

The cow-calf separation debate: Implications for bovine practitioners

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Abstract

The objective of this presentation is to introduce the topic of cow-calf separation in dairy cattle pertinent to the dairy practitioner. It includes background on the reasons given for and against cow-calf contact such as health, behavior, housing considerations, and production effects. It will specifically provide insight into the available and ongoing research in cow-calf contact systems with a focus on the possible role of the bovine practitioner in the current debate. Knowledge gaps are identified in almost all areas of importance to the producer and provide an opportunity for involvement of the bovine practitioner in research and practical implementation.

Keywords: cow-calf contact, behavior, health, production

Introduction

For this presentation, pertinent literature on cow-calf contact systems was reviewed dating back to the 1970's with a particular focus on recent literature. Unless otherwise stated, reference throughout this text is made to Holstein heifer calves with unrestricted access to their own dam.

The literature regarding the effects of cow-calf contact systems on outcomes of interest is sparse under current management and dairy herd health conditions, and interpretation of data is difficult due to small size studies and differences in management systems. Most experience with cow-calf contact systems stems from research herds or predominantly organic and small-scale production systems in Europe.^{1,2}

The public is generally not well informed about farming practices, including immediate cow-calf separation.³ Animal welfare is assessed taking the triad of natural living, affective state, and health and functioning into account.

⁴ Public opinion is often focused on certain aspects of animal welfare concerns only. Those unfamiliar with animal

production appear to prioritize the naturalness of the housing system and typically reject immediate cow-calf separation.^{3,5-7} Although naturalness does not necessarily mean improved welfare, such as exposing animals to inclement weather or predation⁸, consumer criticism of standard animal care practices may erode public trust.⁹

In the most recent National Animal Health Monitoring Systems (NAHMS) report, 24.2% of US producers separated the newborn calf from the dam within one hour after calving and an additional 57.5% between 1 and 14 hours¹⁰, reflecting a high uptake in the industry of the practice of early cow-calf separation.

Besides economic factors, ethical considerations, public image, and work satisfaction are inherent motivators for producers. Interestingly, producers express welfare concerns with both systems, those that allow cow-calf contact and those that do not.¹ Reasons given for rejection of such systems are concerns about separation stress and feasibility, whereas promoting a natural calf-rearing system and better maternal care are given as reasons to promote such systems.¹ Producers interested in cow-calf contact systems must consider the economic impact of a chosen approach, as well as the consumer's willingness to pay and marketing strategies to place products.³ However, studies on the economic impact of cow-calf contact systems are generally lacking. An initial framework of a minimum of factors needed for socio-economic evaluation of dairy calf rearing systems with or without cow contact has recently been developed, but data are lacking to populate respective models.¹¹

Throughout the review of the existing literature, the role of the veterinarian on farms with cow-calf contact was rarely mentioned. If there is a willingness to accept alternative approaches to our current management approaches in dairy production, then bovine practitioners will play an important role in helping to create the necessary data, evaluate the evidence, and advise producers on viable options.

Behavior effects

Separation effects

Prevention of forming a bond between dam and calf only to break it later in a separation perceived as more stressful by humans is often cited as a reason for immediate separation of calves from cows. Although evidence shows that a maternal bond is likely formed within minutes after birth between the calf and cow¹², and even after C-section¹³, the reaction to separation does increase in intensity with prolonged contact. Typically, this is seen in increased vocalizations and restlessness for 24-48 h^{14,15} and in our experience typically peaks in the first 12 h after separation. Calves respond to separation from their dams in a similar fashion with increased vocalizations and

movement.¹⁶Overall, acute responses of cows and calves to separation are common.¹⁷ At the same time, calves with delayed separation from their dams have been observed to express stronger social behavior towards unfamiliar calves and adopt to novel environments more rapidly.^{1,16,17}

Housing considerations

Consideration for the maternity area should include the ability of the cow-calf pair to form a bond and reduce the chances of alien (rejected) calves, licking the calf by other dams, and calves seeking a teat from alien cows, which is commonly noticed in group housing, particularly with restricted dam access.^{18,19} Failed bonding is to be expected at higher rates in housing systems that do not allow undisturbed bonding, such as in space-restricted groups of cattle.²⁰ Furthermore, the dam and calf should be in an environment that is easily cleaned and sanitized between uses, allows for safe handling of individual cows and calves by using gates and headlocks, protect the newborn from injury by other cows, secures access to first-feeding colostrum, and allows an undisturbed environment. Given the difficulty of achieving these in a group maternity area, we have favored individual box stalls for cow-calf pairs in our research.

Calf health and growth

Colostrum management and calf health

Avoiding disease and injury to the calf is one of the most often cited reasons for immediate separation of the newborn from the dam. It allows for controlled colostrum feeding and close attention to monitoring milk intake of the calf. The critical role of successful colostrum management and excellent transfer of passive immunity in the health and future productivity of the dairy calf is well established.^{21,22} Not all cows will produce sufficient quantity or quality of colostrum to feed their calf.²³ Therefore, on the herd level, producers have to be prepared to closely monitor transfer of passive immunity in newborn calves in cow-calf contact systems. On an individual basis, producers also must plan ahead for colostrum supplementation of calves born to dams with obvious inadequate production and cows unable to be nursed or milked within a few hours after calving.

The dam's milk naturally transitions from colostrum to mature milk over the course of the first few days of lactation.^{24,25} This also is a transition phase for the calf and its developing GI tract, and reflects a critically important nutritional phase of early life.²⁶ Calves allowed to suckle from their dam have prolonged access to colostrum and

transition milk (although not conclusively defined, generally meant to mean the milk from 2nd milking to mature milk approx. 4 days after parturition). Transition milk may have independent effects on the calf as compared with effects due to social effects of co-housing dam and calf.²⁶ Transition milk is higher in dry matter and rich in immunologically active proteins, growth factors such as growth hormone, IGF-I and insulin, as well as fatty acids, amino acids and nucleotides compared with mature milk.

Rapid removal of the calf to a dedicated calf area is thought to prevent the exposure of the calf to pathogens shed by the dam (for example in feces or milk), which is a plausible way to prevent disease. A recent review of available literature did not clearly indicate evidence that immediate removal improves calf health, including a difference in Johne's disease risk.²⁷ However, care should be taken in interpreting the available data as most studies available for review were not specifically testing cow-calf contact compared with an adequate control, were observational in nature, and often described changes in the outcome of interest after concurrent implementation of several other "control strategies", of which immediate removal of the calf was often one. There is a need for randomized controlled trials investigating disease risk in calves with and without cow-calf contact in herds with endemic disease status.

Detection of calves needing attention is complicated in cow-calf contact systems by the inability to milk intake directly, evaluate drinking speed and other indicators typically based on milk feeding.

Calf growth

Several studies have shown a greater calf growth in calves with full dam-contact compared with separated calves^{16,28}, and as recently reviewed by Meagher et al.¹⁷ Direct dam contact allows for natural suckling behavior, continuous access to milk with increased frequency of suckling compared with many housing systems, and lack of artificial milk harvest artifacts such as bacterial contamination.²⁹ However, considerations should be given to the feeding strategy for separated calves as many early studies limit-fed milk in the immediately separated calves.

Transition and Weaning

If calves are in a cow-calf contact system at the time of weaning, then weaning occurs similarly with the restriction of access to their dam. Different debonding strategies with reducing access to cows and allowing access to automated milk feeders over a shorter (10 d) or longer (28 d) timeframe have been assessed, with favorable calf performance with longer separation adaptation.^{30,31} In other systems, calves are fence-lined weaned³², or have nose flaps inserted to prevent suckling.² In short-term cow-calf contact systems, calves are removed gradually or abruptly

from the dam and fed milk before weaning occurs, which typically follows principles of weaning milk-fed calves. Given the large variability in cow-calf contact duration and weaning strategies, clear recommendations for widely suitable and animal-friendly approaches are still lacking.

Milk Production

Due to calf consumption and frequent suckling, milk production of cows during calf contact is generally lower than that of cows not suckling their calves.¹⁶ The difference is well documented and increases with increasing calf age (approx. 8-12 kg in the first 10 DIM²⁸). This amount is consistent with approx. 11 kg milk intake in free choice management systems in the first month of life.³³ In our experience and based on the available literature, milk production catches up with a non-contact control group within several days after separation of the calf.^{16,28} To the contrary, some authors report a persistent reduction in milk yield after an 8-week contact period.³⁴ Meagher et al.¹⁷ reviewed the existing literature with the majority (14 out of 15 studies) finding either no difference in the period after suckling, or a positive effect on milk production in the suckling group after separation. This suggests that the large difference in milk production during the suckling phase is due to calf intake and not an alteration of the milk production capacity of the dam caused by suckling. Short-term differences in milk production observed in some studies²⁸ after separation could be due to a period of heightened milk ejection disturbance. Indeed, transiently reduced oxytocin release likely mediated by central inhibition and circulating oxytocin concentrations below that needed for full milk ejection (3-5 pmol/L) have been documented in cows suckling their calves and being switched to machine milking³⁵. This has recently been reviewed.³⁶ Milk ejection disorders in herds where cows suckle their calves have been documented to be higher than in herds not suckling calves, although findings were confounded by herd milk production and milking procedures.³⁷

Cows with suckling calves often have a lower fat percentage in machine-milked milk, a difference thought to be due to a higher amount of residual milk and its removal by the calves.^{34,36-38}

Udder health

One concern of allowing calves to suckle cows is that this may introduce pathogens into the mammary gland and increase the risk for mastitis. Although studies that evaluated this aspect are sparse, detrimental effects for udder health have not conclusively been demonstrated. Rather, an overall beneficial or neutral effect of suckling on mastitis risk has been reported.^{27,39}

Additional knowledge gaps and conclusion

In addition to the aforementioned knowledge gaps, the available research does not provide data on a number of other considerations for cow-calf contact systems. Relatively little is reported about safety for animals and human caretakers in different systems and barn designs, and how these compare with immediate separation in the same environment. Labor requirements will shift from calf feeding to observation of animals to identify the need for intervention, and the balance in labor requirements may be positive, negative, or merely a shift in how labor is allocated. Indicators of reproductive success are underexplored and underreported, and producers report both worse, equal, and better fertility in contact systems, with a large percentage of producers saying that they don't know if fertility changed.²

Additionally, what criteria do producers need to fulfill to be successful and how can veterinarians advise them?

Despite the identified knowledge gaps and uncertainties, implementation of cow-calf contact has the potential to not only engage the public in a positive manner, but also provide options to those producers who, for many different reasons, favor this approach over traditional separation at birth. Postpartum cow and calf health are areas of opportunity on many dairy farms under current management recommendations. If thoroughly planned and implemented, cow-calf contact systems could advance, rather than reduce cow and calf health.

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References

1. Bertelsen M, Vaarst M. Shaping cow-calf contact systems: Farmers' motivations and considerations behind a range of different cow-calf contact systems. *J Dairy Sci* 2023;106:7769-7785.
2. Eriksson H, Fall N, Ivemeyer S, et al. Strategies for keeping dairy cows and calves together – a cross-sectional survey study. *animal* 2022;16:100624.
3. Placzek M, Christoph-Schulz I, Barth K. Public attitude towards cow-calf separation and other common practices of calf rearing in dairy farming—a review. *Organic Agriculture* 2020.
4. Fraser D. Understanding animal welfare. *Acta veterinaria Scandinavica* 2008;50:S1.
5. Ventura BA, von Keyserlingk MAG, Schuppli CA, et al. Views on contentious practices in dairy farming: The case of early cow-calf separation. *Journal of Dairy Science* 2013;96:6105-6116.
6. Busch G, Weary DM, Spiller A, et al. American and German attitudes towards cow-calf separation on dairy farms. *PloS one* 2017;12:e0174013.
7. Hötzel MJ, Cardoso CS, Roslindo A, et al. Citizens' views on the practices of zero-grazing and cow-calf separation in the dairy industry: Does providing information increase acceptability? *Journal of Dairy Science* 2017;100:4150-4160.
8. Beaver A, Ritter C, von Keyserlingk MAG. The Dairy Cattle Housing Dilemma: Natural Behavior Versus Animal Care. *Veterinary Clinics of North America: Food Animal Practice* 2019;35:11-27.
9. Cook NB, von Keyserlingk MAG. Perspective: Prolonged cow-calf contact-A dilemma or simply another step in the evolution of the dairy industry? *J Dairy Sci* 2024;107:4-8.
10. (NAHMS) NAHMS. Dairy 2014-Health and Management Practices on U.S. Dairy Operations. Fort Collins, CO: United States Department of Agriculture, 2014.
11. Knierim U, Wicklow D, Ivemeyer S, et al. A framework for the socio-economic evaluation of rearing systems of dairy calves with or without cow contact. *Journal of Dairy Research* 2020;87:128-132.
12. Hudson SJ, Mullord MM. Investigations of maternal bonding in dairy cattle. *Applied Animal Ethology* 1977;3:271-276.

13. Vandenheede M, Nicks B, Désiron A, et al. Mother-young relationships in Belgian Blue cattle after a Caesarean section: characterisation and effects of parity. *Appl Anim Behav Sci* 2001;72:281-292.
14. Weary DM, Chua B. Effects of early separation on the dairy cow and calf. 1. Separation at 6 h, 1 day and 4 days after birth. *Applied animal behaviour science* 2000;69 3:177-188.
15. Stěhulová I, Lidfors L, Špinka M. Response of dairy cows and calves to early separation: Effect of calf age and visual and auditory contact after separation. *Applied Animal Behaviour Science* 2008;110:144-165.
16. Flower FC, Weary DM. Effects of early separation on the dairy cow and calf:: 2. Separation at 1 day and 2 weeks after birth. *Applied Animal Behaviour Science* 2001;70:275-284.
17. Meagher RK, Beaver A, Weary DM, et al. A systematic review of the effects of prolonged cow-calf contact on behavior, welfare, and productivity. *Journal of Dairy Science* 2019;102:5765-5783.
18. Edwards SA. The behaviour of dairy cows and their newborn calves in individual or group housing. *Applied Animal Ethology* 1983;10:191-198.
19. Bertelsen M, Jensen MB. Behavior of calves reared with half-day contact with their dams. *J Dairy Sci* 2023;106:9613-9629.
20. von Keyserlingk MAG, Weary DM. Maternal behavior in cattle. *Hormones and Behavior* 2007;52:106-113.
21. Lombard J, Urie N, Garry F, et al. Consensus recommendations on calf- and herd-level passive immunity in dairy calves in the United States. *Journal of dairy science* 2020;103:7611-7624.
22. Godden SM, Lombard JE, Woolums AR. Colostrum Management for Dairy Calves. *The Veterinary clinics of North America Food animal practice* 2019;35:535-556.
23. Westhoff TA, Womack SJ, Overton TR, et al. Epidemiology of bovine colostrum production in New York Holstein herds: Cow, management, and environmental factors. *J Dairy Sci* 2023;106:4874-4895.
24. Contarini G, Povolo M, Pelizzola V, et al. Bovine colostrum: Changes in lipid constituents in the first 5 days after parturition. *J Dairy Sci* 2014;97:5065-5072.

25. Fischer-Tlustos AJ, Hertogs K, van Niekerk JK, et al. Oligosaccharide concentrations in colostrum, transition milk, and mature milk of primi- and multiparous Holstein cows during the first week of lactation. *J Dairy Sci* 2020;103:3683-3695.
26. Fischer AJ, Villot C, van Niekerk JK, et al. Invited Review: Nutritional regulation of gut function in dairy calves: From colostrum to weaning. *Applied Animal Science* 2019;35:498-510.
27. Beaver A, Meagher RK, von Keyserlingk MAG, et al. Invited review: A systematic review of the effects of early separation on dairy cow and calf health. *Journal of Dairy Science* 2019;102:5784-5810.
28. Metz J. Productivity aspects of keeping dairy cow and calf together in the post-partum period. *Livestock Production Science* 1987;16:385-394.
29. Stewart S, Godden S, Bey R, et al. Preventing Bacterial Contamination and Proliferation During the Harvest, Storage, and Feeding of Fresh Bovine Colostrum. *Journal of Dairy Science* 2005;88:2571-2578.
30. Sørby J, Johnsen JF, Kischel SG, et al. Calf performance in a cow-driven cow-calf contact system; effect of two methods to gradually reduce cows' access to their calf. *J Dairy Sci* 2024.
31. Sørby J, Johnsen JF, Kischel SG, et al. Effects of 2 gradual debonding strategies on machine milk yield, flow, and composition in a cow-driven cow-calf contact system. *J Dairy Sci* 2024;107:944-955.
32. Hanssen H, Amundsen H, Johnsen JF. Cow-calf contact: a single-herd observational study of AMS yield during the first 100 days in milk. *Acta veterinaria Scandinavica* 2024;66:33.
33. von Keyserlingk MAG, Wolf F, Hötzel M, et al. Effects of Continuous Versus Periodic Milk Availability on Behavior and Performance of Dairy Calves. *Journal of Dairy Science* 2006;89:2126-2131.
34. McPherson SE, Webb LE, Murphy JP, et al. A preliminary study on the feasibility of two different cow-calf contact systems in a pasture-based, seasonal calving dairy system: effects on cow production and health. *Animal* 2024;18:101222.
35. Tancin V, Harcek L, Broucek J, et al. Effect of suckling during early lactation and changeover to machine milking on plasma oxytocin and cortisol levels and milking characteristics in Holstein cows. *J Dairy Res* 1995;62:249-256.

36. Johnsen JF, Zipp KA, Kälber T, et al. Is rearing calves with the dam a feasible option for dairy farms?—Current and future research. *Applied Animal Behaviour Science* 2016;181:1-11.
37. Rell J, Nanchen C, Savary P, et al. Dam-calf contact rearing in Switzerland: Aspects of management and milking. *J Dairy Sci* 2024.
38. Fröberg S, Aspegren-Güldorff A, Olsson I, et al. Effect of restricted suckling on milk yield, milk composition and udder health in cows and behaviour and weight gain in calves, in dual-purpose cattle in the tropics. *Tropical animal health and production* 2007;39:71-81.
39. González-Sedano M, Marin-Mejia B, Maranto MI, et al. Effect of residual calf suckling on clinical and sub-clinical infections of mastitis in dual-purpose cows: Epidemiological measurements. *Research in Veterinary Science* 2010;89:362-366.