

Are You A Source of Stress or Comfort for Your Cows?¹

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■ Take-home messages

- ▶ Cattle's fear of people can be a major source of stress. This stress causes lost production and reduced milking efficiency. Stressed cattle are difficult to handle and there are increased risks of accidents for handlers and animals.
- ▶ Much of this fear results from the way the cattle are handled, which raise concerns about animal welfare.
- ▶ Cattle quickly learn to recognize individual people and to distinguish those who treat them gently from those who don't.
- ▶ You can reduce the fear in your animals. Facilities used during handling must allow easy animal flow so there will be less need to push them around. If you treat a cow aversively (e.g. during veterinary treatment), wear clothing of a special colour or do it in a special place rather than in the cow's stall and certainly not in the milking parlour. The animal will associate the aversive treatment with the colour of the clothing or with the place, and not with you. This will facilitate other manipulations you might need to do.
- ▶ What is important is to make sure that the animals respect you and that they are used to having people around and being handled.

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▪ **Introduction**

Animal welfare is one of the newer socio-economic issues that the dairy industry must face. Initial concern for animal welfare issues in North America was prompted by European animal welfare legislation. However, industry interest in animal welfare is likely to be driven in the future by increasing concern about the image of the industry, a perceptible shift in consumer demand toward “green” farm produce and the close link between animal welfare and productivity. Research has now identified the widespread effects of stress on animal health and productivity and poor animal welfare often translates into poor health and poor production. Under stress, estrus and calving are delayed, growth slows down, meat quality is decreased, and animals become more susceptible to disease. Other research shows a decrease in feed intake and feed efficiency due to stress. Stress can also change milk composition and increases milk fat content. All these effects of stress can mean severe economic consequences for dairy farmers. This is the most important reason for the dairy industry to be active in promoting good animal welfare. In this article, we discuss research showing how fear of humans is a source of stress for dairy cows, how cattle become fearful of people and how this fear reduces handling efficiency and milk production. Finally, we suggest steps that producers can take to reduce fear among their animals, and minimize the deleterious effects on the animals’ behaviour, productivity and welfare.

▪ **Dairy Cattle’s Fear of Humans.**

The way that animals are handled by their caretaker, and the fear of people that they can consequently develop, has a major impact on their welfare. Animals’ fear of people can be a major source of stress, a cause of much lost production, and can make handling difficult and dangerous to both animal and handler. Much of this fear results from certain forms of handling which are aversive to the animals. While it may not be surprising that aversive handling can reduce production, what is surprising is the magnitude of the effects.

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. As prey species, the lives of domestic ruminants are largely geared towards detecting and escaping predators. Fear plays a crucial role in this process by motivating animals to avoid potentially harmful situations.

Humans can evoke fear in animals by virtue of their relative size, and the propensity for quick or unpredictable movements. In traditional, small-scale agriculture, animals habituate to the presence of people by virtue of routine neutral exposure to humans in the course of daily management. Modern farm

practice, however, has reduced much of the opportunity for frequent, benign contact between farm animals and people. Farms are larger, reducing the opportunity for contact between the human caretakers and any given individual animal. Labour saving technology typically further reduces contact time between stock persons and each animal. In particular, many of the opportunities for positive interaction with livestock, such as at feeding time, have been replaced by mechanical or electronic feeders. On the other hand, many of the aversive tasks associated with managing farm animals, such as catching and restraint for vaccination, foot care, administration of medication, and transport, still require human intervention. As a result, there is the risk that animals' direct experiences with humans will be biased increasingly towards the negative. Without the balancing effect of positive daily interaction, we may reinforce our animals' natural fear of humans, and the physiological, production, and welfare consequences of that fear.

▪ **Animals' Fear of Humans and Productivity**

Recent studies show a strong relationship between cattle's fear of humans and their productivity. Hemsworth et al. (1995b) compared 14 dairy farms in Australia and subjected the cows to a simple measure of fearfulness, which was based on the distance that the cows kept from the experimenter during a standard test. This measure was strongly, negatively correlated with mean milk production of the farm, indicating that a surprising 30-50% of the variance between farms in milk production could be explained by the level of fear shown by the cows to humans. Some of the differences between animals in the extent that they are afraid of people may reflect genetic differences. However, it can also reflect the way that animals have been handled. It has been suggested that when animals are repeatedly handled by people in a manner that they find aversive, the animals learn to associate the handling with people and hence develop a learned fear of people.

▪ **Effect of Aversive Handling on Cattle's Fear and Productivity**

A large number of studies have experimentally varied the type of handling in order to change the animals' level of fear of humans, and thus to examine the effect of this on their productivity. Such an experimental approach can determine whether the amount and type of handling received directly affects the level of fearfulness of the animals, and whether this, in turn, reduces productivity.

Seabrook (1994) reports one study that compared milk yield of cows treated aversively (slapped, kicked etc.) with those treated gently (stroked, patted etc.).

Milk yield was reported to be a substantial 664 L/cow/year lower (i.e., a reduction of 13%) in the aversively handled animals. In addition, the aversively handled cows took almost twice as long to enter the milking parlour, and defecated in the parlour six times as often, all of which could reduce the efficiency of the milking operation. Recently, Breuer et al. (1997) found that dairy heifers that were hit for a few minutes before and after milking (which can occur in practice when cattle are moved to a milking parlour) showed a reduced milk yield, an increased loss of weight during the first weeks after calving, and a much higher incidence of lameness than heifers that were handled more gently.

▪ **Effect of Gentle Handling on Fear and Productivity**

In two studies, Hemsworth et al. (1987, 1989) gave heifers extra handling at the time of their first calving. During subsequent milkings, the number of times the milking cluster became dislodged (due to movement of the cow) was reduced, as was the need for extra human assistance at milking. Thus, the efficiency of the milking process was improved. There were no effects on the duration of milk let-down or upon milk production. The time taken to approach the experimenter was reduced by the extra handling, suggesting a reduced level of fearfulness. However, there was no correlation between the cows' approach time and milk yield.

Boissy and Bouissou (1988) reported that extra handling given to heifers during the first nine months of life reduced the "flight distance" and increased the amount of feeding the animals did in the presence of humans, presumably indicating reduced fearfulness. No measures of subsequent productivity were taken. Extra gentle handling of adult cattle has been shown to increase the tendency of the animals to approach people (Hemsworth et al. 1996a). Extra handling of heifers may improve their behaviour during the first milkings, although the large variability between heifers in the response to milking may mask this effect (Bremner 1997).

▪ **Physiological Effects of Handling**

It should not be surprising that an animal's fear of humans can have a direct negative effect on productivity, given evidence of physiological disturbances ("stress") associated with this fear. Cortisol concentrations in milk were found to be lower in cows given extra handling during first calving, suggesting less stress at milking for the handled cows; however, heart rates at milking did not differ. Milk cortisol concentrations were positively correlated with the time taken to approach the experimenter (Hemsworth et al. 1989). Cortisol responses to handling were also found to be lower in heifers given extra handling during their first nine months of life (Boissy and Bouissou 1988). Heart rates of cows in the milking parlour were higher when the cows were handled by relief workers than

by the usual milkers (Knierim and Waran 1993), and when a person was present who had previously mistreated the cows (Rushen et al. 1997). In both studies this elevation in heart rate was associated with lower milk yields. These physiological changes associated with stress could result in lower milk production and problems with milk ejection.

▪ **Effect of the Stock Person on Fear and Productivity**

Several lines of evidence indicate that the amount of fear shown by dairy cattle to humans is affected by the behaviour of the individual stock person. It has long been recognized that there are marked differences between stock persons in the productivity they are able to achieve. For example, Seabrook (1984) examined 12 one-man dairy herds of a large multi-farm enterprise, which had cows of similar genetics and similar building and equipment, and used similar feed and management techniques. However, there was a marked difference between the farms in productivity (maximum difference of 570 L/cow/year or 20% of the overall mean), which was attributed to the stock person. A change in stock person was also found to be associated with marked changes in production of the order of 608 kg/cow/year (either an increase or a decrease), compared to the mean fluctuation of 188 kg/cow/year that occurred from year to year before the changes. In addition, relief workers have been found to obtain 0.7 L/cow/day less than the usual milkers (Knierim and Waran 1993). In addition, there can be substantial differences between different milkers in the milk yield they are able to obtain from the same cows (Knierem 1991).

Some of this difference may reflect differing levels of technical competence, but research shows that the degree of fear the animals show towards the individual stock person can be a major factor underlying the differing productivity of different stock persons. Seabrook (1984) observed the behaviour of cows when they were being handled by "high-producing" stock persons and compared this to cows handled by "low-producing" stock persons. He found that the cows were spoken to and touched more often, appeared less frightened and were more easily moved, and were more likely to approach and less likely to avoid the high-producing stock person.

Our recent study at Lennoxville (Rushen et al. 1997) suggested that milk yields of cows milked in the presence of a person (the person is not in contact with the cow) who has handled them aversively may be 10% lower than normal (Figure 1). This reduction in milk yield was associated with a doubling of residual milk, suggesting the effect was due to a reduced action of oxytocin. In the presence of the aversive handler, movement of the cow during udder preparation was also increased, reducing the efficiency of milking.

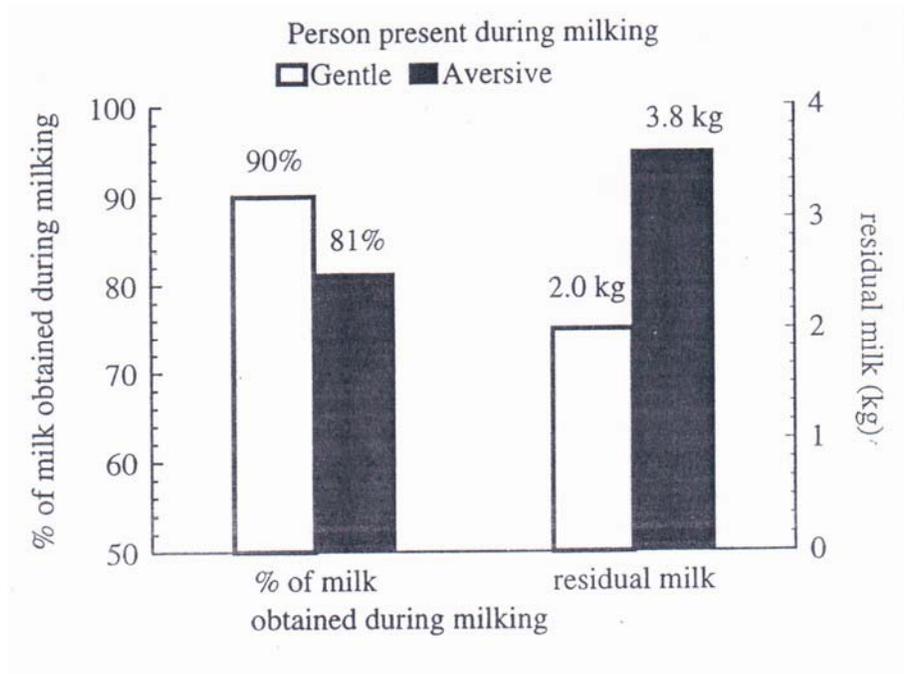


Figure 1. Percentage of milk obtained during milking and residual milk left in the udder for cows milked in the presence of a person who had either handled them gently or who had handled them aversively.

▪ Effect of Stock Persons' Attitudes on Productivity

The studies described above were based on objective observations of either the animals' or the stock persons' behaviour. However, handling can involve very subtle behaviours that may be difficult to detect using normal observational methods. To further investigate the role of the stock person in influencing the level of fear and productivity of cattle, Seabrook (1984; 1994) looked for correlations with the stock person attitudes using a questionnaire. High and low-producing stock persons were found to differ in a number of personality attributes, with the high-producing stock persons reported as being: "not easy going; considerate; not meek; patient; unsociable; not modest; independently minded; persevering; not talkative; confident; uncooperative; and suspicious of change"! It was not clear if these personality differences had their effect by influencing how the stock person handled the animals, or whether they were associated with differing levels of technical competence or use of different management techniques.

In Australia, Hemsworth et al. (1994a) has implemented a program to improve the behaviour and attitudes of stock persons towards pigs. Stock persons who had been through the program showed significant changes in both their attitude and behaviour towards pigs. These changes corresponded with a reduction in the amount of fear of humans shown by the sows on these farms, and a trend towards improved sow productivity. Such results confirm the crucial role of human behaviour and attitudes in determining the level of fear of humans shown by farm animals and its consequences for productivity and welfare. We suggest that such a training program could be very valuable for dairy producers.

▪ **Effects of Handling on Other Parameters**

Poor handling leading to an increased fear of humans by farm animals is likely to lead to a number of other undesirable effects besides reduced production. The most likely of these is the increased risk of injury, to both animals and stock person. These consequences have received much less attention by the research community.

Farming appears to be one of the most hazardous occupations, with a high incidence of work-related injury and mortality. For animal agriculture, traumatic injuries from animals may be one of the most important cause of injury (Murphy 1992; Runyan 1993). The degree of tameness, as opposed to the degree of fear or aggression that the animals show in the presence of humans is likely to contribute substantially to the risk of injury (Murphy 1992; Grandin 1987). However, although recommendations are many, relatively little research appears to have focused on how handling can be improved to reduce injury rates.

Problems of handling and the risk of injury seem to be of most concern to beef production, and perhaps to dairy production. Dairy cattle are often reported to be easy to handle, although handling can be a problem with dairy bulls. Albright (1993) reports that behavioural problems, including difficulty at handling, are responsible for only 1% of culls of dairy cows. Nevertheless, dairy cows are a source of injury, although this is attributed more to their nervousness than to aggressiveness. Variability between dairy cows in ease of handling has been reported (e.g. Dickson et al. 1970), and some cows show considerable kicking when being milked (Knierim and Waran 1993). The tameness of dairy cows is likely to be due to the selection of cows that are easy to handle throughout the long process of domestication. Interestingly, Albright (1993) claims that recently, due to the reduced handling in intensive dairy production, and the consequently reduced selection for tame animals, there has been an increased difficulty in handling dairy stock.

Some studies have investigated how ease of handling can be altered in dairy cattle. Hemsworth et al. (1987, 1989) gave some heifers extra handling at the

time of their first calving. This substantially reduced the incidence of the "Flinch-Step-Kick" response, which is a possible cause of injury to milkers. The effect was large: the incidence of FSK during milking was reduced by 40-50% and by 75% during actual milk let-down. The effect was most apparent during the first six milkings, and thereafter lost importance. Marked differences between two stock persons were also noted in how docile the cows were during milking. Extra handling of heifers and increasing their familiarity with the milking routine can reduce the amount of kicking during milking (Bremner 1997). Boissy and Bouissou (1988) found that extra handling given to heifers during the first nine months of life reduced the time required to capture the animals, and increased the ease of handling. Lefcourt and Barfield (1995) increased handling of Holstein and Texas Longhorn and found that the handling difficulties during milking were reported to be decreased for the Longhorns but not for the Holsteins. The authors conclude that extra handling increases ease of handling in the early stages of lactation, particularly for wilder cattle.

Injury to the animals is likely to be another undesired consequence of poor handling or lack of tameness in animals (Gonyou 1996; Hemsworth et al. 1995a). Lameness in dairy herds, in particular, has been partly blamed upon poor handling of animals. Lameness is likely to be a substantial economic problem, both for the welfare and the productivity of dairy cows (Greenough 1996; Hemsworth et al. 1995a). While the causes of the problem are multifactorial (Greenough 1996), the extent that animals are aggressive or fearful of people, and poor handling during movement is thought to be a major contributor to lameness (Gonyou 1993; Greenough 1996, Hemsworth et al. 1995a). Chesterton et al. (1989) found impatience by the stockman when moving animals to be one of the single most important factors determining the level of lameness within a herd. Breuer et al. (1997) report a much higher incidence of lameness in dairy heifers that were handled roughly before and after milking.

▪ **Fear of Individual People: Generalization or Discrimination?**

One important question is the extent to which animals are able to distinguish between individual people. It is of practical importance to know the extent to which fear resulting from aversive handling by one person is generalized to other people. If this is an inevitable consequence of aversive handling, then all people in the animals' environment would soon come to elicit fear, with potentially severe physiological and productivity consequences.

Virtually any dairy farmer will report anecdotally that animals can, in fact, tell different people apart. Dairy cows (Knierim and Waran 1993; Seabrook and Bartle 1992; Seabrook 1994), have been reported to react differently to different people. More recently, we have systematically examined the extent that

domestic animals can distinguish individual people. de Passillé et al. (1996) noted that when a person entered a calf's pen, periods of contact were shorter and more frequent if the person was unfamiliar. When calves were handled repeatedly by different people, one of whom treated them positively while the other handled them aversively, they contacted the positive handler significantly more than the aversive handler, showing that they could distinguish between them. A subsequent experiment (Munksgaard et al. 1997) found that adult dairy cows could similarly distinguish between people based on the treatment the cows received. Taylor and Davis (1998) also successfully trained adult dairy cows to distinguish between different people.

Munksgaard et al. (1997) found that adult dairy cows can distinguish between people based on the type of handling received, at least when the two people wore different colour clothes. However, the cows did not discriminate between the same handlers when they both wore the same colour, suggesting that the colour worn is an important cue that cows use to recognize people. Cows did not generalize their behaviour to unknown people who wore the same colour clothes. This suggests that while clothing colour is used by cattle to distinguish people, it is by no means the only cue that they use. In support of this, Taylor and Davis (1998) have shown that cattle are capable of distinguishing between people who do wear the same colour clothes.

▪ Finding a solution

To avoid cattle becoming scared of people, simple precautions are essential. First, it is not necessary to treat dairy cows as our house pets. If we lose our dominant position with these animals, there is going to be control problems in the barn. What is important is to make sure that the animals respect you and that they are used to having people around and being handled.

1. Increased contact with humans, particularly during rearing, can markedly decrease the level of fearfulness of the animals.

This has been shown for beef cattle (Boivin et al. 1992a,b) and dairy cattle (Boissy and Bouissou 1988; Bremner 1997) This is the clearest conclusion from the research, yet, surprisingly, recommendations to farmers rarely emphasise the importance of early contact. Whether an animal is more sensitive to human contact at some times than at others is open to speculation. Boissy and Bouissou's (1988) results suggest that dairy heifers are equally responsive to human contact throughout the first nine months of life. Albright (1993) suggests that human contact at certain critical times (e.g. first calving) is more effective than routine handling, and initial results (Hemsworth et al. 1987, 1989) support this. One important question is whether gentle handling at these times will reduce the animal's fear of people in general, or only of the person giving the extra contact. As discussed above, some results suggest that animals will generalize their reduced fear to all people while other studies show that dairy

cattle at least are capable of discriminating between different people. The extent that animals can discriminate between different handlers is crucial to research in this area, but little information is available.

2. Certain behaviours or postures while in close contact can frighten or startle animals.

Numerous recommendations have been made about the most appropriate behaviours (talking quietly, avoiding sudden movements, touching the animal at first approach), and these recommendations seem quite reasonable. However fear is a complex phenomenon and we have little scientific information about it. The study of human behavior that cause fear to farm animals is only beginning. It seems urgent to identify the factors that lead to poor human-animal relationships and to understand the effects of fear on milk production. Such studies have recently been undertaken in Lennoxville with financial support from Novalait inc., a fund to support research established by the Federation of Milk Producers of Quebec.

However, it should be noted that none of the recommendations have actually been tested out. While this may seem unnecessary in some cases, it is more problematic when the recommendations are less obvious, e.g. suggestions as to how far into an animals "flight zone" a handler should penetrate, the best places to touch animals, or the necessity of establishing "dominance" (e.g. Grandin 1987, 1993). Research can clarify the situation. A number of authors (Grandin 1987; Seabrook 1994; Seabrook and Bartle 1992) have suggested that handling would be improved if the handlers used "species-specific" behaviours, used by the animals themselves when establishing social bonds or social relationships. For example, the best places to touch animals could be determined by examining where animals groom each other. However, effectively little is known about social behaviour and communication in farm animals, and so the recommendations remain imprecise.

3. Poorly designed handling facilities

Much of the aversive handling of farm animals occurs when the animals are being moved, especially when handling facilities are poorly designed, causing the animals to frequently balk. Improvement in handling facilities, leading to easier flow of animals, would greatly reduce the amount of rough handling farm animals receive, and would likely result in tamer and less fearful animals.

4. Aversive handling by specific handler.

Consistent use of aversive handling can cause the animals to learn an association between aversive treatments and either a specific handler or humans in general (Hemsworth et al. 1994b, 1996b). De Passillé et al. (1996) and Munksgaard et al. (1997) have shown that dairy cows and calves can learn to avoid a specific handler as a result of aversive treatment. Recommendations are often given to avoid aversive treatments, but apart from the obvious ones,

e.g. electric shock, there is little knowledge of what handling treatments cattle do find aversive. Aversive learning techniques have successfully been used to compare handling techniques for sheep (Rushen 1996), but no comparable work has yet looked at handling techniques for cattle. Understanding which handling techniques animals find most aversive is essential for progress in this area.

5. Lessening animal's learned fear.

However, animals may not inevitably learn to associate aversive handling with the identity of the person doing the handling. A learned fear of people as a result of necessary aversive treatment can be reduced if the person doing the treatment wears special coloured clothes (Munksgaard et al. 1997) or carries out the treatment in a special place (Rushen et al. in press).

■ Conclusion.

In this paper we have explored the various effects of handling, both positive and aversive, on farm animals' fear of humans, and the consequences of that fear. It is clear that aversive handling results in significant fear, certainly of the specific handler, but which also may generalize to all humans. This fear can cause serious losses in productivity, increased handling problems and resultant injuries to both animals and handlers, and diminished animal welfare. Regular gentle handling, particularly from a young age, can help overcome the negative effects of those aversive procedures that are a necessary part of animal husbandry, as well as reducing general fearfulness.

Agricultural animals are frequently subjected to aversive treatment that is not essential to the management routine. Such behaviour on the part of stock persons may be a function of ignorance of more suitable handling methods, and may also reflect fundamental attitudes towards animals in general, or to that species in particular. Fortunately, stock persons attitudes and the resulting behaviour are available to improvement through education and behaviour modification. Such findings serve to underscore the importance of initial and ongoing training of stock persons in the proper handling of agricultural animals.

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