 2, then clinical examination and marking on days 8, 15, 22 etc. and behaviour observation on days 9, 16, 23 etc. In Protocol 2, infested sheep were examined and marked on day 1, behaviour was recorded and sheep were treated against scab on day 2 and further clinical examination, marking and behaviour observation occurred at two week intervals. Physiological changes monitored included: haematology, biochemistry, hormones, inflammatory mediators and nociceptor responses. The pain response threshold (nociceptor threshold) relies on determining the response to peripheral pain from a mechanical or thermal stimulus. Pre-existing painful stimuli are likely to reduce the pain threshold quantitatively (this is known as allodynia), so this approach may be used to assess the pain associated with disease, such as lameness or mastitis. It has also been used in the assessment of analgesics (C.E. Short and A. Van Poznak 1992). Changes in the duration or frequency of normal behaviours, the development of abnormal behaviour and physiological indicators of welfare were affected by the extent of clinical disease condition, disease treatment, observer presence, individual variation, seasonal and diurnal variation, management and other environmental factors.

After sheep had developed sheep scab there was a significant increase in mouthing and rubbing behaviour and a decrease in rumination. Haemoglobin declined and neutrophil counts increased. Prolactin declined and ß-endorphin showed increases at certain times. The mouthing behaviour was clearly a stereotypy and some of the rubbing was stereotyped. The data produced are a clear quantitative indication of the welfare of the animals, firstly as the disease condition became worse and, secondly as the animals recovered after treatment. However a brief clinical examination would not necessarily reveal the severity of effect on the animals. A combination of scientific studies using a range of animal welfare indicators and clinical evaluation are needed in order to appreciate the effects of disease conditions on animal welfare.

5. Conclusions

For each of the clinical disease conditions, referred to in this paper, we have a limited amount of information about the amount of pain and other poor welfare which they cause. The evaluation of the extent of poor welfare during clinical disease is a major research area which needs to be developed. Even in clinical studies of human disease, welfare is generally not adequately evaluated so the magnitude of the disease effects on welfare are not well known. Such information is scarcely available at all for farm animals and other animals used by man.

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