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Management of calves from birth to weaning: Rearing of calves by dam-calf contact

Scientific excellence
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Series summary

The care of young dairy calves is a key aspect of all modern dairy farming enterprises and an area of increasing awareness by society who expects humane treatment of all farm animals [1]. Studies have shown that an increase in farm animal welfare is frequently associated with an improvement in animal performance and farmers' job satisfaction [2].

Healthy, vigorous dairy calves which are provided high planes of nutrition and social contact early in life are more productive later in life [3, 4]. Research on calf rearing has gained considerable traction over the last two decades providing new knowledge that has led to successful rearing of dairy calves in ways that benefit health but also considers their behavioural needs and promotes positive emotional states (see reviews [5, 6]). This IDF Calf Management Factsheet (one in a series of IDF factsheets addressing novel approaches to improve calf rearing) provides a short comprehensive overview of the advantages and challenges of rearing calves with prolonged contact to their dam.

Background

On the majority of dairy farms around the world, dairy calves are separated early, usually within 24 hours, from the dam at birth and reared by providing milk or milk replacer via bucket, bottle, or an automatic feeder. Early separation allows farmers to ensure passive transfer of immunity through individualized colostrum feeding [7], limits the bond formation between the cow and calf and; thus, is thought to reduce the stress response at separation [8]. Immediate separation also allows the farmer to harvest milk for sale and is practical since most of the farm infrastructure has not been built to easily accommodate cow-calf contact.

Early separation of the dam and calf has been recommended to promote hygienic conditions and reduce the risk of transmission of contagious diseases [9] but these assumptions are now being questioned because there is insufficient scientific evidence to either support or refute this assumption. This is an area that needs further research [10]. For some years now, separation of cow and calf has been increasingly criticized by external stakeholders, e.g. citizens and consumers ([11], see review [12]), but also farmers who started exploring cow-calf contact systems that promote contact by the calf with either their own dam (dam-calf contact) or a foster cow [13]. In response to this interest in cow-calf contact from dairy communities around the world, there has been an increase in scientific publications on this topic but also an increase in farmers 'learning by doing' as they explore dam-calf rearing systems [14, 15].

What is dam-calf contact?

Dam-calf contact is characterized by physical contact and behavioural interaction between the dam and her own calf, but it is practiced in different ways and with varying degrees of contact (see definitions by [13]). The timespan of dam-calf contact usually reflects the pre-weaning period and includes suckling. To date, there is no available evidence on what the minimal duration of dam-calf contact should be, but at least 14 days has been suggested [13]. However, this recommendation should be treated with caution, as the determination was made arbitrarily and not on the basis of scientific findings.

What needs to be in place before making the move to dam rearing?

Dairy farm systems are highly variable, thus there are also different ways to accommodate dam-calf contact. Accommodating dam-calf contact in indoor facilities will likely require adaptations in terms of space, as calves may use cubicles, feeding areas, and water troughs. Considerations must be made to ensure that both the dam and the calf have sufficient space to access these key resources. Constructing areas within the facility that enable contact between dams and calves, if not managed with full-day contact [13], may also be needed. Regardless of the system, calves should always have access to a clean, well-managed calf creep area; a space that allows them to be with other calves in the absence of the cows, where they can rest, eat roughage and concentrate, and have access to clean water. Some farms may provide an additional milk source (automatic milk feeder, bottle, or milk bar) in the calf area; a useful resource particularly when calves are separated for a part of the day. Providing a second milk delivery source can also support the weaning process [16]. Since milk intake of calves in suckling-based systems cannot be determined directly, daily monitoring of the animals, as in any rearing system, is key to prevent hunger.

There has been less research exploring dam-calf rearing in pasture-based dairy farms, which is common practice in most beef systems, and it is currently too early to provide science-based recommendations. Dam-calf rearing on pasture-based farms, comes with additional challenges including specific requirements associated with seasonal calving regimes, handling of calves during milking times of the dam, inclement and variable weather conditions, and the needs for shelter [17].

Under natural conditions, the calf remains hidden for a few days before the dam introduces it to the herd. During this time, the bond between dam and calf is formed, ensuring that the calf suckles and follows the dam. Under indoor housing conditions, this hiding situation can often be created in single calving pens where the two can spend together a few days after calving. In pasture-based systems which often also employ seasonal calving, this approach is usually not feasible but providing sufficient space to allow the dam to remove herself from the herd, or housed in a separate pasture, will likely benefit the formation of the bond [17].

In all systems, prolonged cow-calf contact should only be implemented in herds with healthy cows and calves. It is imperative that calves receive colostrum of sufficient quality and quantity to ensure adequate passive transfer of immunity. In dam-calf contact systems, close monitoring of newborn calves is warranted because not all calves manage to suckle colostrum unaided within a few hours after birth [18]. Assistance to suckle and/or provision of supplementary colostrum may be necessary in these cases. This can also positively influence the animal-human relationship [19]. Another important prerequisite to maintain a healthy dairy herd regardless of whether they employ indoor or outdoor systems, is that herds be free of major contagious diseases and that they have health plans in place to minimize risks associated with exposure of the young calf to pathogens such as *Mycobacterium avium* spp. p*aratuberculosis*, *Staphylococcus aureus*, *Salmonella Dublin* and VTEC/STEC *E. coli*.

The potential for the calf to transmit these pathogens from infected dams to other cows, calves and humans cannot be ignored, especially in situations where the inadvertent propagation of these diseases may not be evident until months after the transmission event.

What about weaning dam reared calves?

Given that the major goal of a dairy farm is the sale of milk, suckled calves are usually separated and weaned from their dam between 9 and 24 weeks of age in dam rearing settings [15]. However, the formation of a strong bond also creates challenges during weaning, as the severance of this bond will elicit a stress response, for example, vocalization, restlessness, and possible weight loss [20]. The more abrupt the severing of the bond, the stronger the response. Evidence suggests that the two main issues for the calf are the loss of the dam and the loss of the milk source; the stress response is reduced if these two elements are not removed at the same time [21]. There are a few practices that have been suggested to minimize the stress of separation. Calves can be provided a supplemental milk source (e.g., an automatic milk feeder [16]) so that they can still receive milk (i.e., remove the hunger component to dam-calf separation) even after they have been separated from their dams. However, calves must learn how to use the milk feeders before weaning. Furthermore, a stepwise separation method, whereby the time spent apart by the dam and calf gradually increases with time, can mitigate the stress response [22]. Fence-line weaning coupled with a stepwise separation method has been used as it allows contact but without the suckling component [22]. The use of nose flaps in the calves to prevent suckling is discouraged as they can cause nasal tissue damage [23]. Whilst there are many ways currently employed to achieve weaning on dam-calf farms [15] this area warrants further research to identify best practices.

What are the advantages of dam-calf contact?

The most commonly cited benefit of dam-calf contact is improved calf weight gain [24], although this can also be achieved in separation systems by providing calves with increased milk allowances. Dam-calf contact also allows for the pair to fulfil their behavioural needs such as social learning [25, 26], social grooming [27], and the motivation for the two to be in contact [28]. Suckling behaviour is important for the calf, as it reduces abnormal behaviours (see review [27]), and there is some preliminary evidence that their microbiota might change [29]. We strongly encourage larger observational studies to clearly establish the clear links between suckling and good calf health and performance [10]. More research is also needed to establish the effects of suckling (such as increased oxytocin ejection and increased numbers of daily suckling events) on dam physiology, behaviour, and health [30].google

What are the risks of dam-calf contact?

The fear of disease transmission between dam and calf is one of the main reasons to separate dams and calves at birth. Despite this concern, there has been little research targeted at quantifying the risk of disease transmission in dam-calf contact systems [10]. Dam-calf contact does affect the machine harvested milk yield and milk composition, particularly during the period when the calf is allowed to suckle (see review [24, 27]). There is also an effect of the type of contact, both time per day and total number of days, on lactation performance [31, 32]. It is clear that more research is needed to elucidate the effects of dam-calf contact, including the type of contact and the duration of contact before weaning on milk production, machine milking behaviour, udder health and milk quality. Furthermore, the true cost of dam-calf contact must also include effects on dam and calf health and reproduction. Therefore, we strongly encourage more work on these topics; recognizing that these studies will require large numbers of animals to provide useful data [32]. Within any new system, marketing opportunities will need to be identified, as failure to do so may result in additional operational expenses, at least in the short term, that could affect farm profitability.

What about foster cows?

Practically, the use of foster cows to rear calves is often suggested as an easy solution to provide cow contact to the calves. However, foster systems may neglect the needs of the dam [33, 34]. Foster cow-calf systems can also have challenges, such as foster cows and calves failing to bond [35] and can increase the risk of disease transmission between the foster cow and calves [36]. There is also some evidence that the public may not accept foster cow systems as a sustainable solution to separation [1]; thus, dairy products from foster cow systems may not attract the product premiums that some dam-calf products do [37].

About the series

In 2019, the IDF Standing Committee on Farm Management and Standing Committee on Animal Health and Welfare identified a need to produce factsheets on management of calves from birth to weaning to provide information to dairy farmers and interested stakeholders. Each factsheet stands alone and does not require knowledge of the others. Together, they provide an overview of important aspects of successful calf rearing.

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References

[1] Sirovica LV, Ritter C, Hendricks J, Weary DM, Gulati S, von Keyserlingk MAG. Public attitude toward and perceptions of dairy cattle welfare in cow-calf management systems differing in type of social and maternal contact. J Dairy Sci 2022;105:3248–68. doi: 10.3168/jds.2021-21344

[2] Hansen BG, Østerås O. Farmer welfare and animal welfare- Exploring the relationship between farmer's occupational well-being and stress, farm expansion and animal welfare. Prev. Vet. Med. 2019;170:104741. doi: 10.1016/j.prevetmed.2019.104741

[3] Soberon F, Raffrenato E, Everett RW, van Amburgh ME. Preweaning milk replacer intake and effects on long-term productivity of dairy calves. J Dairy Sci 2012;95(2):783–93. doi: 10.3168/jds.2011-4391

[4] Meagher RK, Daros RR, Costa JHC, von Keyserlingk MAG, Hötzel MJ, Weary DM. Effects of Degree and Timing of Social Housing on Reversal Learning and Response to Novel Objects in Dairy Calves. PLoS ONE 2015;10(8):e0132828. doi.org/10.1371/journal.pone.0132828

[5] Khan MA, Weary DM, von Keyserlingk MAG. *Invited review:* Effects of milk ration on solid feed intake, weaning, and performance in dairy heifers. J Dairy Sci 2011;94(3):1071–81. doi.org/10.3168/jds.2010-3733

[6] Costa JHC, von Keyserlingk, MAG., Weary DM. Invited review: Effects of group housing of dairy calves on behavior, cognition, performance, and health. J Dairy Sci 2016;99(4):2453–67. doi: 10.3168/jds.2015-10144

[7] Beam AL, Lombard JE, Kopral CA, Garber LP, Winter AL, Hicks JA et al. Prevalence of failure of passive transfer of immunity in newborn heifer calves and associated management practices on US dairy operations. J Dairy Sci 2009;92(8):3973–80. doi: 10.3168/jds.2009-2225

[8] Weary DM, Jasper J, Hötzel MJ. Understanding weaning distress. Appl Anim Behav Sci 2008;110(1–2):24–41. doi.org/10.1016/j.applanim.2007.03.025

[9] Sumner CL,von Keyserlingk MAG. Canadian dairy cattle veterinarian perspectives on calf welfare. J Dairy Sci 2018;101(11):10303–16. doi.org/10.3168/jds.2018-14859

[10] Beaver A, Meagher RK, von Keyserlingk MAG, Weary DM. Invited review: A systematic review of the effects of early separation on dairy cow and calf health. J Dairy Sci 2019;107:5784–810. doi: 10.3168/jds.2018-15603

[11] Busch G, Weary DM, Spiller A, von Keyserlingk, MAG. American and German attitudes towards cow-calf separation on dairy farms. PLoS ONE 2017;12(3):e0174013. doi.org/10.1371/journal.pone.0174013

[12] 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. Org. Agr. 2021;11(1):41–50. doi.org/10.1007/s13165-020-00321-3

[13] Sirovnik J, Barth K, de Oliveira D, Ferneborg S, Haskell MJ, Hillmann E, Jensen MB, Mejdell CM., Napolitano F, Vaarst M, Verwer CM, Waiblinger S, Zipp, KA, Johnsen JF. Methodological terminology and definitions for research and discussion of cow-calf contact systems. J Dairy Res 2020;87S1:108–14. doi:10.1017/S0022029920000564

[14] Vaarst M, Hellec F, Verwer C, Johanssen JRE, Sorheim K. Cow calf contact in dairy herds viewed from the perspectives of calves, cows, humans and the farming system. Farmers' perceptions and experiences related to dam-rearing systems. Landbauforschung-J. Sustain. Org. Agric. Syst. 2020;70(1):49–57. doi.org/10.3220/LBF1596195636000

[15] Eriksson H, Fall N, Ivemeyer S, Knierim U, Simantke C, Fuerst-Waltl B, Winckler C, Weissensteiner R, Pomiès D, Martin B., Michaud A, Priolo A, Caccamo M, Sakowski T, Stachelek M, Spengler Neff A; Bieber A, Schneider C, Alvåsen K. Strategies for keeping dairy cows and calves together – a cross-sectional survey study. Animal 2022;16(9):100624. doi: 10.1016/j.animal.2022.100624

[16] Johnsen JF, Beaver A, Mejdell CM, Rushen J, de Passillé AM, Weary DM. Providing supplementary milk to suckling dairy calves improves performance at separation and weaning. J Dairy Sci 2015;98(7):4800–10. doi: 10.3168/jds.2014-9128

[17] Neave HW, Sumner CL, Henwood RJT, Zobel G, Saunders K, Thoday H, Watson T, Webster JR. Dairy farmers' perspectives on providing cow-calf contact in the pasture-based systems of New Zealand. J Dairy Sci 2022;105(1):453–67. doi: 10.3168/jds.2021-21047

[18] Jensen MB. The early behaviour of cow and calf in an individual calving pen. Appl Anim Behav Sci 2011;134(3-4):92–9. doi.org/10.1016/j.applanim.2011.06.017

[19] Waiblinger S, Wagner K, Hillmann E, Barth K (2020) Short- and long-term effects of rearing dairy calves with contact to their mother on their reactions towards humans. J Dairy Res 87(S1):148-153, doi:10.1017/S0022029920000576

[20] Flower FC, Weary DM. Effects of early separation on the dairy cow and calf: 2. Separation at 1 day and 2 weeks after birth. Appl Anim Behav Sci 2001;70(4):275–84. doi: 10.1016/s0168-1591(00)00164-7. PMID: 11179551.

[21] Jasper J, Budzynska M, Weary DM. Weaning distress in dairy calves: Acute behavioural responses by limit-fed calves. Appl Anim Behav Sci 2008;110(1-2):136–43. doi.org/10.1016/j.applanim.2007.03.017

[22] Wenker ML, van Reenen CG, Bokkers EA, McCrea K, de Oliveira D, Sørheim K, Cao Y, Bruckmaier RM, Gross, JJ, Gort G, Verwer CM. Comparing gradual debonding strategies after prolonged cow-calf contact: Stress responses, performance, and health of dairy cow and calf. Appl Anim Behav Sci 2022;253:105694. doi.org/10.1016/j.applanim.2022.105694

[23] Lambertz C, Bowen PR, Erhardt G, Gauly M. Effects of weaning beef cattle in two stages or by abrupt separation on nasal abrasions, behaviour, and weight gain. Anim Prod Sci 2015;55(6):786. doi.org/10.1071/AN14097

[24] Meagher RK, Beaver A, Weary DM, von Keyserlingk MAG. Invited review: A systematic review of the effects of prolonged cow-calf contact on behavior, welfare, and productivity. J Dairy Sci 2019;102(7):5765–83. doi: 10.3168/jds.2018-16021

[25] Buchli C, Raselli A, Hillmann E, Bruckmaier R. Contact with cows during the young age increases social competence and lowers the cardiac stress reaction in dairy calves. Appl Anim Behav Sci 2016. doi.org/10.1016/j.applanim.2016.12.002

[26] Wagner K, Barth K, Palme R, Futschik A, Waiblinger S. Integration into the dairy cow herd: Long-term effects of mother contact during the first twelve weeks of life. Appl Anim Behav Sci 2012;141(3–4):117–29. doi.org/10.1016/j.applanim.2012.08.011

[27] Johnsen JF, Zipp KA, Kälber T, de Passillé AM, Knierim U, Barth K, Mejdell CM. Is rearing calves with the dam a feasible option for dairy farms?: —Current and future research. Appl Anim Behav Sci 2016;181:1–11. doi.org/10.1016/j.applanim.2015.11.011

[28] Wenker ML, Bokkers EAM, Lecorps B, von Keyserlingk MAG, van Reenen CG, Verwer CM, Weary DM. Effect of cow-calf contact on cow motivation to reunite with their calf. Scientific reports 2020;10(1):14233. doi.org/10.1038/s41598-020-70927-w

[29] Beaver A, Petersen C, Weary DM, Finlay BB, von Keyserlingk MAG. Differences in the fecal microbiota of dairy calves reared with differing sources of milk and levels of maternal contact. JDS Communications 2021;2:200–6. doi: 10.3168/jdsc.2020-0059

[30] Lupoli B, Johansson B, Uvnas-Moberg K, Svennersten-Sjaunja K. Effect of suckling on the release of oxytocin, prolactin, cortisol, gastrin, cholecystokinin, somatostatin and insulin in dairy cows and their calves. J Dairy Res 2001;68(2):175–87. doi: 10.1017/s0022029901004721

[31] Barth K. Effects of suckling on milk yield and milk composition of dairy cows in cow–calf contact systems. J Dairy Res 2020;147:133–7. doi: 10.1017/S0022029920000515

[32] Mogensen L, Kudahl A, Kristensen T, Bokkers E, Webb LE, Vaarst M, Lehmann J. Environmental impact of dam-calf contact in organic dairy systems: A scenario study. Livestock Sci 2022;258:104890. doi.org/10.1016/j.livsci.2022.104890

[33] von Keyserlingk, MAG., Weary DM. Maternal behavior in cattle. Hormones and Behavior 2007;52(1):106–13. doi: 10.1016/j.yhbeh.2007.03.015

[34] Mandel R, Nicol CJ. Re-direction of maternal behaviour in dairy cows. Appl Anim Behav Sci 2017;195:24–31. doi.org/10.1016/j.applanim.2017.06.001

[35] Loberg JM. Behaviour of Foster Cows and Calves in Dairy Production: Acceptance of Calves, Cow-Calf Interactions and Weaning. Doctoral thesis. Swedish University of Agricultural Sciences; 2007. api.semanticscholar.org/CorpusID:354387 Accessed 25 March 2024

[36] Köllmann K, Wente N, Zhang Y, Krömker V. Investigations on Transfer of Pathogens between Foster Cows and Calves during the Suckling Period. Animals 2021;11(9):2738. doi.org/10.3390/ani11092738

[37] Boaitey A. Study: Consumers will pay premiums for more calf-dam contact. progressivedairy.com/topics/herd-health/study-consumers-will-pay-premiums-for-more-calf-dam-contact. Accessed 7 December 2021.