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Animal Welfare 2009, 18: 335-345
ISSN 0962-7286

The integration of human-animal relations into animal welfare monitoring schemes

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Abstract

There are increasing local and international pressures for farm animal welfare monitoring schemes. Housing of farm animals is a contentious issue for many, although the impact of the housing system may be overestimated by some. In contrast, the topic of stockmanship has received relatively little attention, even though research has shown that animal carers or stockpeople have a major impact on the welfare of their livestock. While welfare monitoring schemes are likely to improve animal welfare, the impact of such schemes will only be realised by recognising the limitations of stockpeople, monitoring 'stockmanship' and providing specific stockperson training to target key aspects of stockmanship. Appropriate strategies to recruit and train stockpeople in the livestock industries are integral to safeguarding the welfare of livestock. Monitoring the key job-related characteristics of the stockperson, attitudes to animals and to working with these animals, empathy, work motivation and technical knowledge and skills, provides the opportunity to detect deficits in stockmanship and the necessity for further targeted training. Due to the strong relationships between stockperson attitudes and behaviours and animal fear responses, as well as the relationships between attitudes and other job-related characteristics, we believe attitudes, together with empathy, work motivation and technical knowledge and skills, should be the principal focus of measuring stockmanship in on-farm welfare monitoring schemes.

Keywords: *animal welfare, fear, human-animal relations, livestock, stockmanship, welfare monitoring*

Introduction

The last three decades has witnessed a dramatic increase in society's interest in the welfare of farm and other domesticated animals (Fraser 2001; Levy 2004), with the welfare of farm animals high on political and societal agendas. As a consequence of this interest in animal welfare, there is increasing scrutiny of society's use of animals. The relationships that develop between humans and most domestic animals in society are inevitably unequal, with basically two principles applying to the management of animals in a range of animal uses from individual pets to livestock production. These principles are, firstly, management to comply with the objectives of human profit, benefits or pleasure and, secondly, management responsibilities reflecting a duty of humane care of animals. In relation to livestock production and specifically stockmanship, animal productivity is a key objective and consequently stockpeople have an explicit responsibility to care for and manage their livestock to achieve efficient animal performance. The latter principle of management responsibilities reflecting a duty of humane care of animals is based on the widely-held view in many societies that the use of animals by humans is acceptable provided that such use is humane (Mellor & Littin 2004). Implicit in this view is that stockpeople have a responsibility to handle and care for their livestock in a humane manner. While technical skills and knowledge are important attributes of the work performance of stockpeople, two other important characteristics of stockpeople are their attitudes and behaviours towards farm animals. Research has shown that the attitudes of the stockperson, by affecting the stockperson's behaviours, can affect animal fear and stress and in turn animal productivity and welfare.

There are increasing national and international pressures for farm animal welfare monitoring schemes. Housing of farm animals is a contentious issue for many, although the impact of the housing system may be overestimated by some. In contrast, the topic of 'stockmanship' has received relatively little attention, even though research has shown that stockpeople have a major impact on the welfare of their livestock. While welfare monitoring schemes are likely to improve animal welfare, the impact of such schemes will only be realised by recognising the limitations of stockpeople, monitoring stockperson-animal relationships and providing specific stockperson training to

https://doi.org/10.1017/S0962728600000737 Published online by Cambridge University Press

target key aspects of stockperson-animal relationships. In order to consider how human-animal relationships may be integrated into animal welfare monitoring schemes, it is useful to briefly review how human-animal relationships can affect farm animal welfare.

How do stockpeople affect animal welfare?

At the outset it is important to recognise how stockpeople may affect the welfare of their animals. Several job-related characteristics of the stockperson have been shown to affect animal welfare. These include technical knowledge and skills, job motivation, job satisfaction and attitudes; these characteristics are discussed below.

Knowing and being skilled at the techniques that must be used to accomplish a task are clearly prerequisites to being able to perform that task. Thus, technical skills and knowledge will be the most limiting factors to job performance in situations where specific technical skills and knowledge are required to perform the tasks. Some of the key characteristics that stockpeople require to successfully care for and maintain their animals include a good general knowledge of the nutritional, thermal, social and health requirements of the animal, practical experience in the care and maintenance of the animal and an ability to quickly identify any departures in the behaviour, health or performance of the animal and promptly provide or seek appropriate support to address these departures.

Job motivation generally refers to the extent to which a person applies his or her skills and knowledge to the management of the animals under his or her care (eg reliability, thoroughness and conscientiousness of a person). Factors including job satisfaction, meaningfulness of work and utilisation of skills will affect work motivation and commitment. High job performance in any industry relies on a combination of motivation, technical knowledge and skills and an opportunity to perform the job and, clearly, low motivation will limit job performance regardless of technical skills and knowledge of the individual.

Job satisfaction is a characteristic that is influential because of its direct effects on other job-related characteristics, including job motivation and motivation to learn new skills and knowledge. In turn, this impacts on application of technical skills and knowledge, and therefore job satisfaction also has indirect effects on job performance. Job satisfaction refers to the extent to which a person reacts favourably or unfavourably to his or her work and is considered to derive from the extent to which a person's needs or expectations are being met by the job. Thus, job satisfaction is influenced by rewards (personal and financial), job design and enrichment (eg involvement in decision-making processes), work performance, animal comfort and health and the working environment. These characteristics of technical skills and knowledge, job motivation and job satisfaction have been reviewed in detail by a number of authors (Hemsworth & Coleman 1998; Coleman 2004).

Another important characteristic of stockpeople is their attitudes to farm animals. The attitude of the stockperson can affect animal welfare in two main ways, firstly by influencing the stockperson's behaviour and, in turn, the animals' fear of humans and, secondly, by affecting the level of inspection and promptness of intervention when welfare problems arise. Significant relationships have been found between stockperson attitudes and behaviours and animal fear (behaviour) and productivity in the dairy and pig industries and between some of these characteristics in the chicken meat and egg industries. As a consequence of such research, the sequential model shown in Figure 1 has been proposed by Hemsworth and Coleman (1998) to describe the influence of human-animal interactions on the productivity and welfare of intensively-managed farm animals.

These effects of the human-animal relationship on animal welfare will now be considered by reviewing the evidence from studies in both experimental and commercial settings.

Impact of human-animal relationships on farm animal welfare

Evidence from handling studies

Laboratory studies have shown that negative or aversive handling of pigs, imposed briefly but regularly, will increase their fear of humans and reduce their growth and feed conversion efficiency (Barnett *et al* 1983; Gonyou *et al* 1986; Hemsworth *et al* 1981a, 1996a; Hemsworth & Barnett 1991). There are also reports of fear of humans affecting reproduction: negative handling reduced pregnancy rate but not sexual receptivity in gilts (Hemsworth *et al* 1986), fear of humans in oestrous sows reduced their attraction to boars when in the presence of humans (Pedersen *et al* 2003) and fear of humans in sows has been reported by Hemsworth *et al* (1999) but not by Andersen *et al* (2006) to be positively associated with percentage of stillborn piglets. A chronic stress response is the likely mechanism responsible for adverse effects of high fear on productivity in pigs. In many of the handling studies by Hemsworth and colleagues (Table 1), 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.

In experiments with young broiler chickens, Gross and Siegel (1979, 1980) found that birds that received brief human contact, of an apparent positive nature, had greater growth rates, feed conversion efficiency and antibody response to an antigen and were more resistant to *Mycoplasma gallisepticum* than birds that received minimal human contact. Furthermore, water deprivation resulted in higher feed conversion efficiency in the former group of birds (Gross & Siegel 1980, 1982) and, while weight loss after fasting was not affected by handling, birds that had received brief positive human contact were more resistant to *Staphylococcus aureus* (Gross & Siegel 1982). Gross and Siegel (1981) found that chickens that received regular positive human contact from an early age had improved feed conversion efficiency and were more resistant to

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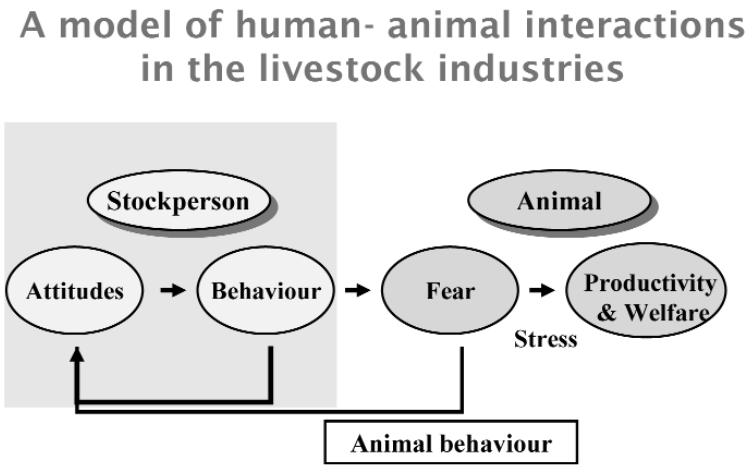
Figure 1

Sequential relationships between some key stockperson and animal variables. Adapted from Hemsworth and Coleman (1998).



Escherichia coli infection, than birds that either received minimal human contact or had been regularly scared. Other studies have also shown that additional positive handling is associated with increased growth performance in chickens (Thompson 1976; Jones & Hughes 1981; Collins & 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.

In an experiment with adult laying hens, Barnett *et al* (1994) found that regular visual contact, involving positive elements such as slow and deliberate movements, which reduced the subsequent avoidance behaviour of adult laying hens, resulted in higher egg production than a treatment which involved minimal human contact. 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 these highly fearful birds. The cell-mediated immune response was lower in laying hens that received reduced and unexpected human contact than birds that received regular and positive human contact (Barnett *et al* 1994).

Handling studies in dairy cattle have shown that aversive handling may increase fear of humans and 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, based on elevated cortisol concentrations, in negatively-handled heifers. Dam-reared dairy goats, which showed increased avoidance of humans in the home pen and in the milking parlour, had greater impairment of milk letdown during routine milking procedures than human-reared dairy goats (Lyons 1989).

Table 1 Summary of the results of studies in which negative handling increased either basal free cortisol concentrations or the size of the adrenal glands in pigs.

Experiment	Effects	*P*-value
Hemsworth *et al* (1981a)		
Basal free cortisol	⇑	0.05
Gonyou *et al* (1986)		
Adrenal glands	⇑	0.05
Hemsworth *et al* (1986)		
Basal free cortisol	⇑	0.05
Hemsworth *et al* (1987)		
Basal free cortisol	⇑	0.01
Hemsworth & Barnett (1986)		
Basal free cortisol	⇑	ns
Hemsworth *et al* (1996)		
Adrenal glands	⇑	0.01

Thus, handling studies on dairy cattle, goats, pigs and poultry in experimental settings indicate that poor handling can adversely affect animal welfare through fear of humans and stress. Furthermore, these affects of handling on stress also have implications on animal productivity and health. During stress, the growth axis is inhibited at several levels (Kaltas & Chrousos 2007). Prolonged activation of the hypothalamic-pituitary-adrenal (HPA) axis leads to suppression of GH secretion, while corticosteroids can induce resistance in target tissues to the effects of GH, insulin-like growth hormone factor I (IGF-1) and other growth factors, and consequently the suppression of growth.

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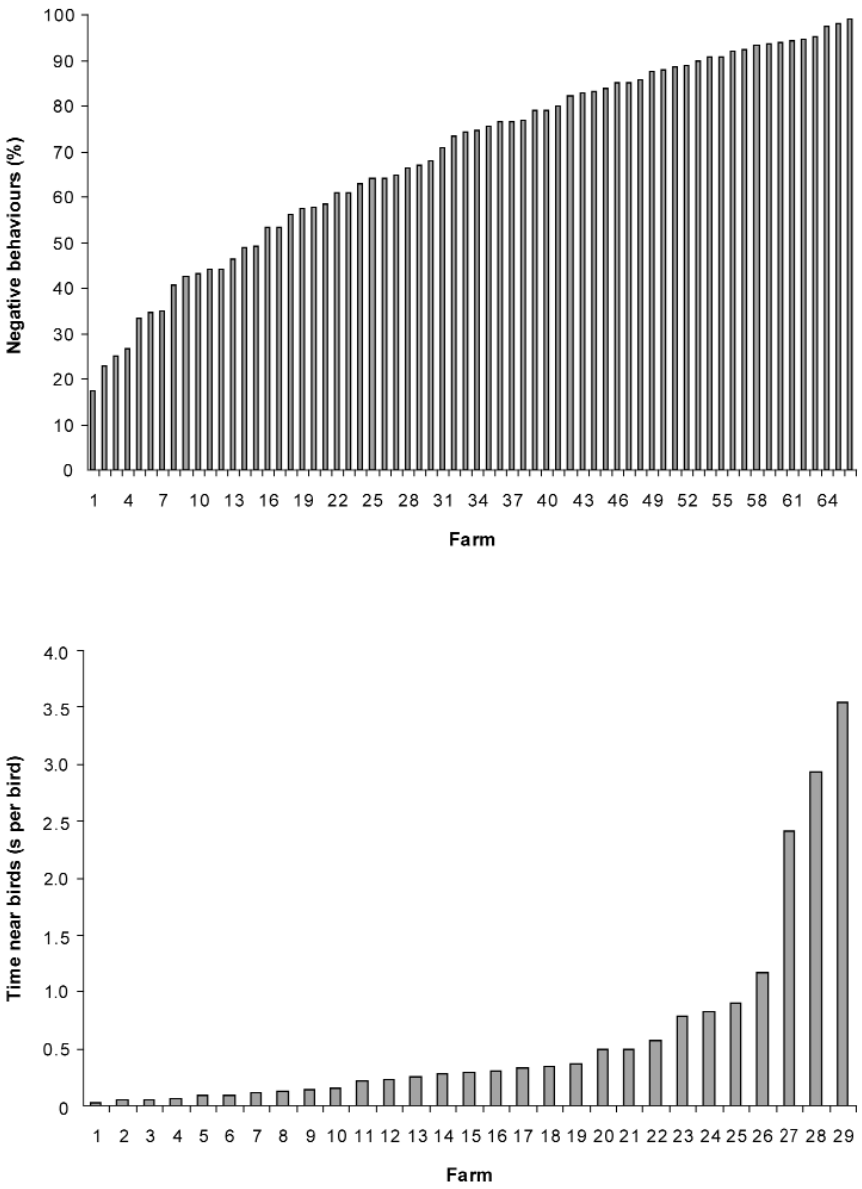
Figure 2



Variation in the behaviour of stockpeople towards dairy cows (upper figure; from Hemsworth *et al* 2000) and towards laying hens (lower figure; from Edwards 2008). Each case refers to an individual stockperson. The stockperson behaviour towards dairy cows is the percentage of negative tactile interactions (eg slaps and hits) to overall tactile interactions used to handle cows at milking. The stockperson behaviour towards laying hens is the average time near focus birds (s per bird) per day.

The catabolic effects of ACTH and corticosteroids are also well known (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). Stressors can suppress immune function leading to increased susceptibility to infectious disease and reduced stimulation from vaccination (Glaser & Kiecolt-Glaser 2005). For example, Barnett *et al* (1994) showed additional human contact that reduced fear in laying hens was associated with an enhanced cell-mediated immune response. Other stressors have been shown to have a similar effect, for example, in chicks (Regnier & Kelley 1981) and pigs (Blecha *et al* 1983).

Evidence from field studies

Variation in stockperson behaviour and animal fear of humans

There are marked differences between stockpeople in their behaviour towards farm animals. Figure 2 shows the variation between dairy stockpeople in their use of negative tactile interactions with cows, such as slaps and hits, and the variation between poultry stockpeople in the time they spend near laying hens (in cages). The fear responses of farm animals to humans varies markedly both between and within farms. As reviewed by Hemsworth and Coleman (1998), there is considerable between-farm variation in the behavioural response of animals to humans in the dairy (Breuer *et al* 2000; Hemsworth *et al* 2000), egg (Barnett *et al* 1992),

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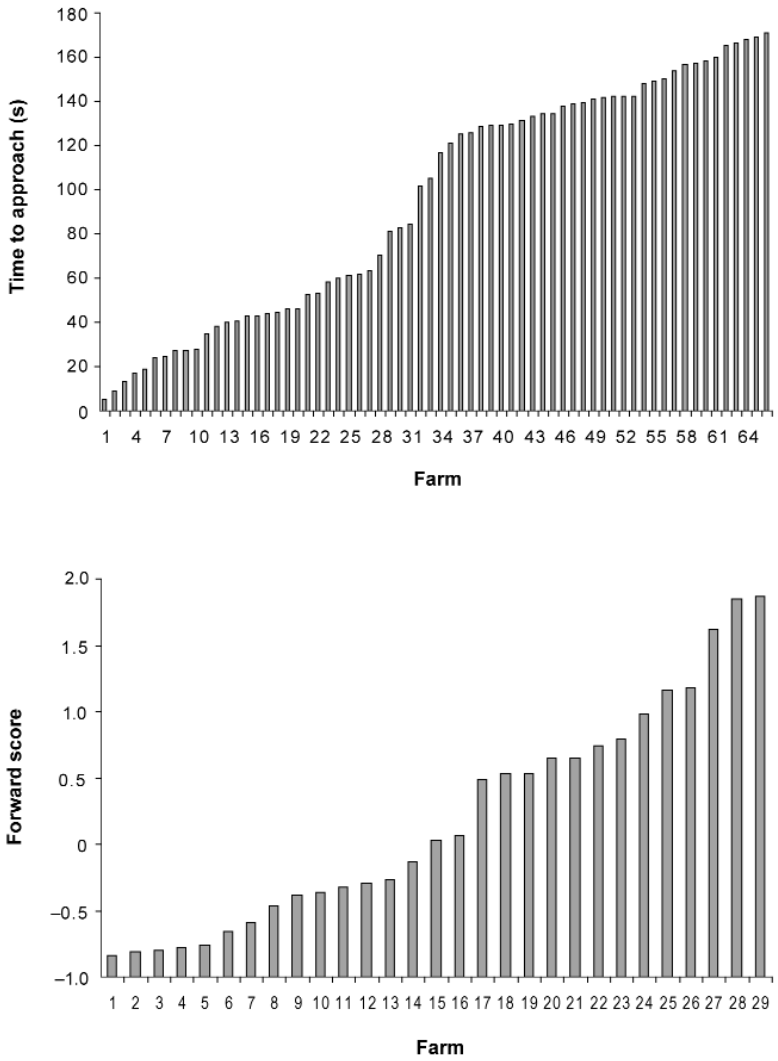
Figure 3

Variation in the behavioural response of dairy cows (upper figure; from Hemsworth *et al* 2000) and laying hens (lower figure; from Edwards 2008) to experimenters in standard tests. Each case refers to an individual farm. Behavioural response for cows is the average time for cows to approach within 3 m of the experimenter at each farm. Behavioural response for hens is the average forward score of hens, which is factor score consisting of behaviours reflecting approach to the experimenter.



chicken meat (Hemsworth *et al* 1994b) and pork industries (Hemworth *et al* 1981b, 1989). Figure 3 depicts the between-farm variation in the approach behaviour of laying hens and dairy cattle to experimenters in standard tests. For other species, Murphey *et al* (1981) reported marked differences in the flight distance of *Bos indicus* and *Bos taurus* breeds of cattle to humans and Hearnshaw *et al* (1979) reported marked differences in the behavioural response of crossbred Brahman cattle and British breeds to restraint in a squeeze shute (or stall) in the close presence of humans.

These variations in both stockperson behaviour and fear responses of farm animals to humans suggest variation in human-animal interactions in the livestock industries and the potential for such variation to lead to variation in animal welfare.

Stockperson-animal relationships

The consistent findings of negative correlations between fear of humans, assessed on the basis of the behavioural response of commercial livestock to humans, and the productivity of these animals, have stimulated considerable research on human-animal interactions in the livestock industries. Observations in the Dutch and Australian pork industries revealed significant negative correlations, based on farm averages, between fear of humans and reproductive performance of pigs (Hemsworth *et al* 1981b, 1989; Table 2). The direction of the relationships indicates that reproductive performance was low at farms where breeding females were fearful of humans and the magnitude of the relationships indicate that variation in fear of humans accounted for up to approximately 20% of the variation in reproductive performance across the study farms. In contrast to farms in the Dutch

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Table 2 Fear and animal productivity correlations in the livestock industries.

Species	Experiment	Between farm correlations between fear of humans and productivity
Pig	Hemsworth *et al* (1981b)	0.51*
	Hemsworth *et al* (1989)	0.55**
	Hemsworth *et al* (1994a)	0.01
Dairy cow	Breuer *et al* (2000)	0.46*
	Hemsworth *et al* (2000)	0.27
Meat chicken	Hemsworth *et al* (1994b)	0.57**
	Cransberg (1996)	0.10
	Hemsworth *et al* (1996b)	0.39
Laying hen	Barnett *et al* (1992)	0.58**

* $P < 0.05$; ** $P < 0.01$.

study, farms in the Australian study varied substantially in terms of size, housing systems, genetics, nutrition and locality, but nevertheless significant fear-productivity relationships were found, demonstrating the robustness of the fear-productivity relationship in the pork industry.

There is evidence of similar negative fear-productivity relationships in the dairy and poultry industries (Table 2). Significant correlations, based on farm averages, were found between fear of humans and milk yield of dairy cows (Breuer *et al* 2000; Hemsworth *et al* 2000). 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 of laying hens and efficiency of feed conversion of commercial meat chickens, respectively: egg production of laying hens and efficiency of feed conversion of meat chickens was inversely related to the level of fear. Similarly, in an experiment examining the effects of cage position on fear and egg production of laying hens, level of fear of humans was significantly and negatively related to egg production and efficiency of feed conversion (Hemsworth & Barnett 1989). In observations on the behavioural response of laying hens to an experimenter, Bredbacka (1988) reported that egg production was lower in hens that showed increased avoidance of humans.

To examine the stockperson characteristics that are related to fear of humans in commercial pigs, Coleman *et al* (1998) and Hemsworth *et al* (1989) studied the attitudes and behaviours of stockpeople working at commercial farms. In both studies, the attitudes of stockpeople towards interacting with their pigs were correlated with the behaviour of the stockpeople towards their pigs, which in turn, was correlated with fear of humans by pigs. For example, negative beliefs that considerable verbal and physical effort was required to move pigs and that pigs did not require petting and stroking were correlated with the use of a high percentage of negative tactile behaviours, such as slaps and hits. Furthermore, a high percentage of negative tactile behaviours used by stockpeople was correlated with increased avoidance by pigs of an experimenter in a standard behavioural test used to assess fear.

Significant sequential relationships have also been found in the dairy industry between the stockperson's attitudes and behaviour towards cows and the behavioural response of cows to humans (Breuer *et al* 2000; Hemsworth *et al* 2000). As in the studies in the pork industry, negative beliefs about the use of petting and the use of verbal and physical effort to handle cows were correlated with the use of negative tactile interactions by stockpeople, such as slaps, pushes and hits. In addition, the use of a high proportion of these negative tactile interactions was associated with high fear levels of humans in cows. These two studies were conducted on Australian dairy farms in which cows are housed outdoors all year round on pastures. Similar results have been found in indoor dairy farms in Austria. Waiblinger *et al* (2002) found that positive attitudes to being patient during milking and when handling cows were positively associated with the use of positive behaviours by stockpeople, while positive attitudes to both the use of talking and petting cows and positive attitudes about feeling comfortable in the presence of cows were negatively associated with use of negative behaviours by stockpeople. Furthermore, the use of positive behaviours and negative behaviours by stockpeople were negatively and positively associated with avoidance behaviour to an experimenter in the barn, respectively. The use of negative behaviour was also negatively correlated with milk yield at the farm.

Lensink *et al* (2000) studied farmer and farm characteristics at 50 veal calf units affiliated with the same veal company, thus providing the opportunity to examine human-animal relationships in a commercial setting in which the housing and husbandry conditions were similar across farms. It was found that a positive attitude by the stockperson to the sensitivity of calves to human contact was predictive of the frequency of positive behaviour towards the calves by the stockperson, such as touching, patting, talking gently and allowing calves to suck fingers: positive attitudes were associated with increased use of positive behaviour. Furthermore, farm size and gender of the stockperson were predictive of the frequency of positive behaviour towards calves by the stockperson, with smaller farms and female stockpeople associated with more positive behaviour. Daily weight gain of calves was predicted by the stockpersons' behaviour towards calves, with higher daily weight gain per calf associated with more positive behaviour and more slow and careful movements. Feed conversion was predicted by the stockperson's behaviour, with improved feed conversion associated with more positive behaviour. It is also of interest that several behavioural variables, such as positive behaviour to calves and farm size were

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predictive of calf mortality: mortality was lower at farms which were large and in which the stockperson displayed more positive behaviour towards calves.

In a study of the same veal calf units, Lensink *et al* (2001) studied additional stockperson and farm variables, as well as calf behaviour. The frequency of positive behaviour towards calves by the stockperson was associated with the avoidance behaviour of calves to the stockperson. In a comparison with units achieving moderate productivity in terms of growth rates, food efficiency and mortality, stockpeople in 'high-producing' units differed in several ways: they had a more positive attitude to the sensitivity of calves to human contact, showed more positive behaviour to calves, had cleaner veal units, and their calves had a better health status. Further examination revealed that positive attitudes by stockpeople towards their calves and towards work, specifically in relation to the importance of cleaning, were associated with the health status of the herd. These two studies indicate that in commercial veal production with highly standardised conditions, productivity differences between units can be associated, at least partly, with the stockperson. Stockpeople who have a positive attitude towards their animals and towards their work are more likely to obtain better production results, at least in part due to better control of the calves' health. Also, more positive attitudes to calves lead to more positive behaviour towards calves, which reduces the calves' fear responses to humans.

In studies on commercial meat chickens, Hemsworth *et al* (1994b) and Cransberg *et al* (2000) found significant relationships between the behaviour of the stockperson and the fear responses of birds to humans. For instance, speed of movement by the stockperson was positively correlated with avoidance of an experimenter by chickens. In contrast to the results of studies in the dairy and pork industries, there was no evidence of a relationship between stockperson attitude and behaviour. In retrospect, it appeared that the wrong attitudinal variables may have been targeted in the questionnaire used to assess attitudes. The most pertinent attitudes in predicting behaviour are those that specifically assess attitudes towards relevant behaviours (Hemsworth & Coleman 1998) and the most important behaviour exhibited by the stockperson that was found to be associated with fear responses by birds to an experimenter was speed of movement, a behaviour which was not specifically addressed in the attitude questionnaire in these studies.

Thus, studies on stockpeople in several intensive livestock industries demonstrate significant relationships between the stockperson's attitudes and behaviour towards animals and the fear of humans by farm animals. However, while these stockperson-animal relationships suggest the possibility of causality, evidence of causality can only be demonstrated by changes in stockperson attitudes and behaviour resulting in changes in animal fear.

Evidence for causality of stockperson-animal relationships from intervention studies in the field

The sequential relationships between stockperson attitudes and behaviour and animal fear and productivity that have been found in the dairy and pork industries (Hemsworth *et al* 1989, 2000; Coleman *et al* 1998; Breuer *et al* 2000; Lensink *et al* 2000, 2001; Waiblinger *et al* 2002) demonstrate the opportunities that exist to improve animal productivity and welfare by appropriate selection and training of stockpeople.

Studies in the dairy and pork industries (Coleman *et al* 2000; Hemsworth *et al* 1994a, 2002) have shown that cognitive-behavioural training in commercial settings can successfully improve the attitudes and behaviour of stockpeople towards their animals, with consequent beneficial effects by reducing animal fear and improving productivity. Basically, these cognitive-behavioural techniques involve re-training 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 behaviours. These cognitive-behavioural techniques are discussed in more detail later on.

In the study by Hemsworth *et al* (1994a), targeting the key stockperson attitudes and behaviours that are correlated with level of fear of humans in pigs resulted in stockpeople having a more positive attitude towards their pigs, with subsequent reductions in the proportion of negative interactions towards their pigs and reductions in the pigs' fear of humans. Furthermore, there was a marked tendency for an improvement in the reproductive performance of the pigs at the farms in which this training programme was introduced. Hemsworth *et al* (2002) also found that similar cognitive-behavioural training of stockpeople was effective in improving the attitudes and behaviour of dairy stockpeople towards their animals and in decreasing fear and improving productivity in dairy cows.

Therefore, there is evidence from studies in the dairy and pork industries that training of stockpeople targeting their attitudes and behaviour, can improve their interactions with farm animals and reduce fear responses in their animals.

Opportunities to improve the relationships between stockpeople and their animals

The studies reviewed here show that the attitudes and consequently the behaviour of stockpeople ultimately determine how the animals are treated. Furthermore, as discussed later, the attitudes towards animals and towards aspects of working with animals may affect work motivation and consequently the application of technical knowledge and skills. Clearly, the attitudes of stockpeople are central to their influence on animal welfare and, thus, are integral to any attempt to monitor and improve animal welfare. Waiblinger and Spoolder (2007) also propose that attitudes are an important underlying determinant of differences in quality of stockmanship.

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We believe that there are three main opportunities to improve human-animal relationships in the livestock industries: training, incorporating 'stockmanship' into welfare-monitoring schemes and greater recognition of the importance of the stockperson on animal welfare, and these opportunities are considered below.

Training

As reviewed earlier, studies in the dairy and pork industries (Coleman *et al* 2000; Hemsworth *et al* 1994a, 2002) have shown that cognitive-behavioural training, in which the key attitudes and behaviour of stockpeople are targeted, can successfully improve the attitudes and behaviour of stockpeople towards their animals, with consequent beneficial effects on animal fear and productivity. Cognitive-behavioural techniques basically involve re-training 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 behaviours (Hemsworth & Coleman 1998). This process of inducing behavioural change is a comprehensive procedure in which all of the personal and external factors that are relevant to the behavioural situation are explicitly targeted.

Therefore, to improve the stockperson's beliefs about their animals and, in particular, their beliefs about handling and working with their animals, stockpeople in the studies by Coleman *et al* (2000) and Hemsworth *et al* (1994a, 2002) were provided with key information on commercial livestock, such as the ease with which they can and should be handled, their sensitivity to the range of negative behaviours used by stockpeople (and their sensitivity to stressors in general), and the adverse effects of these negative behaviours on their fear of humans, which in turn can have negative consequences on their welfare, productivity and ease of handling. The training also provided stockpeople with information on the positive behaviours which can be used to reduce fear in their animals. To address the behavioural aspects of the intervention, stockpeople were shown video footage of the behaviour of stockpeople in commercial units and emphasis was placed on those patterns, such as a high percentage of negative interactions, including moderate negative interactions, that have been shown to increase the farm animals' fear of humans. Video footage of the behavioural responses of animals to a range of stockperson behavioural patterns was also presented to assist stockpeople in recognising and assessing fear responses in their animals. To reinforce the information targeting improvements in both beliefs and behaviours, stockpeople were provided with written material in the form of a booklet, posters and a regular newsletter. The desired outcome of the studies was to reduce the percentage of negative interactions used by stockpeople in handling their animals, that is, reduce the degree of aversiveness of their behaviour towards farm animals.

These studies demonstrate that such training is practical and effective in a wide range of stockpeople working in a variety of situations. Therefore, there is a strong case for introducing this type of training in the livestock industries. A commercial multimedia training programme called 'ProHand Pigs' (Animal Welfare Science Centre 2005), based on the sequential model of human-animal relationships described above, has been developed and validated and is currently being used in Australia, New Zealand and the USA. A similar training programme for the dairy industry (ProHand Dairy) has been developed.

Stockpeople clearly require a basic knowledge of both the behaviour of the farm animal and its requirements, together with a range of well-developed husbandry and management skills to effectively care for and manage the farm animal. Indeed, Waiblinger and Spoolder (2007) propose that 'stockmanship' summarises the different aspect of taking care of animals, particularly the quality of handling animals, daily care (feeding, cleaning, etc), health care (eg how quickly sick animals are recognised and effectively treated) and problem-solving management (eg how management problems are recognised and effectively solved). The stockperson's motivation to utilise these attributes, ie work motivation, is also an important determinant of animal welfare.

Therefore, while knowledge and skills training are fundamental to improving the welfare of commercial livestock, cognitive-behavioural training addressing the key attitudes and behaviour of stockpeople that affect animal fear and possibly other important job-related characteristics of stockpeople, such as job satisfaction and motivation, is likewise important. It is of interest that evidence from the organisational psychology literature indicate an added advantage of training programmes in general for improving worker job satisfaction and job retention (Coleman 2004).

Incorporate 'stockmanship' in welfare monitoring schemes

De Passillé and Rushen (2005) proposed that the most cost-effective way of monitoring or auditing stockmanship in on-farm visits is to ask whether or not the stockperson has followed a suitable training course. While this is a basic requirement in any scheme monitoring stockmanship, the following section reviews opportunities to measure aspects of stockmanship in welfare monitoring schemes.

The key stockperson attitudes that should be targeted for training, attitudes to animals and working with animals, should also be central indices in any on-farm welfare monitoring scheme that aims to measure stockmanship. As reviewed earlier, there is evidence that positive attitudes towards animals and towards working with animals are good predictors of the stockperson's behaviour and performance and should thus also be a requirement in a welfare-monitoring scheme. Also, attitudes may affect other important stockperson characteristics, such as work motivation.

In addition to attitudes, there is evidence that a measure of attitude towards work, the PDI performance score (Johnson 1991; Paajanen *et al* 1999), is a good predictor of the stockperson performance in many areas, work motivation, behaviour towards the animals under his or her care and technical knowledge (Coleman 2001; Carless *et al* 2007). This recent research also found that empathy towards

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animals, which Coleman (2004) suggests refers to a bond that stockpeople may develop with their animals because of being able to put themselves in the animal's position or to understand the way in which the animals are reacting, was a good predictor of technical knowledge, behaviour towards pigs and intention to remain in the job. Beveridge (1996) also found that empathy towards animals was positively associated with positive attitudes towards interacting with cows and positive beliefs about cows but not directly with stockperson behaviour towards cows, while Coleman *et al* (1998) found that empathy towards animals was associated with positive beliefs about pigs and about handling pigs. In other words, empathy appears to be one of the factors that underlies the stockperson's attitudes towards animals.

Technical knowledge and skills, as well as work motivation, will also affect aspects of the work performance of the stockperson and, together with stockperson attitudes, empathy and work motivation, could also be included in measures of stockmanship in an on-farm welfare-monitoring scheme.

It has been shown that stockperson attitudes are amenable to change and Coleman (2004) has proposed that selection processes which identify deficits in attitudes can be used, not only as an employment aid, but as a means for identifying areas which should be targeted through training. Similarly, questionnaires could be used to monitor deficits in attitudes and other important job-related characteristics of the stockperson, such as technical knowledge and skills, empathy and work motivation. Validated questionnaires to assess attitudes to animals and work of stockpeople have been used in the egg, dairy, pork and veal industries (Hemsworth *et al* 1994a, 2002; Coleman *et al* 2000; Lensink *et al* 2000, 2001; Waiblinger *et al* 2002; Edwards 2008). Questionnaires to assess technical knowledge and skills, empathy and work motivation of stockpeople have been used in a number of studies examining the work performance of stockpeople (Beveridge 1996; Coleman *et al* 1998; Coleman 2001; Carless *et al* 2007) and thus are available to monitor stockmanship.

A number of authors have commented on the value and difficulties of incorporating monitoring of stockperson behaviour and animal fear of humans into welfare-monitoring schemes (de Passillé & Rushen 2005; Spoolder 2007). While there is potential to monitor stockperson behaviour in standardised handling situations, there are concerns that the accuracy of measuring the typical behaviour of individual stockpeople may be affected by issues, such as the effect of the observer on stockperson behaviour and standardising the observation setting so that stockperson behaviour is monitored under conditions which are similar and in which routine handling difficulties are present. While remote monitoring may be possible there are likely to be privacy issues.

Concerns arising in monitoring the behavioural responses of animals indicative of fear of humans include: the validity and repeatability of measures of fear in commercial settings, the different measures available, effects of other motivations in a setting in which control is difficult (eg curiosity, hunger, etc), effects of context (eg testing setting, individual person and his/her stimulus properties eg posture, clothing, etc), effects of testing location relative to handling location; identity of test person (eg stimulus generalisation vs stimulus discrimination), pre-testing effects, and the artificial nature of the test (eg novelty of the testing setting). Furthermore, while fear responses to humans may reflect the quality of the human contact, there are situations where there is little human contact, such as in rangeland agricultural systems or possibly in some highly-automated intensive systems, and, consequently, fear responses to humans may simply reflect lack of human contact. Thus, there are several constraints in incorporating measures of fear in a standardised and meaningful manner into on-farm welfare monitoring schemes.

Nevertheless, while monitoring animal and stockperson behaviour provides an opportunity to assess the impact of handling on the animal, it is the stockperson's attitudes and consequently the stockperson's behaviour that ultimately reflect how the animals are treated. Furthermore, the stockperson's attitudes towards animals and towards aspects of working with animals may affect work motivation and consequently the application of the stockperson's technical knowledge and skills. The key underlying job-related characteristics of the stockperson, attitudes to animals and working with these animals, empathy, work motivation and technical knowledge and skills, are therefore obvious candidates to detect deficits in the quality of stockmanship.

Recognition of the critical role of stockpeople

Greater awareness and appreciation by stockpeople and the livestock industries of the importance of stockmanship should facilitate improvements in animal welfare. Anthony (2003), in an ethical analysis of stockmanship in which he recommends the careful consideration by stockpeople of the human-animal bond to promote increased understanding and appreciation of animals, also recognises the impact on animal welfare of a greater appreciation by stockpeople of their importance.

Conclusion

There is a clear need to address the impact that human-animal interactions impose on the welfare of livestock. Appropriate strategies to recruit and train stockpeople in the livestock industries are integral to safeguarding the welfare of livestock. Monitoring the key job-related characteristics of the stockperson, attitudes to animals and to working with these animals, empathy, work motivation and technical knowledge and skills, provides the opportunity to detect deficits in stockmanship and the necessity for further targeted training. While monitoring stockperson and animal behaviour provides the opportunity to examine, more directly, human-animal interactions, it is the attitudes to animals and working with these animals, empathy work motivation and technical knowledge and skills of stockpeople, that underpin the influence of the stockperson on animal welfare. While there is support for measuring stockperson behaviour and fear responses of animals to humans as measures of stockmanship, there are a number of constraints (described above) to standardising such

https://doi.org/10.1017/S0962728600000737 Published online by Cambridge University Press

tests. In contrast, attitude and technical knowledge and skills questionnaires are easier to both standardise and deliver in a standardised manner. However, it is essential that standardised, validated questionnaires be identified for the various livestock species, normative data sets be established and standardised modes of delivery in an on-farm context be developed. As a result of the strong relationships between stockperson attitudes and behaviours and animal fear responses, as well as the relationships between attitudes and other job-related characteristics, we believe attitudes, together with empathy, work motivation and technical knowledge and skills, should be the principal focus of measuring stockmanship in on-farm welfare monitoring schemes.

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