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COW-CALF AND SOW-PIGLET BEHAVIOUR IN RELATION TO COLOSTRUM INGESTION

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Abstract

The declines in both production of immunoglobulin (Ig) by mothers and absorption efficiency by young make it desirable for calves to ingest an adequate amount of colostrum by 6-12 h and piglets to do so by 4-8 h. In cattle, suckling attempts may be delayed by weakness of the cow or calf due to difficult calving, injury, deformities or disease. The incidence of attacking or avoiding calves is greater among heifers than among older cows and rejection is occasionally a serious problem. Amongst dairy cattle, the major factor leading to inadequate colostrum intake is difficulty in finding a teat or suckling from it because the udder is pendulous and the teats are fat. Calves of cows with pendulous udders, and this included most older cows, failed to suck within 6 h and obtained inadequate Ig levels unless put to the teat. Absorption of Ig may be more efficient if the mother is present. Some attacking of piglets by gilts is common and injuries to piglets due to sow attacks may be a serious problem. Injuries, deformities, general weakness or becoming trapped in part of the farrowing pen reduce the chances that a piglet will suckle adequately. Agalactia and competition for teats result in some piglets in larger litters failing to suckle. Fighting for colostrum producing teats peaks 2 h after the birth of the first piglet so later born piglets must obtain less of the Ig produced if farrowing is prolonged. Group farrowing and group calving increase the chances that some piglets or calves will fail to obtain adequate colostrum.

Newborn calves and piglets have very low levels of serum immunoglobulin (Ig) and hence obtaining Ig from colostrum reduces their vulnerability to disease (McEwen *et al.*, 1970; Fallon, 1978; Nordbring and Olsson, 1957; Lecce and Matrone, 1960). The Ig concentration of colostrum is highest at birth and then declines, the rate of decline depending on the amount of colostrum which is being removed. In cows which have been sucked the Ig concentration drops to 50 % by 9-24 h (Kruse, 1970a; Oudar *et al.*, 1976) whilst in sucked sows the drop to 50 % is reached as early as 5 h after the first piglet is born and the level is

close to that in normal milk by 16 h (Bourne, 1969). The ability of the young animal to absorb the various Igs, which have high molecular weights, also declines after birth. The absorption coefficient for all Igs combined declines to 50 % in less than 24 hours in calves (Kaeckenbeeck *et al.*, 1961; Kruse, 1970b) but has reached 0 % by this time for IgA and IgM (Penhale *et al.*, 1973). Most piglets which have ingested colostrum or milk can no longer absorb Ig after 24 hours although starved piglets may still be able to absorb Ig up to 4 days of age (Payne and Marsh, 1962; Lecce and Morgan, 1962). Hence calves obtaining colostrum

from their mothers should ingest an adequate amount within 6-12 hours and piglets should do so within 4-8 hours.

Factors affecting colostrum intake by calves

The behaviour of cows and calves after parturition usually involves the cow standing, remaining close to the calf and licking it; the calf standing teat-seeking, sucking and then resting (Broom, 1981 p. 226; Edwards and Broom, 1982). If the cow is weakened, e.g. by a difficult calving or by hypocalcaemia it may be slow to stand. Heifers, which often have a difficult calving, stand later than cows (table 1). These data (Edwards and Broom, 1982) were obtained from observing 82 Friesian cows and their calves for the 6 h after parturition. The delay before calves stood was also longer for heifers' calves (mean 77 min) than for cows' calves (mean 49 min). Deformity or injury can delay or prevent calf standing. When the calf stands and approaches the mother it is occasionally attacked or avoided. In the study mentioned above, 8 % of heifers did not lick their calves and butting, kicking or interruption of suckling by the mother were shown by members of all age classes especially heifers (table 2). Calf attack or avoidance is affected by the previous experience of the cow (Broom and Leaver, 1977) and is more likely if the teats are sore. Some calves never obtain colos-

trum because of such behaviour but most heifers do eventually allow the calf to suckle so the proportion totally rejected or avoided is small.

Calves spend some time nuzzling around the legs and belly of the mother before they find a teat. Calves which are weak, or which are attacked by the cow, or which become separated from the cow may fail to find a teat but the most important factor affecting the likelihood that a teat will be found is the conformation of the udder. As pointed out by Selman *et al.*, (1970a,b) first sucking is often delayed if the cow has a pendulous udder. Work currently in progress suggests that, having first approached a leg, the calf directs its nuzzling movements to a horizontal surface at about the level of its head when it is held straight out. It then explores further by making comparatively shallow up and downwards movements of the head. These movements are sufficient to lead to teat contact if the udder is small, as it would be in an animal which had not been milked regularly, but the teats may not be found if they are hanging well beneath the belly. Once the teat is found the calf may experience difficulty taking a fat teat into its mouth so again, unmilked animals pose fewer problems. If a calf does not suckle soon after birth the teats become more turgid and difficult to grasp so that suckling becomes increasingly difficult. First suckling is not likely to be delayed due to udder confor-

Table 1. — Calving difficulty effects in relation to parity.

	Parity			
	1	2	3	4 +
Calving duration (min)	76	46	54	35
Median delay before cow first stands (min)	26	3	1	1

data from Edwards, 1980 and Edwards and Broom, 1982.

Table 2. — Suckling interruptions and attacks on calf in relation to parity.

	Parity			
	1	2	3	4 +
Median frequency of interruptions by cow of suckling and nuzzling udder by calf (min^{-1})	0.6	0.5	0.2	0.1
% of cows butting calf	26	16	12	0
% of cows kicking calf	39	10	12	12

data from Edwards and Broom, 1982.

mation and teat size in beef cattle or in dairy heifers but it can be a major problem in older dairy cattle. Table 3 shows that the median delay before first suckling in a study of 161 calvings (Edwards, 1982) was 2 1/2 h for heifers but almost 6 h for cows which had already calved two or more times. Further analysis showed that udder conformation was the major reason for this (table 4).

If the calf becomes separated from its mother so that she does not sniff and lick it within 3 h of its birth she is likely to reject it subsequently (Le Neindre and Garel, 1976). The fact is generally known to cowmen who help cows to carry out this sniffing and licking after a difficult calving by dragging the calf to a point near her head. In a group calving situation calves are often stolen from their

mothers, or they approach other cows, and may become separated temporarily or permanently from their mothers. These calves may not be able to obtain colostrum from the cow with which they stay or, if they do obtain colostrum, there may be none left for the cows' own calf when it is born. In a study of group calving in Friesian cows, 33 % of calves cross-suckled at some time and 3 % were abandoned because their mother had adopted another calf (Edwards, 1983).

The levels of immunoglobulins G1, G2, A, and M in the blood of calves before suckling at 48 hours are shown in table 5. The levels at birth were very low but calves which suckled within the first 6 h achieved more than adequate levels. Those which did not suckle within 6 h but which were then put

Table 3. — Delay before first suckling in relation to parity.

	Parity			
	1	2	3	4 +
Median delay before first suckling (min)	159	238	360	313
% not suckling within 6 h of birth	20	26	55	45

data from Edwards, 1982.

Table 4. — Effects of udder conformation on teat-seeking and delay before first suckling.

	Udder		
	Small	Intermediate	Pendulous
n	20	79	34
Median time teat-seeking (min)	4	7	16
Median delay before first suckling (min)	128	209	320
Percentage not sucking in 6 h	17	29	48

data from Edwards, 1982.

Table 5. — Serum immunoglobulin levels of calves.

	IgG1	IgG2	IgA	IgM
<i>Birth</i>				
Mean (mg/ml)	0.7	0.2	0	0.1
Maximum (mg/ml)	3.5	2.0	0	0.5
Calves with none (%)	50	75	100	44
<i>48 h</i>				
Mean if sucking by 6 h	55.2	0.8	2.3	2.6
Mean if no sucking by 6 h, then assisted	31.1	0.6	1.5	1.2
Mean if no sucking by 6 h, not assisted	7.1	0.7	1.9	1.1

data from Edwards, *et al.*, 1982.

to the teat achieved adequate levels but calves not observed to suckle within 6 h did not. Since almost half of the calves of older cows did not suckle unaided they were clearly at risk (Edwards and Broom, 1979; Edwards, 1982). The factors leading to inadequate colostrum intake by calves are summarised in figure 1. Selman *et al.* (1971) and Fallon (1978) have shown that Ig absorption by the calf is more efficient in the presence of the mother and it would be interesting to know how this comes about in their conditions for Le Neindre (personal communication) was not able to replicate their result.

Factors affecting colostrum intake by piglets

The problems for piglets trying to obtain colostrum are quite different from those for calves. Piglets are much more likely to be attacked by their mother; sows lie for piglets to suck and piglets are more mobile so teat finding is usually easier; litters are often large so competition is an important factor; and milk ejection after parturition has ended is sporadic and brief. The behaviour of sows and piglets during and after farrowing is described by McBride (1963), Hartsock and Graves (1976), and English *et al.* (1977). Farrowing may last for several hours and a sow may attempt to bite piglets as they come near her head. The problem of sows attacking and killing piglets was formerly

considerable but is now largely confined to minor injuries to piglets. As is apparent from table 6 (English *et al.*, 1977) previous experience of piglets reduces the incidence of biting by sows.

Large litters of piglets usually include several weak individuals with poor co-ordination or deformities. Piglets may be injured during birth or soon afterwards. They stand within a few seconds of birth and may damage their legs or become trapped if the floor is perforated or if there are steep drops to lower parts of the farrowing pen. Many litters include individuals which are not able to reach the udder in the first 4-6 h after birth. England (1974) found that 50 % of piglet losses in the first 7 days were of the smallest 20 % of piglets (≤ 900 g) but that these piglets survived just as well as older piglets when hand-reared. Weak, small piglets are more likely to fail to suck and are also more likely to be overlain by the sow.

Milk ejection occurs as each individual piglet is born and the early born piglets which are strong enough to get to the udder go from teat to teat drinking colostrum (Bourne, 1969; Hartsock and Graves, 1976). They must ingest much more colostrum than later born piglets and if farrowing lasts for several hours, the risk that the later born piglets will obtain less of the Ig produced is considerable (Bourne, 1969). There is individual variation amongst sows, according to conditions, in the

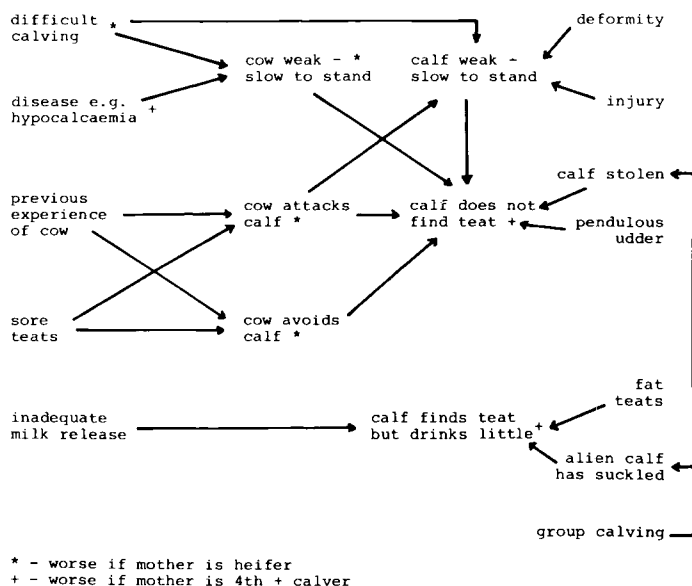


Fig. 1. — Summary of factors leading to inadequate colostrum intake by calves.

amount of Ig available so piglets of sows producing less Ig are less likely to obtain a sufficient quantity (Metz and Oosterlee, 1981). Some teats may be short, blind or inverted and the anterior teats are a little longer than the others (English and Smith, 1975) so teat selection is important to piglets. Jeppesen (1982), using an artificial sow udder (Jeppesen, 1981), showed that piglets avoided very unproductive teats when there were enough teats for all.

Once farrowing is complete, the imminence of the 11s long milk ejection is indicated, half a minute beforehand, by an increase in grunting by the sow (fig. 2; McBride, 1963; Whittemore and Fraser, 1974). The piglets respond to this grunting

Table 6. — Attempts by farrowing sows to bite piglets.

Litter	n	Number attempting to bite	
Gilts	9	8	(89 %)
2nd – 4th	12	3	(25 %)
6th – 9th	10	2	(20 %)

after English *et al.*, 1977.

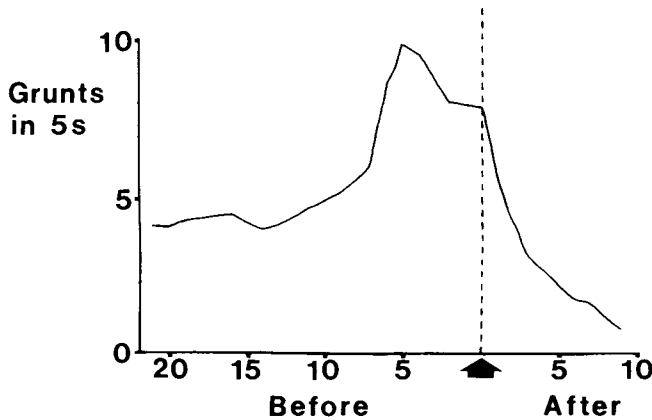


Fig. 2. — Mean number of grunts per 5 s by 6 sows whilst nursing 4 or 5 times. The number of 5 s intervals before and after the onset of rapid sucking by piglets is indicated (redrawn after Whittemore and Fraser, 1974).

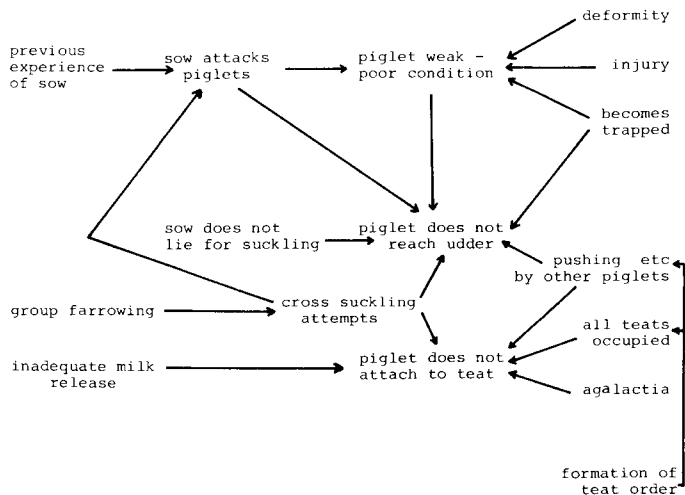


Fig. 3. — Summary of factors leading to inadequate colostrum intake by piglets.

by striving to reach a teat, if they are not already attached to one, and then by sucking. Jeppesen (1982) observed that piglets were more active around the anterior teats which were nearer to the source of the grunts. English *et al.* (1977) suggest that the front teats are safer from kicks. They may produce more milk because the piglets which habitually suck from them become the heaviest of the litter even if they were of average weight at birth (Mitchell, 1953; Barber *et al.*, 1955). These piglets might differ in other ways however.

Fighting for teats was at a peak of 8 per hour 2 h after farrowing and then declined to 2 per hour by 8 h in Hartssock and Graves' (1976) study. Subsequent interactions amongst piglets include some actual fights and much vocalisation, presumably helping to settle disputes about access to teats (Jensen, 1981; Jensen and Algers, in press). The regular usage of particular teats is apparent within a few hours of birth and McBride (1963) found

that there was a positive correlation between birth weights and the size of teat obtained. The weaker piglets get the worst teats, or none at all if most teats are occupied hence competition will have an effect on the amount of colostrum ingested. The likelihood that weaker piglets will be pushed away from the udder by other piglets or will find no productive teats available is greater if the litter size is large or if group farrowing occurs. Cross-sucking is allowed by some sows so the strongest piglets from each of the litters present may obtain the colostrum or milk leaving none for the weaker piglets. The factors affecting colostrum intake by piglets are summarised in figure 3.

EEC seminar on gastro-intestinal diseases in the young pig and calf 1-3 December 1982, INRA CRZV de Theix 63110 Beaumont, France.

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Question

From Dr. H.J. Greene to Dr. Broom

Since Dr. Logan's research suggests that feeding colostrum immediately after birth is essential and since calves left to cows may not suck for some hours, would it not be advisable to feed colostrum by bucket to ensure an adequate intake?

Answer

It is necessary to feed colostrum early. This can be achieved by taking the calf to the cow and helping it to suck. There is conflicting evidence about the merits and disadvantages of suckling versus bucket feeding.