INFLUENCE OF MILK FEEDING METHODS ON THE WELFARE OF DAIRY CALVES

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SUMMARY

Problems occur in raising dairy calves during the milk feeding period due to the occurrence of abnormal behaviours and health problems. Offering calves an artificial teat to suck the milk from, with a low flow of milk and access to the teat at all times reduces cross-sucking between calves. In computer controlled milk feeding systems calves may perform cross-sucking and often have reduced health. Calves suckling the dam restrictively or ad libitum or foster cows show no signs of cross-sucking. Calves can be raised with a good welfare if they are housed and milk fed according to their behavioural needs.

Keywords: cattle, dairy calves, suckling, milk feeding, behaviour, cross-sucking

OBJECTIVE OF REVIEW

The objective of this paper is to highlight problems with current milk feeding methods to dairy calves, and to suggest developments of the milk feeding system to dairy calves in order to avoid abnormal behaviours and health problems. This will be done by presenting research results and developmental work done primarily in Sweden in collaboration with Denmark, Norway, Finland and Mexico.

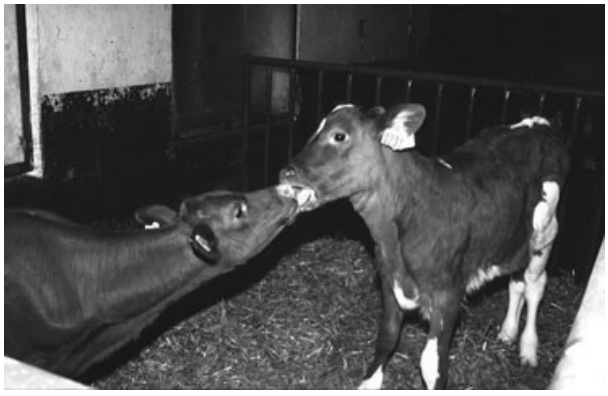
THE PROBLEM

Dairy calves are in most countries removed from the dam shortly after birth and raised in single or group pens during the milk period. There are many different ways of feeding milk to calves, but one common method is to provide restricted amounts of whole milk or milk substitute in open buckets or troughs to the calves at two meals per day. They usually receive a restricted amount per calf of 2–3 l. /meal. The milk is usually finished within one minute and thereafter calves start sucking on different parts of the body of each other, so called cross-sucking (Fig. 1a), or they suck on the bucket or other fittings of the pen (Lidfors, 1993). This abnormal sucking is most intense during the first six minutes, where after it declines until 15 minutes after the milk meal when it has almost stopped (Lidfors, 1993; Lidfors, 1994). If calves are kept in single pens they can only reach to suck on the mouths and ears of neighbouring calves. If they are raised in group pens they can also suck under the belly of pen mates. When they suck on the navel of others it can lead to oedema and navel infection. Dybkjaer (1988) reported that hair loss and inflammation of sucked body parts can occur.

When heifer calves are being sucked under the belly it may be the undeveloped teats that are sucked. This behaviour is called intersucking, and has been defined by one animal touching the udder region of a group member with its mouth and trying to get hold of the teat with the intention of sucking milk (Keil and Langhans, 2001). Milk sucking, milk theft or galactophagia are other synonyms for intersucking, which are usually used for cows that also succeed in swallowing milk from the teat of another cow (Lidfors and Isberg, 2003). In a questionnaire answered by telephone interview of 230 Swedish farmers there was a significant relationship between calves sucking under the belly of other calves and heifers intersucking $P<0.001$), heifers intersucking and cows intersucking ($p<0.05$) and cows intersucking and cows sucking on themselves ($p<0.01$) (Lidfors and Isberg, 2003).

Intersucking in heifers may be a risk factor in relation to teat injuries and secretion of a milky substance (Von Burmeister et al., 1981), and farmers have reported heifers to start producing milk as a response of intense intersucking. Some researchers have pointed out that if calves are fed milk from cows with mastitis and if they then suck on the teats of other heifer calves there is a risk that the bacteria is stored in the teats and udder until the day the heifer starts producing milk (Barto et al., 1982; Robertson et al., 1990).

A



B

Figure 1. Cross-sucking calves when housed in pairs (A: photo Jenny Loberg), and computer controlled milk feeding system to dairy calves (B: photo Per Peetz Nielsen)

RAISING CALVES ON THE DAM OR FOSTER COWS

Calves may be left with their mother, and on organic farms in Sweden there is a rule stating that calves should be left with the dam for at least the first four days (KRAV-rules, 2006). Some farmers find ways of letting the calves suck for longer times, and then it is often done by letting the calves suck twice or three times per day, in a restricted suckling method (Hartman, 1994, Anderberg, 2001). Restricted suckling is often done in countries where *Bos indicus* or crosses between *Bos taurus* and *Bos indicus* cows are milked, because the cow releases the milk better if she has her calf next to her, and the calf is allowed to suckle the residual milk which would otherwise be left in the udder. This milk may also be valuable for the calf as it is higher in fat percentage and gives the calf a higher MJ (Gratte, 2005).

One of the problems with restricted suckling is that if calves are allowed to suckle directly after milking some dairy cows keep their milk in the udder during milking and then release it to the calf when it suckle (Hartman, 1994; Fröberg et al., 2005). However, the calf is not able to drink all the milk in the udder, and thus leave some teats un-suckled (Jung, 1994; Gratte, 2005). In order to get the cows to release the milk farmers may then have to give the cow an injection with oxytocin, which may cause negative effects on milk let-down if used too frequently.

Alternatively, dairy calves may be raised by a foster cow, i.e. a cow which nurses alien calves. A study showed that most dairy cows of the Swedish Holstein and Swedish Red breed accepted four alien calves when they were presented to them at four different times during the lactation (Loberg and Lidfors, 2001). However, accepting to be nursed is not the same as adopting the calves as if they were her own calves, and a study on this showed that some cows adopts all calves whereas more cows adopt only one or two of the alien calves (Nielsen et al., 2007). At weaning and separation from the foster calves the foster cows may react negatively and vocalise, try to get back to the calves (Loberg et al., 2007a), and not releasing milk to the milk machine (Hernandez, 2005). The use of a weaning plate on the muzzle of the calves so that they were weaned from milk before they were separated from the foster cow lead to a significantly smaller reaction at separation both in the foster cow and her calves (Loberg et al., 2007a, b).

RAISING CALVES ON COMPUTER CONTROLLED MILK FEEDERS

New animal welfare regulations and increased herd size within the Nordic countries has lead to that a larger number of calves are housed in groups today. Within EU calves above 8 weeks must be group housed (Council Directive 97/2/EC, 1997), and on organic farms calves must be group housed already from 1 week of age (Council Regulation 1804/1999/EC, 1999). Group housing of young calves has beneficial effects on their development of movements, play and social skills (Jensen et al., 1999). In order to facilitate milk feeding to calves in large groups and to let them suck in connection to milk intake computer controlled milk feeding systems have been developed by different companies (Fig. 1b). However, there are some problems with this system. First of all it is usually based on having 20–30 calves in the same pen, and if the farm is small calves usually varies in age thus making it impossible to have an “all-in-all-out system” where pens can be cleaned between groups of calves.

Grouping of unfamiliar cattle has been found to increase aggression, social stress, locomotion behaviour and to have negative effects on feed intake and milk yield (reviewed by Bøe and Faerevik, 2003). An investigation of the social preferences of calves showed that pre-weaned calves established social preference already after 3 weeks of grouping, and that calves separated

during a Y-maze test spent more time with a familiar calf (Færevik et al., 2006). During a separation test calves showed fewer sign of separation stress when separated together with a familiar calf compared to with an unfamiliar calf, or alone (Færevik et al., 2006).

In large groups there are larger risks of getting health problems. In a study on 136 dairy farms with a total number of 3081 calves in Sweden it was found that cases of diarrhoea were significantly more severe in calves housed in large group pens (more than 10 calves) than in individually housed calves (Svensson et al., 2003). There was a tendency that cases of diarrhoea was more severe in calves housed in large groups than in calves housed in small groups (less than 10 calves) (Svensson et al., 2003). In a recent study it was found that diseased calves were drinking as much milk as healthy calves, but that they reduced the number of times they visited the automatic milk feeders to check if they would get milk, so called unrewarded visits (Svensson and Jensen, 2007). The research project will continue and aims at finding reliable ways of using the data that comes out from the computer controlled milk feeding system to detect sick calves at an early stage.

Another problem with this system is that calves must drink milk one by one, and the synchronised behaviour typical of cattle can not be performed. A number of studies have been done to study the effects of number of calves per feeder and number of milk portions on use of the feeder and social behaviour (Jensen, 2004), on the effect of milk allowance and weaning type (Jensen, 2006), on the effects of milk feeding method and group size on feeding behaviour and cross-sucking (Jensen and Budde, 2006), and on how the age at introduction to the group affects dairy calves' use of a computer-controlled milk feeder (Jensen, 2007). In a recently published study we found that calves that got a high milk allowance (9,2 L./day) used less time in the milk feeder than calves that got a low milk allowance (4,8 L./day), because they had fewer visits where they were not given any milk (Nielsen et al., 2007b). A gradual weaning of milk during 14 days lead to a reduced number of visits without getting milk, and a larger intake of concentrate during the first week after weaning compared to calves abruptly weaned (Nielsen et al., 2007). It was also found that the abruptly weaned calves performed more cross-sucking both during and after weaning than the gradually weaned calves (Nielsen et al., 2007).

The flow of milk in the teats of the computer controlled milk feeders were reduced in one study in combination with a large or small meal. The data is currently under evaluation, but the hypothesis is that if calves can drink the milk slower and get a larger meal size they would not cross-suck as much on each other and they would not visit the milk feeder so frequently to check if they will get milk again.

RAISING CALVES ON ARTIFICIAL TEATS IN SMALL GROUPS

In a study where the milk was delivered slowly into an open bucket during 10 minutes the reduced milk intake lead to that calves spent the entire time licking the milk and they performed less cross-suck during and after milk intake(Loberg and Lidfors, 2001). When the same calves were allowed to suck on a teat floating in the milk of the open bucket they also cross-sucked less (Loberg and Lidfors, 2001). The combination of low milk flow and the possibility to suck gave the lowest amount of cross-sucking (Loberg and Lidfors, 2001). When calves are fed milk in teat-buckets cross-sucking may be reduced, but if the teat-buckets are removed immediately after the milk is finished they start cross-sucking (Jung and Lidfors, 2001). Putting up barriers between calves during milk intake is an effective way of reducing cross-sucking (Jensen et al., 2007). The

larger amount of milk calves are fed at a meal the less cross-sucking is performed after finishing the milk (Jung and Lidfors, 2001).

THE FUTURE

In order to reduce cross-sucking calves should be able to suck the milk, have large enough meals that cause satiety and having ad libitum access to concentrate, silage and hay so that they have something to chew on if hungry. This also leads to a development of their rumen function. In small groups calves can more easily be kept with a small age difference, which reduces competition and health problems.

CONCLUSIONS

It is concluded that calves can be raised with a good welfare if they are housed and milk fed according to their behavioural needs.

ACKNOWLEDGEMENT

I want to thank my former and present PhD students Jens Jung, Jenny Loberg, Per Peetz Nielsen and Sofie Fröberg for having carried out much of the research which has been presented. I also want to thank all researchers involved in Nordic Contact Organ for Agriculture (NKJ) Margit Bak Jensen, Christian Krohn, Knut Boe, Gry Faervik, Laura Hanninen, Satu Raussi, and Helena Hepola for good cooperation over the years. I also want to thank the researchers in the Cow-Calf group within the FOOD21 project Kerstin Svennersten-Sjaunja, Charlotte Berg, Ingemar Olsson and Michael Ventorp, as well as Gösta Andersson from DeLaval for good cooperation in our different studies both in Sweden and Mexico. I also want to thank our collaborators in Mexico Carlos Galina, Agustin Orihuela and Carlos Sandoval. The research has been financed by FORMAS, Mistra, Stint, SLF, The Agricultural Board, The Animal Welfare Agency and IFS.

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