

THE CALF'S STARTER KIT: MASTERING COLOSTRUM QUALITY, TIMING, AND TESTING FOR LONG-TERM HERD SUCCESS

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ABSTRACT

Colostrum is the "starter kit" for every calf and contains nutrients, bioactive components, cells and microorganisms that provide energy and protection against pathogens and contribute to the maturation and development of the gastrointestinal tract. Colostrum contains such components as fatty acids, whey proteins, oligosaccharides, immune cells and microorganisms which are crucial for the health and well-being of the newborn calf and hence it should not be underestimated.

The economic upgradation of livestock farms depends greatly on efficient neonatal management, which directly influences the growth rate, morbidity, mortality and future productivity of the milking herd. (Thakur et al., 2025). First few hours after the birth is very crucial for bovine calf to attain and absorb immunoglobulins. Calf is born agammaglobulinemic and rely wholly on post birth colostrum ingestion. High quality colostrum is produced by multiparous dams with carrying brix around 30-35%. Higher the brix value greater the IgG content in the colostrum. These antibodies especially IgG confer in stimulation of intestinal epithelial cells for maturation and absorptive capacity. Calves innate immune response is also influenced by colostrum because of the diverse array of cytokines and bioactive factors (Dahl et al., 2020). To achieve successful passive transfer, calves care takers should ensure colostrum ingestion within first four hours after birth. Quantity should ideally be around 10-13 % of the calves' body weight. First three feeding is considered crucial for betterment of calves development. The second feeding should be given within 8-12 hours which ensures the chances of achieving targeted serum IgG concentration greater than 10g/L (Stancheva & Penev, 2025). Along with antibody transfer calves should also be transitioned slowly with mixed colostrum to normal milk to provide immunological and nutritional support during the critical first days of life (Conneely et al., 2014). These transition milk helps in maintaining required nutrition with total solids above 10% to satisfy the calves rapidly growing metabolic energy demand (Edwards & Renaud, 2025). Maintaining the quality of these milk is prerequisite by minimizing microbial contamination through stringent collection and storage protocols, as elevated bacterial loads can impair the intestinal absorption of immunoglobulins and compromise the calf's overall health outcomes (Flynn et al., 2025). The prevalence of failure of passive immunity is caused by delayed ingestion, as intestinal permeability to immunoglobulins declines rapidly within the first hours of life (Abdelfattah et al., 2025). To counter these risks, utilizing tools such as Brix refractometry allows producers to accurately identify colostrum with immunoglobulin G concentrations exceeding 75 g/L, ensuring that only superior-quality maternal secretions are administered to the neonate (Socket, 2025). Along with evidence suggests that delivering smaller volumes of highly concentrated colostrum at least 75–100 g/L of

IgG—can result in more efficient absorption compared to larger, more dilute feedings (Socket et al., 2023). Providing colostrum for minimum of 5 days after birth ensures improved gut health and reduced abnormal fecal scores indicating sustained exposure to maternal bioactive components promote long term resilience. Implementation of 4Q rule like quality, quikness, quantity and quota provides a stage to buffer against failure of passive transfer. Serum IgG concentrations at 24 hour mark to asses the absorption efficacy of colostrum to facilitate successful passive transfer. This also accomplished by digital Brix refractometry to quantify total proteins as an indirect measure of IgG. Digital refractometry greatly facilitate as an on farm tool to measure IgG absorption in calves. Colostrum brix of 30-35% gives rise to serum brix of 9-12% if the risk factors of failure of passive transfer is taken care of. Diagnostic accuracy of these optical devices helps in more precise herd level decision making regarding the storage and timely administration of colostrum. The cut point of 22 % in colostrum brix ensures the 80% of IgG transfer thereby giving successful passive transfer. At farm level for farmers the usage of digital or optical refractometry is cost effective and also eases the dependence of high cost lab run tests which consumes time as well as capital.

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Establishing a Brix refractometer threshold of 10% effectively places the calves in obtaining the successful passive transfer (Thornhill et al., 2015). Farmers should be aware of the usage of refractometry and relying on it for colostrum secretion reading varies inaccordance with type of colostrum used. for example direct maternal secretions are completely reliable for post feeding IgG reading but wheras if colostrum replacer is used then there can be subtle inaccuracies. The serum threshold of 5.2-5.5g/dL ensures a succesful passive transfer and serum IgG concentrations above 10 g/L serve as the sureshot clinical criterion for success (Hameed et al., 2019)

CONCLUSION

Incorporating the regular use of refractometer in farm activity enables to produce to shift from regular reactive treatment protocol to successful proactive management revolving around quantifiable immune status. This facilitates a successful calf management in building the management gaps and ensuring overall herd improvement. Further study is needed on these diagnostic tools to assess the influence of breed specific and environmental factors on imunoglobulin absorption rates ensuring that thresholds of passive transfer remain clinically relevant.

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