IMPACT OF HUMAN-ANIMAL INTERACTIONS ON HEALTH AND PRODUCTIVITY OF FARM ANIMALS

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SUMMARY

While technical skills and knowledge are important attributes of the work performance of stockpeople, two other important but less well recognised characteristics of stockpeople are their attitude and behaviour towards farm animals. Research has shown that stockperson attitude can affect animal productivity, health and welfare by influencing stockperson behaviour and in turn animal fear and stress. While fear thresholds have been reduced by domestication, fear responses to humans have not been eliminated in farm animals. There is a strong case for utilizing stockperson training courses that target stockperson attitudes and behaviour.

Keywords: human-animal relationships, productivity, health, animal welfare, fear, stress, attitudes, behaviour

INTRODUCTION

Modern farm animals have undergone thousands of years of domestication: for horses (*Equus feus*), asses (*Equus africanus*), camels (*Camelus* spp.), water buffalo (*Bubalus bubalis*) and chickens (*Gallus gallus*) about 5,000 to 7,000 years ago in different parts of Asia and North Africa; for Ilamas and alpacas (Lama spp.), guinea pigs (Cavia spp.) and turkeys (*Meleagris gallopavo*) also about 5,000 to 7,000 years ago in various locations in the New World; for domesticated cattle (*Bos primigenius*) and pigs (*Sus scrofa*) about 8,000 to 9,000 years ago at various sites in Asia; and for wild sheep (*Ovis orientalis*) and goats (*Capra agagrus*) about 11,000 years ago in the Near East (Serpell, 1986). Many authors, including Serpell (1986), have proposed that it was unlikely that Paleolithic and Neolithic people consciously domesticated animals for specific economic or practical purposes. Rather animal domestication, at least in the early stages, was probably an unconscious process on the part of humans, in which tame or semi-tame wild animals were gradually brought under increasing levels of human control.

Animal domestication can be viewed as a process by which captive animals adapt to humans and the environment that they provide for the animals (Price, 2002). Since domestication implies change, it is expected that the phenotype of the domesticated animal will differ from the phenotype of its wild counterparts. Adaptation to the captive environment is achieved through genetic changes (e.g. artificial selection, natural selection and relaxed selection) occurring over generations, and environmental stimulation and experiences during an animal's lifetime. Thus domestication can be viewed as both an evolutionary process and a developmental phenomenon (Price, 2002).

Despite thousands of years of domestication, studies of feral and free-ranging livestock have shown that the behaviour of our agricultural animals still closely resembles that of their wild ancestors (see Rushen et al., 1999). Although there are many reported differences between wild and domestic stocks, there is little evidence that domestication has resulted in the loss of behaviours from the species repertoire or that the basic structure of the motor patterns for such behaviours has been changed (see Price, 2002). In nearly all cases, behavioural differences between wild and domestic stocks are quantitative in character and best explained by differences in response thresholds. These comparisons are difficult because of problems in both determining an appropriate wild population and interpreting differences between wild and domestic populations under one environment, in nature or in captivity. However, studies of farmed and wild Atlantic salmon (*Salmo salar*) for example, both reared in either captive or wild environments, indicate that farmed salmon show less predator responses, while also showing increased growth, increased disease resistance and decreased stress responses (see Price, 2002).

Nevertheless, while behavioural differences between wild and domestic stocks are mainly quantitative in character, predominantly explained by differences in response thresholds to stimuli, there is still surprising variation within our farm animal species in their behavioural response to humans (see Hemsworth and Coleman, 1998; Waiblinger et al., 2006). Many laboratory studies have shown that handling can markedly affect fear responses of farm animals to humans (see Hemsworth and Coleman, 1998; Rushen et al., 1999; Waiblinger et al., 2006); however the existence of substantial variation in animal fear in commercial farms illustrates the implications of this aversive emotional state in farms animals on animal behaviour, productivity, health and welfare. While this variation highlights the problem in the livestock industries, it also indicates that there are opportunities to reduce the fear response of livestock to humans. This is the topic of the present review.

In this paper, I will review the current literature on the effects of handling and fear of humans on the stress physiology, productivity, health, and welfare of farm animals. I will also briefly examine the opportunities to reduce fear of humans in farm animals. There are a number of valuable reviews in the literature, such as those by Hemsworth and Coleman (1998), Rushen et al. (1999) and Waiblinger *et al*. (2006), which I utilise in this review.

LABORATORY STUDIES ON THE EFFECTS OF HANDLING ON ANIMAL FEAR, STRESS, PHYSIOLOGY AND HEALTH

Negative or aversive handling of pigs, imposed briefly but regularly, not only results in high levels fear of humans, but may also markedly reduce growth and reproductive performance in pigs (Barnett et al., 1983; Gonyou *et al*., 1986; Hemsworth *et al*., 1981a, 1986a, 1987, 1996a; Hemsworth and Barnett, 1991). The mechanism responsible for the adverse effects of high fear on the productivity of pigs appears to be a chronic stress response, because handling treatments which resulted in high fear levels also produced either a sustained elevation in the basal free cortisol concentrations or an enlargement of the adrenal glands, together with depressions in growth and reproductive performance. It is well known that the long-term activation of the hypothalamic-pituitary adrenal axis can have marked effects on efficiency of growth due to the catabolic effects of ACTH and corticosteroids (Elsasser *et al*., 2000). Corticosteroids also support the synthesis and action of adrenalin in stimulating glycogenolysis and lipolysis (Matteri *et al*., 2000). Stress-induced changes in the secretion of pituitary hormones have been implicated in failed reproduction (Clarke *et al*., 1992; Moberg, 2000). Seabrook and Bartle (1992) also reported depressions in the growth of

pigs following aversive handling. In contrast, Paterson and Pearce (1989, 1992) and Pearce *et al*. (1989) found no effects of regular aversive handling on the growth performance and corticosteroid concentrations in pigs. There is no obvious explanation for this lack of effects in the studies by Paterson and colleagues; however differences between studies in the nature, amount and imposition of handling treatments may be responsible for these apparently contradictory results.

Handlings studies in poultry generally indicate that handling treatments likely to increase the birds' fear of humans may depress growth performance in chickens. For example, in experiments with young chickens, Gross and Siegel (1979, 1980, 1982) found that birds that received frequent human contact, of an apparent positive nature from an early age had improved growth rates and feed efficiency and were more resistant to *Escherichia coli* infection than birds that either received minimal human contact or had been deliberately scared. Barnett *et al*. (1994) found that regular and positive human contact, in comparison to reduced and unexpected human contact, increased fear of humans and reduced egg production in laying hens. The authors speculated that the lower productivity of birds in the latter treatment may have been a consequence of a chronic stress response since there was evidence of immunosuppression in the more fearful birds. Other studies in which positive handling was utilised, have also shown that additional positive handling is associated with increased growth performance in chickens (Thompson, 1976; Jones and Hughes, 1981; Collins and Siegel, 1987). In contrast, Reichmann *et al*. (1978) found no effects of handling on the growth performance of either young broiler or layer chickens, whereas Freeman and Manning (1979) suggested that regular handling decreased growth performance in layer chickens. Since handling may vary from positive to negative in nature for birds, variation in the nature of handling between these studies may have been responsible for the variation in the effects of handling on growth performance.

Handling studies in dairy cattle have shown that aversive handling may depress milk yield in cows (Rushen *et al*., 1999; Breuer, 2000; Breuer *et al*., 2003). The results of the study by Rushen *et al*. (1999) implicate the secretion of catecholamines under the influence of the autonomic nervous system affecting milk letdown while the study by Breuer *et al*. (2003) found evidence of chronic stress in negatively-handled heifers. Stressors that result in an acute stress response may depress milk yield due to inhibition of milk letdown (Bruckmaier *et al*., 1993, 1997; Bruckmaier and Blum, 1998). The long–term stress response of cows and how these responses affect milk yield are poorly understood. One key function of the stress response is to divert food and substrates, such as acetates, glucose and amino acids, away from normal day to day functions such as growth and reproduction (Sapolsky, 1992) and thus during a chronic stress response, the substrates may be diverted elsewhere, thereby interfering with milk synthesis (Breuer *et al*., 2003). Dam-reared goats, which showed increased avoidance of humans, were found to have greater milk ejection impairment than human-reared goats, suggesting reduced inhibition of milk let-down (Lyons, 1989).

ON-FARM RELATIONSHIPS BETWEEN HANDLING AND ANIMAL FEAR, STRESS, PRODUCTIVITY AND HEALTH

Observations in the Dutch and Australian pig industries have revealed significant relationships, based on farm averages, between fear of humans and reproductive performance pigs (Hemsworth *et al*., 1981b, 1989). The direction of the relationships indicate that reproductive performance was low at farms where breeding females were highly fearful of humans and the magnitude of these relationships indicate that variation in fear of humans accounted for about 20% of the variation in reproductive performance across the study farms.

Similar negative fear-productivity relationships have been found in the dairy and poultry industries. Significant correlations, based on farm averages, have been found between fear of humans and milk yield in dairy cows (Breuer *et al*., 2000; Hemsworth *et al*., 2000; Waiblinger *et al*., 2002). Negative handling and high fear of humans have also been associated with injuries and poor meat quality in dairy cattle (Lensink et al., 2001b). Studies by Barnett *et al*. (1992), Hemsworth *et al*. (1994b, 1996b) and Cransberg *et al*. (2000) found significant negative relationships, based on farm averages, between the level of fear of humans and egg production in laying hens and efficiency of feed conversion in meat chickens. These studies show that egg production in laying hens and efficiency of feed conversion in meat chickens at farms were inversely related to the level of fear of humans by birds at farms (Barnett *et al*., 1992; Hemsworth *et al*., 1994b, 1996). Similarly, in an experiment examining the effects of cage position on fear and egg production in laying hens, level of fear of humans was significantly and negatively related to egg production and efficiency of feed conversion (Hemsworth and Barnett, 1989). In observations on the behavioural response of laying hens to an experimenter, Bredbacka (1988) reported that egg mass production was lower in hens that showed increased avoidance of humans. In poultry, inappropriate fear reactions, like panic or violent escape attempts, can also result in injuries which can lead to infection, chronic pain and debilitation (Jones, 1996, 1997).

Fordyce *et al*. (1988) found that beef cattle that were the most active and vocal when restrained in a weighing stall had the most carcasses bruising and tended to have tougher meat following slaughter. Although part of the behavioural responses of cattle when restrained in a weighing stall would be responses to restraint and novelty, a component of these responses would be specifically to humans. In studying a similar behavioural response to restraint, Burrow (1997) reported that exit speed of beef cattle was negatively correlated with weight gain.

EFFECTS OF FEAR OF HUMANS ON ANIMAL WELFARE

Fear is generally considered an undesirable emotional state of suffering in both humans and animals (Jones and Waddington, 1992) and one of the key recommendations proposed to the United Kingdom Parliament by the Brambell Committee in 1965 (Brambell *et al*., 1965) was that intensive-housed livestock should be free from fear and there are several reasons why fear of humans will reduce the welfare of farm animals.

Research that has been reviewed in this paper has shown that farm animals that are both highly fearful of humans and in regular contact with humans are likely to experience not only an acute stress response in the presence of humans but also a chronic stress response that is evident even in the absence of humans (Hemsworth and Coleman, 1998). Fearful animals are also more likely to sustain injuries trying to avoid humans during routine inspections and handling. Furthermore, in situations where human contact is aversive, the stockperson's attitude towards the animal is likely to be poor and thus the stockperson's commitment to the surveillance of and the attendance to welfare (and health and production) problems facing the animal may be inadequate. Clearly, fear in farm animals can impact on farm animal welfare and thus this topic of how farm animals are handled is a legitimate welfare consideration.

REDUCING FEAR IN FARM ANIMALS

Research in the livestock industries indicates that human-animal interactions can markedly limit animal productivity and welfare. Understanding the attitudes and behaviour of stockpeople appears to be the key to manipulating these human-animal interactions to improve animal productivity and welfare.

The sequential relationships between stockperson attitudes and behaviour and animal fear and productivity that have been found in the dairy and pig industries (Hemsworth *et al*., 1989, 2000; Coleman *et* al., 1998; Breuer *et al*., 2000; Waiblinger *et al*., 2002) demonstrate the opportunities that exist to improve animal productivity and welfare by appropriate selection and training of stockpeople. In fact, studies in these livestock industries have shown that it is possible to improve the attitudes and behaviour of stockpeople and, in turn, reduce the level of fear and improve productivity in commercial cows and pigs (Coleman *et al*., 2000b; Hemsworth *et al*., 1994a, 2002). This approach in improving the attitudes and behaviour of stockpeople has been described in detail by Hemsworth and Coleman (1998). Basically, cognitive-behavioural training techniques involve retraining people in terms of their behaviour by firstly targeting both the beliefs that underlie the behaviour (attitude) and the behaviour in question and secondly, maintaining these changed beliefs and behaviour. This process of inducing behavioural change is really a comprehensive procedure in which all of the personal and external factors that are relevant to the behavioural situation are explicitly targeted.

Recent results by Coleman *et al*. (2000a) and Coleman (2001) indicate that job-related characteristics, such as empathy, attitudes towards pigs and towards aspects of work, are useful predictors of work performance of the stockperson and thus, potentially such measures could be assembled into a kit for use in selection of stockpeople in the pig industry. In addition to assisting in selecting stockpeople, assessing the key job-related characteristics of stockpeople may also provide the livestock industries with a good opportunity to monitor the potential impact of individual stockpeople. Screening aids such as attitude and job motivation questionnaires may identify both weakness in individual stockperson and targeted training for these individuals.

CONCLUSION

While technical skills and knowledge are important attributes of the work performance of stockpeople (Coleman, 2004), two other important but less well recognised characteristics are their attitude and behaviour towards their farm animals. Research has shown that the behaviour of stockpeople can result in farm animals developing fear responses to humans, which can have large motivational and emotional effects on the animals. It is these fear levels, through stress, that may adversely affect animal productivity, health and welfare. While there has been little research conducted on animal health, a limited number of studies indicate the potential impact of human-animal relationships on animal health. Furthermore, stress elicited by fear has implications for animal health because of the close relationship between stress and illness (Moberg, 2000).

In conclusion, there are opportunities to reduce the limitations that human-animal interactions impose on animal productivity, health and welfare. While our understanding of the regulation and impact of human-animal interactions has improved considerably over the last decade or so, recognition of the role of stockpeople on the productivity, health and welfare of livestock has only recently occurred. Appropriate strategies to recruit and train stockpeople in the livestock

industries will be integral in safeguarding the welfare of commercial livestock as well as their health and productivity.

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