

The effect of cow-calf separation in dairy cattle on animal behaviour

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Introduction

The abrupt separation of cows and calves has been found to affect both cow and calf behaviour (Hopster *et al.*, 1995). This abrupt separation is typical in artificial calf rearing systems which are common practice in the majority of beef and dairy production programmes. The artificial rearing of calves is characterized by individual penning, which facilitates accurate measurement of food intakes but limits calf contact. Cross-suckling behaviour has been found to occur frequently in artificially reared calves (Wood *et al.*, 1967; Lalande *et al.*, 1979) and individually penned calves have been found to perform stereotypic behaviours which are generally oral in nature. In contrast, calf rearing in developing countries is dominated by the use of suckling systems. The dairy production systems limit suckling to facilitate milk removal, which allows the calf and the cow to have continued but limited contact. In these systems cows have been found to give greater milk yields and calves reared by limited suckling seem to have greater milk conversion efficiencies (Ugarte and Preston, 1972; Gaya *et al.*, 1978; Knowles and Edwards, 1983) and lower mortality rates (Ugarte, 1989; Alvarez *et al.*, 1980) compared with calves reared artificially. However, the effect of abrupt separation of the cow and calf has been found to be relatively short lived with cows and calves showing increased cortisol levels and 'stress' for up to 6 to 8 h following separation (Hopster *et al.*, 1995). This may indicate that cows which are continually separated from their calves may be subjected to repeated periods of 'stress' each time the cow and calf are separated. The objective of this experiment was to compare the effect on cow and calf behaviour of abrupt cow-calf separation and continuous limited contact between cows and their own calf or a foster calf.

Material and methods

The experiment was completed in Colombia with the co-operation of a non-government organizations Centro Inter-institucional para la Producción de

Agropecuaria en el Valle del Rio Cauca (CIPAV) and a commercial dairy farm, Hacienda Lucerna. At 4 days *post partum* 36 multiparous dairy cows were allocated to one of three treatments, where they remained for the following lactation (up to 305 days). The treatments used were: a non-suckling treatment (NS), where the cow and the calf were separated at 4 days *post partum* and the calves were reared artificially and separately from the dam and two limited suckling treatments where the cows were sucked for 15 min following mechanical milking. In the first treatment, 12 cows were sucked by their own calf (SM) and in the second experiment, 12 cows were sucked by a foster calf (SF). The calves were reared in their treatment groups and all the experimental cows were grazed together throughout the experiment. The behaviour study was conducted over 24 h at 30-day intervals, equivalent to three observation periods during the first 100 days of lactation or age. Behavioural observation periods began after morning milking and continued until the same time the following day. During these periods each animal was observed once every 5 min until dusk and then every 15 min until dawn. The cows and calves were observed on the same days. During the observation periods the times cows spent in various behaviours were recorded. A count of the number of acts of aggression were recorded, using 15-min recording periods. In calves the times spent lying, grazing, sucking, feeding on concentrate and standing were recorded. The incidence of walking, non-nutritive cross-suckling, allo-grooming, grooming others and agonistic behaviour were recorded, using 15-min recording periods during which the number of actual events were recorded. The duration of suckling and the incidence of cross-suckling was recorded by observing calves for 6 s every minute during and for 20 min following the ingestion of milk. Cross-suckling was defined as a calf performing suckling movements while having some part of another calf's body in its mouth. During this cross-suckling, new suckling events were recorded when: a calf stopped sucking one calf and sucked another calf; the calf changed to suck another part of the

Table 1 Behaviour in suckled and non-suckled cows (min or incidence per 24 h)

Activity	Non-suckled	Suckled (Foster)	Suckled (Maternal)	s.e.d.†
Grazing	348	360	348	25.5
Lying	150	145	148	18.0
Lying ruminating	440	437	442	24.1
Standing ruminating	120	116	119	10.1
Total ruminating	550	553	561	30.2
Feeding	59	59	61	25.5
Walking	111	105	109	12.0
Standing	212	218	213	9.6
Total	1440	1440	1440	–
Aggression	2.1	1.9	1.7	0.08

† All differences not statistically significant ($P > 0.05$).

body; or the calf stopped to perform another behaviour and then resumed sucking the same calf and body part. During cross-sucking events, the body area which was sucked and the calf performing the sucking and being sucked were recorded.

All the data were analysed using the Minitab software package. The behaviour data which were not normally distributed was transformed by adding 0.5 to each observation and then were analysed as with normally distributed data. The data were analysed using analysis of variance (ANOVA) with the generalized linear model (GLM) and a significant effect was determined from the 'P' value in the ANOVA table for three treatments, following which the treatments were paired and compared by Tukey's method for equal observations.

Results

The times spent in various behavioural activities during three 24-h periods by the cows are presented in Table 1. Behaviour was similar in all the treatment

groups, with suckling treatment having no significant effect on grazing, lying, feeding, walking, standing or ruminating (either standing and lying) time in the long term.

The time spent and the incidence of various behavioural activities during 24 h by the calves are presented in Table 2. In all the treatment groups, the time spent lying and standing were similar. However, the time spent eating concentrate was significantly greater ($P < 0.05$) in calves reared artificially, compared with restrictedly suckled calves. The frequency of cross-sucking was greater in calves reared artificially, ($P < 0.05$) compared with calves which were restricted suckled. The number of incidents of walking, grooming and performing agonistic behaviour was similar in all the treatments groups.

During the experiment, a total of 96 instances of cross-sucking were recorded. In artificially reared calves the frequency of cross-sucking was greatest directly following the ingestion of milk and the frequency reduced slowly over the following 15 min, falling to negligible levels at around 12 min post feeding. In restrictedly suckled calves, the incidence of cross-sucking was significantly lower and the incidents occurred only after calves had been sucking the cows for 12 min.

Discussion

In this experiment the long-term behaviour in calves was similar irrespective of whether they had been suckled by calves with no significant effect of suckling treatment on grazing, lying, feeding, walking, standing or ruminating (either standing and lying) time. However, it has been found that cows and calves show increased cortisol levels and 'stress' in the short term, within 6 to 8 h following

Table 2 Behaviour in suckled and non-suckled calves (min or incidence per 24 h)

Activity	Non-suckled	Suckled (Foster)	Suckled (maternal)	s.e.d.	P
Time spent (min/day)					
Lying	970	968	965	110.0	
Standing	325	342	336	45.5	
Feeding (concentrate)	70	33	39	13.5	*
Grazing	10	13	14	7.1	
Suckling	25	28	29	5.1	
Total	1400	1384	1383	–	
Incidents (no. per 24 h)					
Walking	26.4	30.4	32.0	6.5	
Grooming (self)	14.7	18.2	19.1	4.1	
Grooming (other)	2.3	5.1	3.5	1.7	
Agonistic	11.1	10.4	9.8	2.56	
Cross-suckling	1.80	0.52	0.14	0.231	*

separation (Hopster *et al.*, 1995) and these responses were observed over a longer period. It has been found also that cows respond to the calf when it is placed in an adjoining paddock (Hudson and Mullford, 1977). The cows in this experiment were grazed at least 300 m away from where the calves were housed and did not show any signs of response. The cows used in this experiment were multiparous and Hopster *et al.* (1995) found that multiparous cows only respond mildly immediately following cow-calf separation. The results indicated that the continuous limited suckling and repeated cow-calf separation had no significant effect on cow behaviour. The incidence of cross-sucking was found to be significantly greater in artificially reared calves compared with limited suckled calves. This cross-sucking has been found to occur in artificially reared calves (Wood *et al.*, 1967; Lalande *et al.*, 1979) particularly those reared in groups. In contrast, the incidence of cross-sucking in the limited suckled calves was negligible. In the artificially reared calves the frequency was found to be greatest following milk ingestion, which is similar to previous work with artificially reared calves (Hammel *et al.*, 1988; Passillé *et al.*, 1992; Lidfors, 1993). The ingestion of milk has been found to increase the motivational state (Toates, 1986) of the calf to perform sucking behaviour. Also the ingestion of only small quantities of milk has been found sufficient to stimulate cross-sucking (Brake *et al.*, 1982). The artificially reared calves spent significantly less time consuming milk, which left them with a high sucking motivation. As a consequence the incidence of cross-sucking was greater in calves reared artificially. In contrast, limited suckled calves spent longer sucking and consequently would return to a pen with a low motivational state which would result in a low incidence of cross-sucking.

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