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Dairy Pipeline

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Getting them off to a good start—Newborn calf management

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Regardless of the calf rearing system, what happens to the calf during the first hours of life has a dramatic effect upon health and future productivity. Two topics of primary importance are early exposure and colostrum.

Early exposure
The first hours of life are critical for the calf; they determine the establishment of the "biome" or population of bacteria which colonize the respiratory and digestive tracts. We know that some bacteria are desirable for the young animal while others can have negative impacts on health and growth. Some bacteria become established during the passage through the birth canal. However, the environment and quality of the first meal of colostrum may have a far larger impact on bacterial colonization of the respiratory and digestive system. Clean box stalls or calving pens well bedded with straw or a well-drained, grassy pasture encourage a more gradual population of the mucosa with organisms that may facilitate better health. However, if the calf is exposed to manure contaminated bedding or poorly ventilated facilities at birth or they consume colostrum with high bacterial counts from dirty bottles or esophageal feeders, high levels of undesirable organisms will populate the mucosal surface of the lungs and digestive system and encourage early onset of poor health.

Research has shown that the arrival of bacteria before colostrum in the small intestine can seriously impair absorption of immunoglobulins (James et al. J. Dairy Science 64:52).

Colostrum
Since no immunity is passed from the dam before birth, the calf depends on absorption of immunoglobulins (Ig) from colostrum. Success means optimizing **each** of the following:

- Clean calving environment and all devices used to feed colostrum are clean.
- Excellent handling of colostrum to minimize bacterial growth. Either feed or cool it within 30 minutes to prevent growth of bacteria. When preparing colostrum for storage, cool it as quickly as possible by immersing the container in ice cold water to achieve a temperature of < 40°F within minutes, even if it's going to be frozen later for longer term storage. Refrigerated colostrum should not be fed more than 2 days after harvest.
- Feed colostrum as soon after birth as possible (< 6 hours). Absorption of Ig declines as the calf ages. A more rapid decrease in absorptive efficiency occurs with a contaminated environment, colostrum with high bacteria counts, or use of unclean equipment.
- Follow the math to achieve desired Ig absorption by the calf.

- Test colostrum with a Brix refractometer and feed that testing > 22 which equates to an Ig concentration of > 50g/L.
- Feed enough volume: at least 4 liters. This means the calf receives at least 200g of IgG within 6 hours of birth.
- Clean colostrum: < 50,000 cfu/ml. Test colostrum for bacteria count as it is fed.

- Track your success in achieving good transfer of immunoglobulins. The table shown below represents currently accepted goals for colostrum management. It recognizes that perfection as a goal is not reasonable and provides a more appropriate recognition of what constitutes good colostrum management.

Consensus category	Consensus IgG category (g/L)	Equiva-lent total protein (g/dL)	Equiva-lent Brix (%)	Consensus % calves in herd
Excellent	>25.0	>6.2	>9.4	40
Good	18.0 – 24.9	5.8 – 6.1	8.9 – 9.3	30
Fair	10.0 – 17.9	5.1 - 6.0	8.1 – 8.8	20
Poor	<10.0	<5.1	<8.1	10%

Table 1. Consensus categories, serum IgG concentrations, and equivalent Brix measurements and percentage of calves in each category. Lombard et al. J. Dairy Sci. 103:7611.

- Success occurs when **systems** are in place to facilitate the harvest and feeding of clean colostrum in a timely fashion.

What else do we know about feeding colostrum and handling the newborn calf?

- Feeding via bottle or tubing with an esophageal feeder doesn't seem to affect success of IgG absorption. However, ensure that personnel using an esophageal feeder are properly trained to prevent the feeder from entering the lungs! http://veterinaryextension.colostate.edu/menu2/Cattle/TubeDoc.pdf
- Relying on the calf to nurse the cow yields inconsistent results.
- More than one feeding of colostrum is helpful. Although absorptive efficiency of Ig decreases as the calf ages there are benefits provided by other naturally occurring biologically active molecules in colostrum. They promote improved growth and development of the intestinal tissue and foster better early growth and health. Save first milking colostrum for the first feeding, but milk harvested after the first milking and until the milk is suitable for human consumption should be fed to the youngest calves.
- Feeding the dam's colostrum to her calf? In addition to Ig and other factors described above, colostrum also contains immune cells from the dam which are absorbed along with the Ig. Recent research has shown benefits to both calf immunity and response to later vaccinations when the calf receives her dam's colostrum. Unfortunately freezing or pasteurization destroys these cells. Calves fed milk from another cow are not likely to see these benefits.
- Pasteurize colostrum? The need to pasteurize colostrum depends upon the health status of the herd. If the herd is not a "closed" population or there is risk of some infectious diseases, then it is recommended that all colostrum be pasteurized prior to feeding using a batch pasteurization system.
- Colostrum replacers? At times there may be an insufficient supply of colostrum of the desired quality for the first meal or it may be difficult to feed fresh, high quality colostrum to the calf. Research has shown equal or better efficiency of Ig absorption with replacers. These replacers are expensive but the added cost frequently is offset by better growth and health of calves **IF** it is not possible to feed high quality colostrum early in life. Colostrum replacers also eliminate the risk of disease

transfer if the dam is infected with subclinical disease.

Success means developing **SYSTEMS** that provide a clean calving environment and facilitate harvest and feeding of **high-quality** colostrum early in the life of the calf. Remember, let's do what's right for the calf!

Fetal programming: taking care of our heifers before they're born

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Fetal programming in cattle refers to the process by which the prenatal environment of a developing calf can have a long-term impact on its future health, growth, and productivity. It is well-established that the internal conditions of the dam as well as the environmental conditions experienced by a developing fetus can have a significant impact on its physical and metabolic development, and may also influence its susceptibility to various diseases later in life. This article aims to discuss the influence of heat stress and udder health during prenatal development and their impact on the productive life and longevity of calves.

In dairy cattle, fetal programming occurs in response to a variety of factors, including the dam's nutrition during pregnancy, udder health, heat stress, exposure to environmental toxins, and other factors. Studies have shown that poor maternal nutrition during pregnancy can negatively affect the growth and development of the calf and lead to an increased risk of metabolic disorders and diseases, such as mastitis later in life. Providing optimal nutrition and care to pregnant dairy cows can help promote healthy growth and development of the fetus, which may result in improved milk production and quality, as well as better overall health and longevity of the animal.

Global warming during the past decade has contributed to increased exposure to heat stress for dairy cows. Most studies on dairy cows addressed direct heat stress effects on primary and functional traits during lactation. So far, there is comparatively low interest in analyzing heat stress effects during the dry period, because body heat production is directly associated with milk production. As a consequence, in dry cow management there is a lack of heat stress protection. Therefore a few researchers have focused on the effect of heat stress in the dry period (late gestation) in the cow, and how this heat stress affects the offspring's future performances. Researchers at the University of Florida report that heifers born from cows exposed to heat stress conditions during the last 45 days of gestation have lower birth and weaning weights when compared to heifers born from cows exposed to thermoneutral conditions. Also, heifers from heat stressed cows had less total plasma protein, and total serum IgG, and tended to have decreased hematocrit. Researchers from the University of Wisconsin found that the negative effects of heat stress can persist through multiple generations. Grand-daughters produced from grand-dams exposed to heat stress produce less milk and have a higher risk of being culled than cows that are produced from grand-dams raised in thermoneutral conditions. In 2021, researchers from the University of Giessen, report that offspring produced from dams that are exposed to heat stress conditions during the last 8 weeks of gestation produce significantly less milk and milk fat during their first lactation. These heifers also have significantly lower conception rates resulting. Low lifetime milk yields with poor reproductive performance lead to an increased culling rate of heifers born from dams exposed to heat stress.

Despite extensive research on the impact of mastitis on the reproductive and milk production performance of dairy cows, there is a lack of knowledge regarding the correlation between the maternal udder health status and the reproductive and milk production outcomes of their offspring. In 2023 researchers reported the association between maternal average monthly somatic cell count (SCC) with reproduction performance, anti-Müllerian hormone (AMH) concentration, udder health status, and milk production in the offspring. Cows coming from dams with the higher monthly SCC had more services per conception and produced less milk, fat, and protein. In addition, anti-Müllerian hormone concentration was lower for those heifers born from cows with high monthly SCC.

In summary, fetal programming in dairy cattle can significantly impact future offspring. Heat stress during the dry period has been found to negatively affect the growth, milk production, and overall health of the offspring, with some impairments persisting through multiple generations. Therefore, it is important to focus research on different management practices to mitigate heat stress during the dry period. Meanwhile, little information is available on the association between maternal udder health status and the reproductive and milk production outcomes of offspring. However, recent research suggests that high SCC in dams may lead to decreased productivity and reproductive performance in their offspring. It can also affect the productive lifetime of dairy cows. Providing optimal nutrition and care to pregnant dairy cows can help ensure the healthy growth and development of the fetus, leading to improved milk production and quality, along with better health for that heifer that will in turn become a productive cow in the future herd.

Upcoming Events

Deadline for SDBII Applications:
Farm Infrastructure Improvement Grant and the Precision Technology & Management Investment Grant
June 2, 2023

Franklin County Youth Livestock Show with Dairy
June 10, 2023

Southwest VA 4-H Tractor Club Silent Auction
June 15-17, 2023 (Abingdon, VA)

Southwest VA 4-H Tractor Club Raffle
June 17, 2023 (Abingdon, VA)

Franklin County DHIA Banquet
June 22, 2023

Managing Milk Price & Risk Using Futures and Options Markets
June 26, 2023 (Rocky Mount, VA)

Farmer CPR and First Aid Beginner Classes
June 29, 2023 (Rocky Mount, VA)

Southeast Dairy Youth Retreat
July 9 - July 12, 2023 (Statesville, NC)

State 4-H / FFA Dairy Youth Field Day
August 3, 2023 (Harrisonburg, VA)

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