Managing Calf Immunity; Some New Concepts

Based on research presented at the 2012 Minnesota Dairy Health Conference

Conversely to general knowledge, newborn calves are born immune suppressed rather than immune deficient, as the immune system has actually been developed properly at calving. However, calving corticosteroids generate an immune depression which is known to increase susceptibility of acquiring diseases right after calving. Wisely, nature developed colostrum in response to this weakness, allowing the mother to support the newborn calf by delivering immune protection through this modified milk.

FRESH VS. FROZEN COLOSTRUM
The basic “3 Q’s” of colostrum still remain to be very important in having a successful calf rearing operation – high QUALITY, in ample QUANTITY and given QUICK after calving. However, a novel part in this process, according Amelia R. Woolums from the University of Georgia, is the role of maternal cells in colostrum to improve calf protection. Research indicates that, along with immunoglobulins (i.e. IgG), maternal cells in colostrum move across the intestinal wall of calves and enter into their tissues, where they seem to influence the development of neonatal immune responses.

The importance of these new findings is that, on the contrary, frozen or pasteurized colostrum and colostrum replacers lack whole functional cells and thus may not stimulate the same type of response as is stimulated by fresh colostrum which does contain whole cells. However, more research is necessary to determine the practical importance of this difference. While it is ideal to feed fresh, high quality colostrum, it is still recommended to feed high quality frozen colostrum if high quality fresh colostrum is not available.

CONTINUING SUCCESS AFTER COLOSTRUM
Whole colostrum, however, is the starting point to healthy calf growing, calf nutrition is another frequent weak point related to disease prevention. For years, we have been underfeeding milk, hoping the calf will consume concentrate quicker. However, new research has shown that “intensified” milk feeding is not only associated to more milk production in first and second lactation cows but also having stimulating an immune responses in calves. This opens the door for improvement by increasing the quantities we traditionally feed our calves, especially during cold weather.

Neal Anderson from the Ontario Ministry of Agriculture proposed a new intensified milk feeding system using acidified milk, where calves are allowed to have free access to milk. Milk is delivered on-demand to satisfy a calf’s inborn need for suckling, starting off with several meals per day consisting of small volumes per meal. These volumes would increase to satisfy health, maintenance and growth.

Acidified milk or acidified milk replacer can be stored at room temperature and allows producers to mix batches at one- to three-day intervals to save on labor without risking decomposition. Nonetheless, this concept comes with a completely different rearing philosophy, where not only are loud bawls and suckle feeding signs of hunger but of good health.

Automated feeding and group housing are desired characteristics of this system too. Socialization in pairs or small groups benefits calves, said the researcher. Group housing allows calves to see and mimic behavior, including suckling, which may be the reason for greater milk intakes and gain compared to rearing calves in single pens. In some European countries, legislation has forced the adoption of group rearing systems. In Canada, recommended best practice calls for a minimum total daily intake of 20% of...
body weight in whole milk (or equivalent nutrient delivery via milk replacer) until 28 days of age.

Since body weight increases daily, free-access feeding (cont’d from page 1) or use of automated feeders with simulated free-access programming may be the easiest way to adopt the new feeding recommendations. Nevertheless, management is not the easiest, warm ambient temperatures may convert the acidified milk to cheese and cold ambient temperatures may reduce intake. In addition, excessive stirring may convert milk to butter. As a result, a completely new system will need to be well-tested before changing our traditional management. This comes without mention to greater concerns of disease spread in co-mingling calves if prevention, hygiene, management and ventilation are not the optimal. Further information can be found on the OMAFRA web page (http://www.omafra.gov.on.ca/english/livestock/dairy/calves/index.html).

AFFECTS ON FUTURE PERFORMANCE
Michael Van Amburgh from Cornell University refers to the “lactocrine hypothesis”, as a concept that has been recently introduced and describes the effect of milk-born factors (including colostrum in this definition) on the epigenetic development of specific tissues or physiological functions. Thus, the neonate can be programmed maternally and postnatally to alter the development of a particular process, explaining future lactation performance. It is not well understood if the future lactation response in calves fed an intensified milk feeding system is a function of total nutrient intake as a calf or if there are are factors in whole milk that are responsible for the developmental function.

Nevertheless, investigations suggest that the long-term milk response is related to protein synthesis, thus energy intake above maintenance coupled with adequate protein and amino acids are essential for the signaling mechanism important for long-term changes in productivity. Work from Faber et al. (2005) demonstrated that the amount of colostrum provided to calves at birth significantly influences pre-pubertal growth rate and showed a trend for milk yield through the second lactation.

Other related studies have demonstrated that calves fed maternal colostrum have significantly higher feed efficiency compared to calves fed serum-derived colostrum replacement. Since the IgG statuses of both treatments were nearly identical it suggests that other factors in colostrum other than IgG’s were important in contributing to the differences (hormones, growth factors).

Similarly, calves fed 4 liters of colostrum and ad libitum intake of milk replacer had significantly higher average daily gains (pre-weaning and post-weaning) than calves fed 2 liters of colostrum and ad libitum intake of milk replacer. Therefore, logically you can conclude that if colostrum induces changes in feed efficiency, the first feeding can possibly affect future milk production too.

Keep working hard in the traditional concepts of colostrum and healthy calf rearing, but know new research is being done in this area, driving new tendencies in the near future. The ABS Technical Service team will be open for your questions and glad to assist you in achieving success!