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Behaviour of dairy heifers during adaptation to milking

K.J. BREMNER

ABWRC, AgResearch Ruakura, Private Bag 3123, Hamilton, New Zealand.

ABSTRACT

Effects of prior handling on behaviour of heifers at milking was studied in 42 Friesian heifers (reared on nurse cows, Herd A) and 36 monozygotic twins (calfeteria-reared, Herd B). Herd A heifers were allocated to 3 treatments: No Handling (N) - no handling or parlour experience; Limited Handling (L) - moved through the parlour during two sessions; or Familiarised (F) - 14 sessions during which animals were tamed, moved through the parlour and handled around the udder. Herd B heifers were allocated to N or F only. Behaviour at various stages of milking was observed during the first 14 milkings.

Despite significant variation between individuals, all Herd A heifers significantly decreased moves and kicks from Period 1 (milkings 1 - 7) to Period 2 (milkings 8 - 14), and improved milk letdown but treatments were not significantly different at the various stages of milkings.

However in Herd B, pre-milking handling and experience of the milking environment consistently reduced the frequency of adverse responses by heifers at most stages of milking.

Keywords: dairy heifers; milking behaviour; training; adaptation.

INTRODUCTION

The production of heifers is influenced by many factors including the relationship between animal and milker. The importance of the relationship between cows and herdsman has been highlighted by Seabrook (1972a & b, 1977, 1980, 1984a & b) and Reid (1977).

Research indicates that, irrespective of rearing conditions, animals from dairy breeds are easier to approach and handle than those from beef breeds (Murphey *et al.*, 1980, 1981; Boivin *et al.*, 1992, 1994), and those accustomed to handling (Fordyce *et al.*, 1982; Boivin *et al.*, 1992a & b) or to human presence during the first few months of life (Le Neindre *et al.*, 1995; Boivin *et al.*, 1994) react less than those unfamiliar with humans.

The behavioural reactions of cows during the milking process have been described and attempts made to quantify or score them. Dickson *et al.* (1970) scored the reactivity of dairy cows to the milking procedure on a 0 to 4 scale, whereas Willis (1983) described the adverse reactions of dairy cows during milking as flinch (F), step (S) and kick (K) or FSK responses.

Because introducing heifers to the milking procedure is potentially dangerous to the milker, time-consuming and interruptive to the milking routine, it is important to consider any procedures which may limit these adverse effects. This study examined the effects of pre-calving experience of the milking environment and handling, on the subsequent behaviour of heifers during milking.

MATERIALS AND METHODS

Animals

Herd A consisted of 42 rising 2 year-old heifers on a commercial farm in the Tokoroa region. The heifers were

all sired by one bull, reared on nurse cows, and joined the main herd after calving.

Herd B consisted of 18 pairs of monozygotic twin heifers which were managed as one group at Ruakura Research Centre. Identical twin heifer calves were sourced from the NZ dairy industry, purchased at 4 days and reared on site.

Treatments

In Herd A, heifers were allocated to one of three treatments based on expected calving date, production index (PI) of dam and body size. In Herd B, heifers were allocated to one of two treatments, one twin to each, based on expected calving date. Treatments were carried out in June/July ending at least 2 weeks prior to calving. Treatments were: no physical contact or experience in the herringbone milking parlour (N), and taming plus familiarisation with all aspects of milking except cup placement (F). In addition, in Herd A, a third group received limited parlour experience (L) which consisted of walking the group through the milking parlour, with free choice of side, twice on each of two days, then restraining them into milking positions once on each of those days.

Treatment F involved yarding the animals and reducing the flight distance of each individual, then rubbing body regions (tailhead, tail, back, top of shoulders, back of udder, inside hind legs). When heifers would stand for an approach in the yard, the group was moved through the milking parlour, with free choice of side, until walking freely. Next the front gate was closed and heifers were restrained in milking positions. They were then rubbed on hindquarters, side, tail, back of udder then udder and teats, with the handler retreating to a "safe" area if the heifer responded with a flinch, movement or kick. Within each

session the heifers were handled on each side of the parlour. Once heifers accepted contact anywhere within the udder region, this treatment was repeated while udders were washed during two (Herd A) or four (Herd B) sessions. Eventually milking machines and a high pressure pump were turned on, and water was sprayed in the yard, the pit and then on the platform.

Milking procedure

If a heifer calved overnight she was first milked at the next PM milking; if she calved during the day, she was first milked at the AM milking on the following day. Prior to milking, her calf was removed to a calf-rearing barn. In each herd, two milkers shared milking duties.

Each heifer was observed, and behaviour recorded, for the first 7 days of lactation (14 milkings). For each heifer, behaviour was observed during parlour entry, first touch, udder washing, cup placement, milking and cup removal, and (for Herd A only) during drenching. If the cups were kicked off, this was recorded. Also recorded was the presence or absence of a normal milk letdown, and whether a heifer milked out fully.

For Herd A the worst reaction (i.e. presence or absence of leg movement or a kick response) was recorded for each heifer at each of the first 14 milkings, whereas for Herd B, the number of occurrences of each type of behaviour was recorded.

Statistical Analysis

For Herd A, observed responses were summed and the binomial data was analysed for Treatment and Period effects by fitting linear models using GenStat5. The periods were milkings 1-7 (Period 1) and 8-14 (Period 2).

For Herd B, the behaviours were analysed as count data and analysis of variance conducted for each behavioural category, with Treatment and Milking Number included in the model.

RESULTS

By the end of the treatment regime, approximately 60% (Herd A) and 80% (Herd B) of the F heifers allowed the experimenter to approach and make contact with the head and/or hindquarters in a yard without any avoidance responses, although some still showed initial apprehension indicated by tensing or preparing to step away. When in milking positions, all F heifers allowed the experimenter to rub hindquarters, tail, udder and teats without any movement or kicking responses.

Of the animals allocated to Treatment groups, the behaviour of 38 (Herd A) and 32 (Herd B) heifers was recorded during lactation. Other animals were not pregnant or, in Herd B only, calved but were not milked in the herd because the twin mate was not pregnant.

Herd A

There was large variation between individual heifers in their behaviour at entry into the parlour and during milking. Irrespective of treatment, for almost all categories recorded, behaviour significantly improved from

Period 1 to Period 2 (see Table 1). For all treatments, there was a significant increase in the incidence of “good” or zero reactions, and a significant decrease in the severity of any move/kick response for more L and F animals to enter the parlour willingly.

For most of the behavioural responses measured, there were no significant differences between treatments. There was a tendency for more L and F animals to enter the parlour willingly, for L animals to kick more when first touched, and for both L and F heifers to kick more during udder preparation and cluster placement/removal. In addition, there was a tendency for N heifers to kick cups off during fewer milkings, and for F heifers to behave better during drenching.

A significant ($P < 0.05$) Period x Treatment effect was observed in behaviour during cup placement, with L and F heifers observed to increase the frequency of “good” responses from Period 1 to Period 2 more than N. Combined “good” responses at 3 stages of milking (cup placement, kick off during milking, cup removal) showed a significant Period x Treatment effect ($P < 0.01$), with L and F heifers increasing more than N, although from a lower level. When kicking behaviour was combined for the same 3 stages, there was a non-significant ($P < 0.1$) Period x Treatment effect, as kicking behaviour declined across all treatments (from average 49 to 32%), but possibly not to the same extent in all treatments.

Herd B

The frequencies of observed behavioural responses (per cow per milking) are presented in Table 2.

Two stages of milking during which a milker is close to a heifer for more than a brief moment are washing of the teats and placement of the cups. The responses of N and F heifers to these two procedures are shown in Figure 1.

Significant treatment effects on behaviour over the first 14 milkings were shown in the frequency of movements (excluding kicks) per cow per milking during the milking process ($N > F$, $P < 0.05$), total kicks during milking ($N > F$, $P < 0.05$) and total movement + kicks during milking ($N > F$, $P < 0.001$). The frequency of kicking responses by N and F heifers over the 14 milkings are shown in Figure 2.

FIGURE 1: The average frequency of move and kick responses to washing and to cup placement by non-handled (N) and familiarised (F) heifers in Herd B during the first 14 milkings (S.E.D. of twin mates shown; ** = treatment difference at 1% significance).

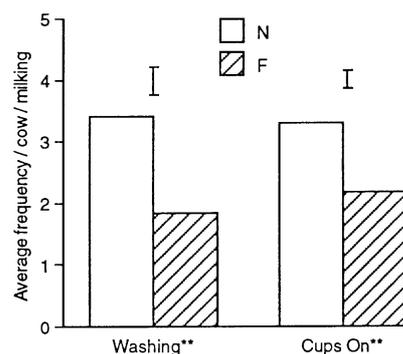


TABLE 1: The mean percentage (approximate SEM in brackets) of milkings at which observed behavioural responses were recorded in Period 1 and Period 2 for non-familiarised (N), partially familiarised (L) and fully familiarised (F) heifers in Herd A.

Parameter	Milking period	Treatment		
		N	L	F
Entry - good ^{1,a}	1	11 (6.7)	41 (15.5)	45 (15.5)
	2	22 (11.1)	53 (16.0)	54 (15.5)
	SED	7.6	12.5	11.6
First Touch - good ⁴	1	38 (13.2)	11 (6.9)	24 (11.8)
	2	84 (8.4)	58 (14.6)	72 (12.7)
	SED	11.0	11.6	13.2
First Touch - kick ^{NS}	1	2 (1.9)	10 (5.2)	2 (1.8)
	2	0 (3.3)	6 (3.3)	2 (1.8)
	SED	2.8	3.7	3.1
Washing - good ⁴	1	78 (6.6)	74 (7.9)	89 (4.8)
	2	96 (2.5)	92 (3.8)	97 (2.4)
	SED	5.7	6.6	4.6
Washing - kick ³	1	1 (1.4)	7 (6.8)	2 (2.6)
	2	0 (0.8)	1 (0.9)	0 (0.8)
	SED	2.5	2.7	2.7
Cups On - good ^{4,x}	1	26 (11.5)	10 (6.5)	10 (6.5)
	2	37 (13.5)	48 (15.8)	41 (15.2)
	SED	8.5	9.5	9.0
Cups On - kick ⁴	1	19 (9.4)	45 (15.7)	44 (15.4)
	2	9 (5.4)	12 (7.7)	10 (6.5)
	SED	5.2	9.7	8.5
Letdown - good ⁴	1	39 (11.4)	49 (12.6)	29 (11.1)
	2	95 (3.1)	99 (1.1)	96 (2.7)
	SED	8.4	11.1	10.6
Cups not kicked off ⁴	1	82 (6.9)	48 (12.0)	56 (11.6)
	2	92 (4.1)	84 (7.1)	88 (5.8)
	SED	5.1	9.5	8.4
Cups Off - good ⁴	1	69 (11.1)	59 (13.5)	57 (13.7)
	2	95 (3.2)	85 (8.2)	89 (6.5)
	SED	7.0	9.9	9.6
Cups Off - kick ³	1	5 (3.1)	7 (4.4)	10 (5.6)
	2	0 (0.9)	4 (2.6)	1 (1.1)
	SED	2.4	2.9	3.0
Milked out ⁴	1	53 (9.8)	51 (10.5)	51 (10.8)
	2	96 (2.3)	99 (1.2)	96 (2.4)
	SED	7.5	10.8	8.4
Drenching - good ⁴	1	4 (4.3)	2 (2.4)	10 (10.2)
	2	43 (21.8)	54 (22.9)	81 (15.6)
	SED	20.3	17.8	26.9
Drenching - panic/escape ⁴	1	20 (8.3)	17 (8.6)	14 (7.3)
	2	2 (1.3)	2 (1.6)	0 (1.3)
	SED	4.7	5.0	4.6

^{1, 2, 3, 4} = Period effect significant at 10%, 5%, 1% or 0.1% level, respectively

^a = Treatment effect significant at 10% level

^x = Period x Treatment effect significant at 5% level

There was a general decline in all undesirable responses from milkings 1 to 14.

DISCUSSION

Although in Herd A pre-milking parlour and handling experience did not appear to facilitate adaptation to milking, in Herd B familiarised animals reacted less than

TABLE 2: The mean frequency of observed responses per heifer per milking at various stages of the milking process over the first 14 milkings in Herd B non-familiarised (N) and familiarised (F) heifers.

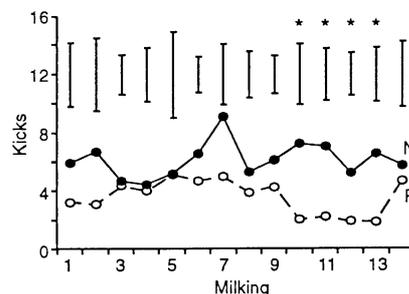
Parameter	Treatment		S.E.D.
	N	F	
First Touch			
- moves ³	0.774	0.281	0.1069
- kicks ¹	0.455	0.131	0.1287
- moves + kicks ³	1.229	0.412	0.1366
Udder Washing			
- moves ^{NS}	1.69	1.06	0.350
- kicks ¹	1.71	0.77	0.331
- moves + kicks ²	3.40	1.83	0.445
Cups On			
- moves ¹	1.281	0.895	0.1528
- kicks ¹	2.01	1.27	0.252
- moves + kicks ²	3.29	2.17	0.291
Kicked cups off ^{NS}	1.079	1.005	0.1802
Cups Off			
- moves ¹	0.638	0.398	0.1063
- kicks ^{NS}	0.421	0.371	0.868
- moves + kicks ¹	1.060	0.769	0.1353
Entire process ^z			
- moves ¹	4.81	3.11	0.597
- kicks ¹	5.51	3.23	0.774
- moves+kicks ³	10.32	6.34	0.846
During milking only ^y			
- moves ^{NS}	0.424	0.479	0.1261
- kicks ^{NS}	0.92	0.68	0.219
- moves + kicks ^{NS}	1.34	1.16	0.221
- kicks + KickOffs ¹	6.59	4.23	0.831
- moves+kicks+KickOffs ³	11.4	7.34	0.871

^{1, 2, 3} = significant Treatment effect at 5%, 1% or 0.1% level, respectively

^z = including first contact and washing, but Cups Off excluded because automatic cup remover string often caused Moves/Kicks

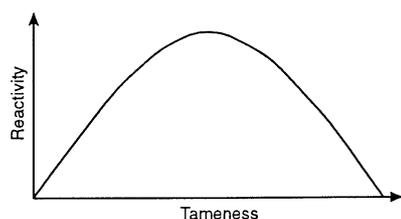
^y = from time all cups in place until cups removed

FIGURE 2: The average frequency of kicking by non-handled (N) and familiarised (F) heifers in Herd B during the first 14 milkings (S.E.D. of twin mates shown; * = significant treatment difference this milking, at 5% level).



controls during most stages of milking. In both herds, familiarised animals appeared to be less fearful of human presence and contact. Previous studies have indicated that ease of handling and milking in heifers is related to tameness (Albright, 1978; Arave *et al.*, 1985). Because, in this study, both very tame and very fearful animals were less likely to move or kick, it is postulated that there is a non-linear relationship between tameness and reactivity (Figure 3).

FIGURE 3: Proposed model for behavioural reactivity during their initial milkings in relation to tameness of heifers.



It is possible that when very fearful animals (such as those in Herd A) undergo a moderate increase in tameness, the inhibition caused by fear is reduced, and the animals may show increased reactivity. When moderately tame animals (such as those in Herd B) become tamer they are more likely to show decreased reactivity.

CONCLUSIONS

Familiarity with the yard and parlour environment was useful, as more of the L and F heifers entered the parlour of their own accord and F heifers in Herd A were easier to drench. In Herd A, prepartum rubbing of udder and teats tended to reduce the reaction of heifers to udder contact and washing, however, because familiarisation probably reduced fear responses they tended to increase their adverse reactions to the unfamiliar stimuli of cup placement and milking, whereas in Herd B, heifers were consistently less reactive at most stages of milking. The benefits of familiarisation were seen over at least 7 days but large differences between animals may necessitate an individual approach to training. Although the familiarisation treatment improved the behaviour of heifers in Herd B, it did not eliminate all undesirable behaviours.

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