Farm animal welfare — who writes the rules?
Occasional Publication No. 23 — British Society of Animal Science 1999
edited by A. J. F. Russel, C. A. Morgan, C. J. Savory, M. C. Appleby and T. L. J. Lawrence

Does separate housing of newly calved heifers influence social behaviour and lessen claw horn lesion development?

D. E. Cross[1], D. N. Logue[2], J. E. Offer[2], L. M. Birnie[1] and M. A. Lomax[1]

[1]*University of Aberdeen, MacRobert Building, 581 King Street, Aberdeen, AB24 5UA*
[2]*Dairy Health Unit, SAC Veterinary Services, Auchincruive, Ayr KA6 5AE*

Introduction

Minimizing exposure of the newly calved heifer to environmental stress at its introduction into the dairy herd would have benefits in terms of production and animal welfare. Fordham *et al.* (1991) suggested that housing environment changes were more stressful than previously assumed. Observations of increased behavioural activity after environmental changes over periods of several weeks were suggested to be a mechanism for greater stress levels of the animals at key periods in the life cycle. Increased first lactation yields would bring considerable economic benefits associated with higher returns (Phelps, 1992). Behavioural stresses may lower animal reproductive efficiency, expressed as a longer return time to service and thus an increased calving interval (Moberg, 1991). Changes in management around the calving period in dairy heifers was observed to predispose heifers to *pododermatitis aseptica* (PDAS), often loosely called 'subclinical laminitis', leading to solar ulceration (Bazeley and Pinsent, 1984). Abnormal behavioural patterns are also associated with lameness (Colam-Ainsworth *et al.*, 1989). The importance of reducing incidence of lameness in order to improve dairy cattle welfare is well recognized. Recent work in Ireland and Scotland indicated that behaviour should be considered as a factor in foot lesion and lameness development (Logue, 1996). This study examined the hypothesis that separate housing of first calving heifers from the adult herd would have a beneficial effect upon claw horn lesion development and the extent to which behavioural changes may be associated with this effect.

Material and methods

Animals and treatments

Twenty-four heifers were allocated by calving date into two groups of 12, separate (S) and mixed (M) at calving. The S group was housed with a further 15 heifers in Cantilever style cubicles (2·1 × 1·25 m) and the M group was housed with 47 cows in a section of the same house with a mixture of Cantilever and Auchincruive style cubicles (2·2 × 1·3 m). The cubicle house had concrete floors with sawdust bedding and automatic scrapers. Passageways were level-floored and scraped seven times daily. All animals had access to a cubicle each. Both groups were given a silage-based complete diet supplemented with concentrates (0·4 kg/l at 25 kg milk) in the milking parlour. Three cows were lost from lesion studies and five from behavioural studies, all from group M due to health problems unrelated to the present report.

Lesion data

In the lesion study, data were obtained for each hind claw, assessing foot angle, foot length and foot lesions for severity and extent. These data were collected in the manner described by Leach *et al.* (1997), approximately 1 month pre-calving and 1, 3 and 5 months post calving. Lesion data used were obtained from a simultaneous study on the heifers (Logue *et al.*, 1998).

Behavioural study

Behavioural data were collected 4 months post calving. Activity was recorded every 20 min over 24 h to characterize the daily time budget, based on the modification of a method previously described by Singh *et al.* (1993). A novel object approach test, based on modification of a method by Boissy and Bouissou (1995), measurement of parlour docility (Dickson *et al.* 1969) and parlour rank order entry were also undertaken. These tests provided a range of behavioural parameters in normal husbandry situations and conditions which could then be analysed for potential stress situations.

Statistical analyses

Data from the lesion studies were analysed as log transformed sum of lesions across all eight claws. All behavioural data sections were analysed using SPSS package for UNIX release 6.0 using Pearsons square analysis, analysis of variance tests and GLM (least maximum likelihood) tests. Students *t* tests were effected using Minitab 7.2 package.

Results

There was a significant difference ($P < 0·05$) in total lesion score between groups (means 1·96 and 2·16,

s.e.d. 0·2), for S and M groups respectively. In terms of behaviour, total time standing was not significantly different. However, S tended to spend less of total passageway time ruminating (27·8% compared with M group at 40%; $P > 0·05$). S group heifers spent significantly less time standing in passageways relative to M group heifers and more time standing in cubicles ($P < 0·001$). In the novel object test, S spent significantly longer (107·73 (s.e.d. 28·1) s) close to the object than M (79·23 (s.e.d. 20·25) s, $P < 0·05$). S heifers also had a corrected parlour entry order average of 12·51 (s.e.d. 1·88), compared to 34·69 (s.e.d. 2·47) for M ($P < 0·001$). However, M heifers were more docile than S heifers (average score 2 to 3 and 1 respectively). Total feeding time was not significantly different between groups although M heifers tended to feed later during late night and early morning.

Table 1 *Number of observations of standing in each specific location site for each treatment group*

Activity	Separate	Mixed	Significance
Standing in passage	97 (41·1%)	75 (59·5%)	$\chi^2 = 20·23$ d.f. = 2
Standing in cubicle	72 (30·5%)	13 (10·3%)	***
Total	169	88	

Discussion

Separate housing of first calving heifers reduced claw horn lesions particularly due to PDAS after calving and for this reason, is likely to reduce herd lameness in the longer term (Logue, 1996). The longer times spent standing in dirty passages was associated with increased claw lesions in the M group. Although not significantly different, the increased rumination time while standing in these passageways may have a biological importance in relation to the development of these lesions. In addition, there were subtle differences in behaviour of the S group compared with the M group. M group heifers were less inquisitive than those of the S group and rated lower in herd dominance order, with entry order into the parlour. Parlour entry order was corrected statistically by random pairing of animals as far as possible as the group sizes were different. The M group also had a more docile parlour temperament. Accommodation used to conduct this study employed the same management regime and used the same building, only containing cubicles of differing design — Cantilever and Auchincruive. As cubicle dimensions were similar and provided similar accommodation, we have considered carefully whether treatment effects may have been due to this factor. Observations revealed that group M heifers had a choice between style of cubicle but showed no preference for one over the other. Interpretation of results was complicated by the different size of groups but this was accounted for by using the generalized linear model in the statistical analysis. However, these results suggest that a management system involving separate heifer housing will reduce feet problems and the behavioural analysis supported that M group heifers were displaced by older cows. As a result, it is concluded that separate housing and feeding systems may be of value to limit dairy lameness and PDAS or 'subclinical laminitis'.

Acknowledgements

D. Cross is grateful to the involvement of O. McPherson in statistical analysis. SAC receives funding from SOAEFD.

References

Bazeley, K. and Pinsent, P. J. N. 1984. Preliminary observations on a series of outbreaks of acute laminitis in dairy cattle. *Veterinary Record* **115:** 619-622.

Boissy, A. and Bouissou, M. F. 1995. Assessment of individual differences in behavioural reactions of heifers exposed to various fear-eliciting situations. *Applied Animal Behaviour Science* **46:** 17-31.

Colam-Ainsworth, P., Lunn, G. A., Thomas, R. C. and Eddy, R. G. 1989. Behaviour of cows in cubicles and its relationship with laminitis in replacement dairy heifers. *Veterinary Record* **125:** 573-575.

Dickson, D. P., Barr, G. R, Johnson, L. P and Wiecker, D. A. 1969. Social dominance and temperament in Holstein cows. *Journal of Dairy Science* **53:** 904-907.

Fordham, D. P., Al-Gahtani, S., Dunotoye, L. A. and Rodway, R. G. 1991. Changes in plasma cortisol and β-endorphin concentrations and behaviour in sheep. *Animal Production* **52:** 287-296.

Leach, K. A., Logue, D. N., Kempson, S. A., Offer, J. E., Ternent, H. E. and Randall, J. M. 1997. Claw lesions in dairy cattle: development of sole and white line haemorrhages during the first lactation. *The Veterinary Journal* **154:** 215-225.

Logue, D. N. 1996. Productivity, management and disease in dairy cattle. *XIX World Buiatric Congress, Edinburgh 8th-12th July 1996,* pp. 83-88.

Logue, D. N., Offer, J. E. and McGovern, R. E. 1998. The housing effects of first calving Holstein Friesian heifers separately or with the adult herd on claw conformation and lesion development. In *Proceedings of the 10th international symposium on lameness in ruminants, 7-19th September 1988, Lucerne* (ed. C. J. Lischer and P. Ossent), pp. 60-62. University of Zurich.

Moberg, Gary P. 1991. How behavioural stress disrupts the endocrine control of reproduction in domestic animals. *Journal of Dairy Science* **74:** 304-311.

Phelps, A. 1992. Vastly superior first lactations when heifers fed separately. *Feedstuffs* **64:** 11.

Singh, S. S., Ward, W. R., Lautenbach, K. and Murray, R. D. 1993. Behaviour of lame and normal dairy cows in cubicles and a straw yard. *Veterinary Record* **133:** 204-208.