Colostrum is perhaps the single most important factor that affects the health and vitality of neonatal calves. As calves are born agammaglobulinemic, at birth the immune system is basically naive to the variety of pathogens present in the calves’ environment. Immunoglobulins (Ig’s) must be obtained from colostrum while the gut wall is open to macromolecular transport. Passive immunity acquired during this time helps to protect the calf from these pathogens during their first few days of life, as they begin to foster their own immunity. While the transfer of Ig’s is vitally important, colostrum is also rich in essential nutrients that the calf needs in its first few hours of life, for both growth and maintenance. In 2012, Van Amburgh and Lopez, of Cornell University’s Department of Animal Science, presented ‘A Brief Review of the Developmental Role of Colostrum in Neonates’ during the Minnesota Dairy Health Conference. In this presentation, they touched upon the lactocrine hypothesis and then laid out colostrum’s role in fostering long-term productivity and feed efficiency via factors other than immunoglobulins.

The Lactocrine Hypothesis
Van Amburgh and Lopez point to a relatively new definition related to epigenetics in new-borns: the concept of the lactocrine hypothesis. This is the effect that certain growth factors and hormones in mammary secretions (found in colostrum and milk) have an impact on young mammals. The implication from data from other species suggests the possibility that neonates can be programmed post-natally to modify developmental functions. In calves, increasing nutrient intake from milk prior to weaning has resulted in increased milk yield during first lactation, compared to the milk yield of restricted calves. While this seems to be the result of increased nutrient intake and pre-weaning growth rate, and not some other milk-borne factor, the effect of signals from colostrum would only serve to magnify this result.

The role of colostrum
While the exact mechanisms by which colostrum has long-term effects on the development of the gastrointestinal tract are still not well understood, it is potentially the non-nutrient factors in colostrum that play a major role. Molecules such as IGF-1 and insulin have been shown to increase the rate of protein synthesis in piglets. Likewise, milk-borne relaxin concentrations have been shown to spur better eventual reproductive performance in piglets as well. In calves, those fed maternal colostrum instead of serum-derived colostrum replacement (which was developed to provide Ig’s but does not contain other bioactive factors that maternal colostrum contains) had feed efficiency that was significantly higher, suggesting that factors other than colostrum’s IgG’s contributed to the differences. In another calf study, those fed 4 litres of colostrum compared to those fed 2 litres, prior to ad libitum milk replacer intake pre-weaning, had average daily gains that were significantly higher both pre- and post-weaning. If colostrum, therefore, contributes to feed efficiency changes, then it can be supposed that the first feeding can affect future milk production.
In calves, glucose absorption capacity is enhanced and plasma glucose concentrations are also considerably higher when they are colostrum-fed as opposed to being formula-fed. This could help researchers understand colostrum’s role beyond immunoglobulins, in terms of long-term productivity, if these glucose uptake differences were to persist. Indeed, new work, coupled with a review of past research and literature, shows that additional factors in colostrum, and not just the very important presence of immunoglobulins, spur long-term productivity and enhance dairy calf feed efficiency. All the more reason to be sure that on-farm colostrum protocols are in place and up-to-date!

Key takeaways from the research:

- Colostrum is vitally important for neonatal calves to achieve passive immunity through immunoglobulins while they develop their own immunity.
- Other factors in colostrum are also important for the health and vitality of calves.
- Non-nutrient factors in colostrum such as IGF-1, insulin and relaxin have been shown to increase the rate of protein synthesis, reproductive performance and feed efficiency.
- Having a colostrum protocol in place for neonatal calves is necessary for increased health, vitality and performance.

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