

特別講演要旨

Nutrition and Management to Optimize Calf Health, Growth, and Future Productivity

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The early life period is critical for getting calves off to a good start and allowing them to reach their potential for future productivity. Colostrum management is the cornerstone of successful calf rearing. The key is to provide an adequate quantity of high quality colostrum as quickly as possible after birth, and to ensure that stringent sanitation procedures are followed at each step. The guideline used for many years was that calves should have blood immunoglobulin G (IgG) concentration >10 g/L at 24 – 48 hours of age. However, many calf raisers achieve this goal but still suffer from excessive calf morbidity. Recently an expert group established new guidelines for colostrum adequacy (Lombard et al., 2020). The four categories based on calf blood IgG concentration are excellent (≥ 25.0 g/L), good (18.0 – 24.9 g/L), fair (10.0 – 17.9), and poor (<10.0 g/L). These categories are highly correlated with calf mortality and morbidity and provide a new standard for evaluation of colostrum management.

Part of the effect of better colostrum management results from intake of nutrients and growth factors from colostrum. Colostrum is a rich source of protein, fat, minerals, and vitamins compared with mature milk. The carbohydrate and fat composition is different from mature milk. Colostrum is also rich in hormones such as insulin and insulin-like growth factor 1 (IGF-1), cytokines, immune proteins, growth factors, and other bioactive substances. The role of many of these compounds remains to be established, but the mother provides a host of signaling compounds to the calf through colostrum. Calves must consume adequate colostrum in order to be able to take advantage of greater nutrient supply in milk or milk replacer to grow more rapidly.

Recent research has indicated that calves benefit from being fed the transition milk that follows colostrum production. This milk still has greater concentrations of hormones and growth factors, as well as the transitioning nutrient composition between colostrum and milk. While the logistics of this practice become difficult on larger farms, the practice looks promising.

The amount of milk or milk replacer fed to calves has increased tremendously in the last 10 years. Calf growth responds linearly to increasing milk allowance up to ad libitum intake, with improved feed efficiency. Research has shown that calves exhibit signs of hunger and distress when milk intake is <8 L/d. Practices important for feeding more milk include weaning at a later age (8 wk or later) and weaning gradually over at least a 10-day period. Step-down programs that focus on feeding large amounts of milk early in life followed by progressive decreases in milk volume beginning at around day 35 of age work well to smooth the transition to dry feed. Weaning can occur when calves consume at least 1.3 kg/d of starter for 3 consecutive days. Water availability is critical for starter intake and utilization, and should be provided from the first week of life even in cold climates.

A high quality, palatable starter concentrate should be provided to calves in small amounts from the first week of life, and should be available for ad libitum consumption at all times. Recent research has shown that with

intensified liquid feeding programs a starter with 25% (DM basis) CP provides less fat in body tissue gain and greater growth of the critical gastrointestinal tract and liver tissues than a starter with 20% CP. A small amount of chopped forage (2 – 5% of the starter grain) often improves overall intake and feed efficiency, but free choice forage should not be provided until about 6 months of age. Conditions in the undeveloped rumen are not favorable for fiber digestion until the absorptive papillae are developed, which helps to maintain the rumen pH at > 6.0.

After weaning calves should continue to receive the starter feed for ad libitum intake, with no more than 5 to 10% chopped forage included. Once calves have adjusted to the weaning transition, a grower concentrate can gradually be substituted for the starter mix.