

Measurements of fear in dairy cattle: a review of latest findings

By Sally Jayne Coggins

Introduction

Increasing numbers of studies suggest that fear in dairy cattle during routine handling and restraint procedures reduces productivity and efficiency (Boissy & Bouissou, 1995, Albright & Arave, 1997, Rushen et al., 1999, Breuer et al., 2000). Not only does fear produce economic losses, it has a number of welfare implications. Fearful cattle are more likely to injure themselves and personnel (Boissy & Bouissou, 1995, Rushen et al., 1999). This fear and the resultant pain from injuries indicate a compromise in animal welfare (Phillips, 2002). Parameters used to measure "fear" vary widely among studies. Plausible, quantifiable and consistent parameters representative of "fear" must be established to reduce subjectivity between results in future studies, facilitating implementation of management techniques that improve welfare, based on sound, consistent research. This paper will discuss results of recent research into measurements of fear in cattle and the practical applications of such strategies when attempts are made to improve welfare.

Discussion

Indications of fear used previously include: degree of aversion (de Passille et al., 1996, Munksgaard et al., 1997, Rushen et al., 1999) or approach behaviour (Breuer et al., 1999), sniffing frequency, decreased lying behaviour (Herskin et al. 2004), exploration (Boissy & Bouissou, 1995), defecation/urination frequency (Munksgaard et al., 1997), heart rate, respiration rate and cortisol concentrations (Voisinet et al., 1997, Boissy & Bouissou, 1998, Rushen et al., 1999, Mitchell et al., 2004). Physiological measures of fear are commonly more objective (Phillips, 2002), but are time consuming and may induce stress.

Rousing and Wailblinger (2004) considered the degree of aversion to humans as the most valid behavioural indication of fear, when developing tests capable of assessing the behavioural response to humans of cattle on a herd scale. This study tested the robustness of a herd-scale aversion (AV) test and voluntary animal approach (VAA) test, in terms of reliability and consistency in retests and between-observer results. Tests were built on methods used previously to evaluate responses to humans by individual cows (Hemsworth & Coleman, 1998, Hemsworth et. al., 2000).

The AV test involved a person slowly approaching a number of randomly selected cows from a confined herd. Two observers categorised individual cow responses on a scale of one (avoidance maintained at >2m from test person) to five (touch). The VAA test was a 15-minute test in which two observers recorded the number of cows that approached the test person within 2.5 metres, that touched the test person, and individual latencies from test start to first approach within 2.5 metres. The AV test proved more robust in terms of fear analysis, as the motivation of approach behaviour recorded in the VAA test could not be defined as simply a "lack of fear". That said, authors concluded that both of these tests mutually strengthen each other and offer a reliable assessment of the "human-animal relationship". This "relationship" may prove superior to "fear" as a measure of welfare (since negative and positive interactions are assessed) and offers a practical method for obtaining indications of herd human-animal relationship and welfare.

Welp et al. (2004) investigated vigilance as a behavioural measure of fear in dairy cattle in their response to particular caretakers. Authors suggested that vigilance (animal raising head when grazing) in wild animals occurs in response to a threat (i.e., predation) and is therefore fear. They applied this principle to dairy cattle.

Individual animals were habituated to an arena containing a high-walled receptacle within which was attractive feed. The height of the walls of this feed container restricted vision during feeding. Thus vigilance was recorded every time the animal lifted its head. A first

experiment tested vigilance responses to a dog, unfamiliar person, or neither. A second experiment used cattle from another group that had established avoidance as an appropriate (or learned) response to an aversive handler. This second experiment tested vigilance in the presence of the aversive handler, gentle handler, and an unfamiliar person. Results showed increased vigilance in the presence of the aversive handler, suggesting vigilance was a measure of fear under these circumstances. The researchers made no attempts to suggest that generalising this behavioural measurement beyond controlled conditions would remain accurate. Cattle are social animals that tend to explore their environment with characteristic curiosity (Phillips, 2002); therefore vigilance in herd situations cannot be solely indicative of fear.

In restraint situations, behavioural measures of aversion are restricted, so physiological responses may be measured instead. Wailblinger et.al. (2004) investigated whether previous handling and gentle interactions affect heart rate and behaviour of dairy cows during a veterinary procedure. This experiment used two groups of ten cows. Regular staff handled all cattle routinely over four weeks. On ten of the days during this four-week period, the test group received 5 minutes of additional positive handling by a designated handler. In the following week, heart rate and behaviour were recorded in each cow when restrained in a crush and rectally palpated/inseminated in the presence of: the handler; a regular staff member; an unfamiliar person; or no person. In all four test situations, treated cattle showed lower heart rate, and less defensive and restless behaviour. Reductions were most dramatic when the handler was present.

It is worth noting that restless behaviours (tail flicking, head shaking, flinching) may be influenced by external stimuli (e.g., insects). Defensive behaviour (kicking, butting) may indicate stress/fear, but at present, heart rate remains the most consistent single measure of distress. Thus stress responses can be reduced during standard veterinary procedures via previous regular, positive interactions with a handler. Reactions are further reduced if that handler is present and gently interacting with the cow during procedures.

Conclusion

Some degree of subjectivity persists whenever assessing welfare, since a level of emotional inference is inherent. Standardising parameters that assess "fear" will allow integration of results from studies with less subjectivity, facilitating the implementation of techniques to improve animal welfare. Studies published in the past year describe measurements (AV & VAA tests) of the human-animal relationship in herds that offer viable behavioural assessments of welfare in herd situations. However, other recent data support the pre-eminence of physiological measures (i.e., heart rate) as the most viable assessments of fear and human-animal relationship in restraint conditions.

References

- Albright, J.L. and Arave, C.W. (1997) *The Behavior of Cattle*, CAB International. New York, USA. p. 191.
- Boissy, A. and Bouissou, M.F. (1998) Effects of early handling on heifers' subsequent reactivity to humans and unfamiliar situations. *Appl. Anim. Behav. Sci.* 20, 259-273.
- Boissy, A. and Bouissou, M.F. (1995) Assessment of Individual differences in behavioural reactions of heifers exposed to various fear-eliciting situations. *Appl. Anim. Behav. Sci.* 46, 17-31.
- Breuer, K., Hemsworth, P.H., Barnett, J.L., Matthew, L.R. and Coleman, G.J. (2000) Behavioural responses to humans and the productivity of commercial dairy cows. *Appl. Anim. Behav. Sci.* 66, 273-288.

- de Passille, A.M., Rushen, J., Ladewig, J. and Petherick, C. (1996) Dairy Calves Discrimination of People Based on Previous Handling. *J. Anim. Sci.* 74, 969-974.
- Hemsworth, P.H. and Coleman, G.J. (1998) *Human-Livestock Interactions. The Stock-person and the Productivity and Welfare of Intensively Farmed Animals*. CAB International. p. 152.
- Hemsworth, P.H., Coleman, G.J., Barnett, J.L. and Borg, S. (2000) Relationships between human-animal interactions and productivity of commercial dairy cows. *J. Anim. Sci.* 78, 2821-2831.
- Herskin, M.S., Kristensen, A. and Munksgaard, L. (2004) Behavioural responses of dairy cows toward novel stimuli presented in the home environment. *Appl. Anim. Behav. Sci.* 89, 27-40.
- Mitchell, K.D., Stookey, J.M., Larnas, D.K., Watts, J.M., Haley, D.B. and Huyde, T. (2004) The effects of blindfolding on behaviour and heart rate in beef cattle during restraint. *Appl. Anim. Behav. Sci.* 85, 233-245.
- Munksgaard, L., de Passille, A.M., Rushen, J., Thodberg, K. and Jensen, M.B. (1997) Discrimination of people by Dairy cows based on handling. *J. Dairy Sci.* 80, 1106-1112.
- Phillips, C. (2002) *Cattle Behaviour and Welfare* Second edition. Blackwell Science Ltd. Melb. office, Vic, Australia.
- Rousing, T. and Wailblinger, S. (2004) Evaluation of on-farm methods for testing the human-animal relationship in dairy herds with cubicle loose housing systems - test-retest and inter-observer reliability and consistency to familiarity of test person. *Appl. Anim. Behav. Sci.* 85, 215-231.
- Rushen, J., de Passille, A.M.B. and Munksgaard, L. (1999) Fear of People by Cows and Effects on Milk Yield, Behaviour, and Heart Rate at Milking. *J. Dairy Sci.* 82, 720-727.
- Rybarzyk, P., Koba, Y., Rushen, J., Tanida, H. and de Passille, A.M. (2001) Can cows discriminate people by their faces? *Appl. Anim. Behav. Sci.* 74, 175-189.
- Voisinet, B.D., Grandin, T., O'Connor, S.F., Tatum, J.D. and Struthers, J.J. (1997) Feedlot cattle with calm temperaments have higher average daily gains than cattle with excitable temperaments. *J. Anim. Sci.* 75, 892-896.
- Wailblinger, S., Menke, C., Korff, J. and Bucher, A. (2004) Previous handling and gentle interactions affect behaviour and heart rate of dairy cows during a veterinary procedure. *Appl. Anim. Behav. Sci.* 85, 31-42.
- Welp, T., Rushen, J., Kramer, D.L., Festa-Bianchet M. and de Passille, A.M. (2004) Vigilance as a measure of fear in dairy cattle. *Appl. Anim. Behav.*