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The human factor: influence on livestock performance and welfare

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ABSTRACT

Research in the livestock industries in which animals have frequent contact with humans has shown that human-animal interactions can limit the productivity and welfare of these farm animals. Many of these interactions are routinely and, at times, habitually used by stock-people. While these interactions may appear harmless to the animals, this research has shown that the frequent use of some of these routine behaviours by stock-people can result in farm animals becoming highly fearful of humans. It is these high fear levels, through stress, that appear to limit animal productivity and welfare. This research has also shown that one of the antecedents of stock-person behaviour is the attitude of the stock-person towards interacting with his or her farm animals. Intervention studies in the dairy and pig industries have shown the potential of cognitive-behavioural intervention techniques designed to specifically target those attitudes and behaviours of stock-people that affect animal fear and, in turn, animal productivity.

Keywords: human-animal relationships, attitude, behaviour, fear, productivity, welfare.

INTRODUCTION

Human-animal interactions are a common feature of modern intensive farming systems. Research, particularly in the pig industry, has shown that the interactions between stock-people and their animals can limit the productivity and welfare of livestock (Hemsworth and Coleman, 1998). Many of the handling behaviours used by stock-people are routinely and, at times, habitually used and many of these behaviours appear harmless or inoffensive to the animals. Nevertheless, research has shown that the frequent use of some of these routine behaviours by stock-people can result in farm animals becoming highly fearful of humans. It is these high fear levels, through stress, that appear to limit animal productivity and welfare (Hemsworth and Coleman, 1998). Less extensive research has been conducted on human-animal interactions in the poultry and dairy industries, but this research has generally supported the results of research on human-animal interactions in the pig industry.

While our understanding of the important human characteristics influencing these interactions in livestock production has improved considerably over the last decade or so, there are still substantial gaps in our knowledge. The difficulty of studying these human-animal interactions in a controlled manner in commercial situations has limited research in this area. Further research is clearly warranted because of the important implications of this topic on not only the animal but also the stock-person. This paper reviews some of the most recent research on human-animal interactions in the dairy, pig and poultry industries to demonstrate some of the important principles that may govern these interactions and their effects in intensive livestock production systems.

Research on human-animal interactions in the livestock industries

Research in the pig industry over the last 20 years has revealed significant interrelationships between the stock-person's attitudes and behaviour towards pigs and the behaviour and productivity of pigs. For example, observations in the Dutch and Australian pig industries have revealed significant negative correlations, based on farm averages, between fear of humans and reproductive performance of pigs (Hemsworth *et al.*, 1981b, 1989). Fear was assessed in these studies on the basis of the amount of approach by pigs to a stationary experimenter. In studying the factors affecting fear in commercial pigs, Coleman *et al.* (1998) and Hemsworth *et al.* (1989) found that the attitudes of stock-people towards interacting with their pigs were predictive of the behaviour of the stock-people towards their pigs, which in turn, was found to be predictive of fear of humans by pigs. For example, positive attitudes to the use of petting and the use of verbal and physical effort to handle pigs were negatively correlated with the use of negative tactile interactions such as slaps, pushes and hits. Furthermore, the use of these negative tactile interactions by the stock-person was positively correlated with the level of fear of humans at the farm. Positive tactile interactions were defined as pats, strokes and the hand resting on the pig's back.

The results of this research in the pig industry have generally been supported by the results of handling studies on pigs. These handling studies indicate that high fear of humans, through a chronic stress response, can limit the growth and reproduction of pigs (e.g., Gonyou *et al.*, 1986; Hemsworth *et al.*, 1981a, 1986, 1987, 1996; Hemsworth and Barnett, 1991). The main results of these studies are summarised in Table 1.

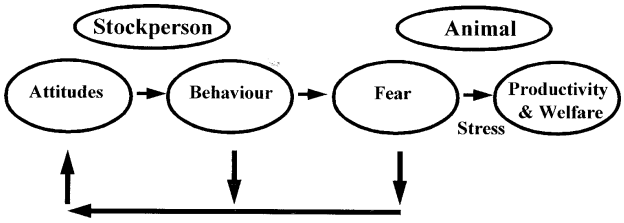
As a consequence of research in both experimental and commercial conditions, Hemsworth and Coleman (1998) have proposed a model to describe the development and influence of human-animal interactions on the productivity and welfare of intensively-managed farm animals (Figure 1). The human-animal relationship as proposed in this model may also have immediate and long-term implications for the stock-person. For example, the human-animal interactions may affect the stock-person to the extent that job-related characteristics, such as job satisfaction, motivation and commitment (Coleman *et al.*, 1998), may be affected with implication for the job performance and

career prospects of the stock-person. This, in turn, is also likely to affect the performance and welfare of the livestock.

TABLE 1: A summary of the effects of negative handling treatments on the productivity and stress physiology of pigs in six studies.

Experiment	Variable	-ve handling	P value
Hemsworth *et al. (1981)*	Growth rate	⇓	0.05
	Basal free cortisol	⇑	0.05
Gonyou *et al. (1986)*	Growth rate	⇓	0.05
	Adrenal glands	⇑	0.05
Hemsworth *et al. (1986)*	Pregnancy rate	⇓	0.05
	Basal free cortisol	⇑	0.05
Hemsworth *et al. (1987)*	Growth rate	⇓	0.05
	Basal free cortisol	⇑	0.01
Hemsworth and Barnett *(1991)*	Growth rate	⇓	NS
	Basal free cortisol	⇑	NS
Hemsworth *et al. (1996)*	Growth rate	⇓	0.05
	Adrenal glands	⇑	0.01

FIGURE 1. Model of human-animal interactions in intensive livestock production.



The attitude-behaviour relationships outlined in this model indicate that the antecedents of stock-person behaviour include the attitudes that the stock-person holds towards the specific behaviour. This proposal is underpinned by Fishbein's theory of reasoned action (Ajzen and Fishbein, 1980) that "as a general rule, we intend to behave in favourable ways with respect to things and people we like and to display unfavourable behaviours towards things and people we dislike. And, barring unforeseen events, we translate our plans into actions". It should also be recognised that in addition to sequential relationships between stock-person attitudes and behaviour, animal fear and animal productivity and welfare as depicted in Figure 1, it is proposed that there are some important reciprocal relationships that are involved in the development and regulation of these relationships. As will be discussed later, these human-animal relationships provide opportunities to improve animal productivity and welfare by targeting the important human characteristics that regulate human-animal interactions in commercial conditions.

Less extensive research has been conducted on human-animal interactions in the poultry and dairy industries, but this research has supported the model depicted in Fig. 1. Studies on commercial poultry have found significant negative relationships, based on farm averages, between the level of fear of humans and the productivity of commercial broiler chickens and laying hens (Barnett *et al.*, 1992; Hemsworth *et al.*, 1994b). Handling studies on poultry have shown that chickens and laying hens are particularly sensitive to visual contact with humans (Jones, 1993; Barnett *et al.*, 1994) and that handling treatments presumably increasing fear of humans may depress growth (for example, Gross and Siegel, 1979, 1980, 1982; Collins and Siegel, 1987). Observations on stock-people at broiler chicken farms reveal that the visual cues from the stock-person may regulate the fear responses of commercial birds to humans: speed of movement of the stock-person was positively correlated with the level of fear of humans by birds (Cransberg, 1996). However, attitude-stock-person behaviour relationships have not been established in the broiler industry (Cransberg, 1996).

Recent research in the Australian dairy industry has found significant correlations between the attitudes of stock-people towards interacting with their cows, the behaviour of the stock-people towards their cows and fear of humans by cows (Breuer *et al*., 2000; Hemsworth *et al*., 1998). Positive attitudes by stock-people about the amount of physical and verbal effort required to move and handle cows and positive beliefs about talking to cows were negatively correlated with the use of negative tactile interactions towards cows such as slaps with the hand or hits with a piece of polypipe. The number of these negative tactile interactions used by stock-people was negatively correlated with the amount of approach shown by cows to a stationary experimenter (Breuer *et al*., 2000; Hemsworth *et al*., 1998). As seen in the pig and poultry industries, negative fear-productivity correlations, based on farm averages, were found in the dairy industry. Fear of humans accounted for up to 20% of the variation between farms in milk yield (Breuer *et al*., 2000). Seabrook (1972) has also suggested that milk yield may be at risk when cows are fearful of humans. In a study of 28 one-person herds in the UK, milk yield was positively associated with introverted and confident stock-people. Although the behaviour of cows was not quantified, Seabrook (1972) reported that the cows were most willing to enter the milking parlour and were less restless in the presence of the stock-person in the highest yielding herds.

Several handling studies also suggest that handling may affect fear of humans, which in turn may limit the productivity of commercial dairy cows. For example, handling has been shown to affect the behavioural response of cows to humans (Boissy and Bouisou, 1988; Boivin *et al*., 1992; Breuer *et al*., 1997). Two recent studies also suggest that aversive handling may depress the milk yield of cows. Rushen *et al*. (1999) found that the presence of an aversive handler increased residual milk and tended to decrease milk yield. Moderate or forceful slaps imposed briefly before or after milking when animals failed to avoid humans, increased flight distance and tended to reduced milk yield in heifers (Breuer *et al*., 1997).

Opportunities to improve human-animal interactions in the livestock industries

The significant relationships found between stock-

person attitudes and behaviour and animal fear (behaviour) and productivity in the pig and dairy industries (Coleman *et al*., 1998; Hemsworth *et al*., 1981b, 1989, 1998; Breuer *et al*., 2000) indicate opportunities to improve animal behaviour and productivity by improving the attitudes and behaviour of stock-people. Indeed, studies in the pig industry have shown that cognitive-behavioural modification techniques, designed to specifically target those attitudes and behaviours of stock-people that affect animal fear, can firstly improve the attitudinal and behavioural profiles of stock-people towards pigs and secondly reduce level of fear and improve productivity of their pigs (Coleman *et al*., 1999; Hemsworth *et al*., 1994a). Recent studies in the dairy industry have also indicated similar opportunities to improve the productivity of dairy cows. A cognitive-behavioural modification programme, similar to that used in the pig industry by Coleman *et al*. (1999) and Hemsworth *et al.* (1994a) has been shown to improve the attitude and behaviour of the stock-people and the behaviour and productivity of commercial dairy cows (Hemsworth *et al*., 1998, 1999).

This approach in improving the attitudes and behaviour of stock-people has been described in detail by Hemsworth and Coleman (1998). Basically, cognitive-behavioural modification techniques, which have been successfully used to modify human behaviour, involve retraining people in terms of their behaviour as well as changing their attitudes and beliefs. Because of the reciprocal relationship between the attitudes and behaviour of the stock-person and the equally strong relationships between the stock-person's attitude and behaviour and the animal's fear and productivity, the behavioural modification procedure should target both the attitudes and behaviour of stock-people. Furthermore, inducing and maintaining attitudinal and behavioural change involves processes somewhat different from those used in the normal classroom situation: it not only involves imparting knowledge and skills, but also involves changing established habits, altering well-established attitudes and beliefs and preparing the person to handle reactions from others towards the individual following change. The process of inducing behavioural change is a comprehensive procedure in which all of the personal and external factors which are relevant to the behavioural situation are explicitly targeted.

In addition to training stock-people, there may be opportunities to select stock-people to work in the livestock industries. Hemsworth and Coleman (1998) have discussed the potential of using a test battery which targets those specific attitudes and behaviours as well as those generic characteristics which are predictive of work performance. At present, there have been no research studies which have investigated the entire range of possible factors which may be relevant to stock-person performance. Where people have had previous experience working in a particular industry, research has shown that the person's attitude towards working with animals in that industry is a good predictor of their behaviour, and ultimately, farm production. While other studies have suggested that personality may be relevant and that empathy may be important (see Hemsworth and Coleman, 1998), these variables need to be studied further. As yet no research has focused on other variables such as attitudes to work, work motivation and work preference.

CONCLUSION

The role of the stock-person in determining animal performance and welfare has generally been neglected in the livestock industries. Recent research has shown that we should not underestimate the role and impact of the stock-person on animal performance and welfare. To do so will seriously risk the performance and welfare of our livestock. It is likely that in the near future both the livestock industries and the general community will place an increasing emphasis on ensuring the competency of stock-people to manage our livestock.

Studies on human-animal interactions also indicate that these interactions in livestock production may affect animal welfare. The threat to welfare of fearful animals arises because of injuries that they may sustain in trying to avoid humans during routine inspections and handling, the evidence that these animals are likely to experience a chronic stress response, and finally, the effects of this chronic stress response on immuno-suppression (Hemsworth and Coleman, 1998), which in turn may have serious consequences on the health of the animals. Furthermore, if the stock-person's attitude towards the animal is poor, the stock-person's commitment to the surveillance of and the attendance to welfare (and production) problems facing the animal is likely to deteriorate. Therefore, the attitudinal and behavioural profiles of the stock-person may have marked effects on both animal productivity and welfare via fear of humans by the animal and via work performance of the stock-person.

REFERENCES

Ajzen, I.; Fishbein, M. 1980. Understanding Attitudes and Predicting Social Behaviour. Prentice-Hall Inc., Englewood Cliffs, N.J.

Barnett, J.L.; Hemsworth, P.H.; Newman, E.A. 1992. Fear of humans and its relationships with productivity in laying hens at commercial farms. *British Poultry Science* **33**: 699-710.

Barnett, J.L.; Hemsworth, P.H.; Hennessy, D.P.; McCallum, T.M.; Newman, E.A. 1994. The effects of modifying the amount of human contact on the behavioural, physiological and production responses of laying hens. *Applied Animal Behaviour Science* **41**: 87-100.

Boissy, A.; Bouissou, M.F. 1988. Effects of early handling on heifers' subsequent reactivity to humans and to unfamiliar situations. *Applied Animal Behaviour Science* **20**: 259-273.

Boivin, X.; Le Neindre, P.; Chupin, J.M. 1992. Establishment of cattle-human relationships. *Applied Animal Behaviour Science* **32**: 325-335.

Breuer, K.; Hemsworth, P.H.; Coleman, G.J. 1997. The influence of handling on the behaviour and productivity of lactating heifers. *Proc.31st International Congress of the International Society for Applied Ethology*, Research Institute of Animal Production, Prague, Czech Republic and the Institute of Animal Biochemistry and Genetics, Slovak Academy of Sciences, Slovakia.

Breuer, K.; Hemsworth, P.H.; Barnett, J.L.; Matthews, L.R.; Coleman, G.J. 1999. Behavioural response to humans and the productivity of commercial dairy cows. *Applied Animal Behaviour Science* (in press).

Coleman, G.J.; Hemsworth, P.H.; Hay, M.; Cox, M. 1998. Predicting stock-person behaviour towards pigs from attitudinal and job-related variables and empathy. *Applied Animal Behaviour Science* **58**: 63-75.

Coleman, G.J.; Hemsworth, P.H.; Hay, M.; Cox, M. 1999. Modifying stock-person attitudes and behaviour towards pigs at a large commercial farm. *Applied Animal Behaviour Science* (in press).

Collins, J.W.; Siegel, P.B. 1987. Human handling, flock size and responses to an *E. coli* challenge in young chickens. *Applied Animal Behaviour Science* **19**: 183-188.

Cransberg, P.H. 1996. The relationship between human factors and the productivity and welfare of commercial broiler chickens. Master of Behavioural Science Thesis, July 1996, La Trobe University, Victoria, Australia.

Gonyou, H.W.; Hemsworth, P.H.; Barnett, J.L. 1986. Effects of frequent interactions with humans on growing pigs. *Applied Animal Behaviour Science* **16**: 269-278.

Gross, W.B.; Siegel, P.B. 1979. Adaptation of chickens to their handlers and experimental results. *Avian Diseases* **23**: 708-714.

Gross, W.B.; Siegel, P.B. 1980. Effects of early environmental stresses on chicken body weight, antibody response to RBC antigens, feed efficiency and response to fasting. *Avian Diseases* **24**: 549-579.

Gross, W.B.; Siegel, P.B. 1982. Influences of sequences of environmental factors on the responses of chickens to fasting and to *Staphylococcus aureus* infection. *American Journal of Veterinary Research* **43**: 137-139.

Hemsworth, P.H.; Barnett, J.L. 1991. The effects of aversively handling pigs either individually or in groups on their behaviour, growth and corticosteroids. *Applied Animal Behaviour Science* **30**: 61-72.

Hemsworth, P.H.; Barnett, J.L.; Hansen, C. 1981a. The influence of handling by humans on the behaviour, growth and corticosteroids in the juvenile female pig. *Hormones and Behaviour* **15**: 396-403.

Hemsworth, P.H.; Brand, A.; Willems, P.J. 1981b. The behavioural response of sows to the presence of human beings and their productivity. *Livestock Production Science* **8**: 67-74.

Hemsworth, P.H.; Barnett, J.L.; Hansen, C. 1986. The influence of handling by humans on the behaviour, reproduction and corticosteroids of male and female pigs. *Applied Animal Behaviour Science* **15**: 303-314.

Hemsworth, P.H.; Barnett, J.L.; Hansen, C. 1987. The influence of inconsistent handling on the behaviour, growth and corticosteroids of young pigs. *Applied Animal Behaviour Science* **17**: 245-252.

Hemsworth, P.H.; Barnett, J.L.; Campbell, R.G. 1996. A study of the relative aversiveness of a new daily injection procedure for pigs. *Applied Animal Behaviour Science* **49**: 389-401.

Hemsworth, P.H.; Barnett, J.L.; Coleman, G.J.; Hansen, C. 1989. A study of the relationships between the attitudinal and behavioural profiles of stock-persons and the level of fear of humans and reproductive performance of commercial pigs. *Applied Animal Behaviour Science* **23**: 301-314.

Hemsworth, P.H.; Coleman, G.J. 1998. Human-Livestock Interactions: The Stock-person and the Productivity and Welfare of Intensively-farmed Animals. CAB International, Oxon UK.

Hemsworth, P.H.; Coleman, G.J.; Barnett, J.L. 1994a. Improving the attitude and behaviour of stock-persons towards pigs and the consequences on the behaviour and reproductive performance of commercial pigs. *Applied Animal Behaviour Science* **39**: 349-362.

Hemsworth, P.H.; Coleman, G.J.; Barnett, J.L.; Jones, R.B. 1994b. Fear of humans and the productivity of commercial broiler chickens. *Applied Animal Behaviour Science* **41**: 101-114.

Hemsworth, P.H.; Coleman, G.J.; Barnett, L.B. 1998. Training stock-people to improve the productivity and welfare of their dairy cattle. *Final report to the Dairy Research and Development Corporation.* Project DAV370.

Hemsworth, P.H.; Coleman, G.J.; Barnett, L.B. 1999. The effects of a training programme targeting stock-person attitudes and behaviour on cow productivity. *Final report to the Dairy Research and Development Corporation.* Project DAV419.

Jones, R.B. 1993. Reduction of the domestic chick's fear of humans by regular handling and related treatments. *Animal Behaviour* **46**: 991-998.

Ravel, A.; D'Allaire, S.D.; Bigras-Poulin, M.; Ward, R. 1996. Personality traits of stock-people working in farrowing units on two types of farms in Quebec. *Proceedings of 14th Congress of the International Pig Veterinary Society, 7-10 July, Bologna, Italy*. Faculty of Veterinary Medicine, University of Bologna, Bologna, p. 514.

Rushen, J.; de Passille, A.M.B.; Munksgaard L. 1999. Fear of people by cows and effects on milk yield, behaviour and heart rate at milking. *Journal of Dairy Science* **82**: 720-727.

Seabrook, M.F. 1972. A study to determine the influence of the herdsman's personality on milk yield. *Journal of Agricultural and Laboratory Science* **1**: 45-59.