TECH TALK

Give your calves the best start

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Feeding calves high quality colostrum in a timely manner greatly impacts calf health and ultimately, farm profitability. The provision of a dry cow mineral lick can significantly boost colostrum quality and passive immunity transfer.

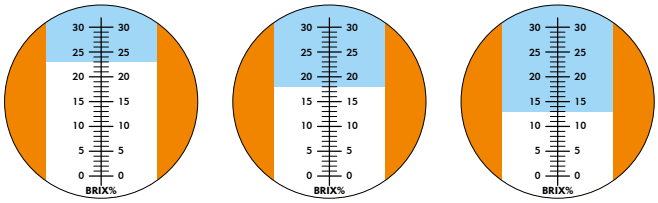
About colostrum

High quality colostrum provides newborn calves with the building blocks of a healthy immune system. Colostrum contains immunoglobulins that are produced by the cow in response to pathogens that she has been exposed to during her lifetime. When provided to a calf in the first 12 hours of life, the calf will develop an immune response to these same pathogens and thus provide a passive immunity to protect it until they can develop their own active immunity. Colostrum isn't just a rich source of protective antibodies – it also contains a range of vital hormones, proteins and other nutrients. Optimal colostrum intake has been shown to directly influence average daily weight gain of dairy calves during the first 56 days of life. This has a range of flow-on benefits, not the least being improved calf survival, lower risk of disease, lower veterinary costs, lower cull rates and a lower age at first conception. In effect, a healthy start to life strongly influences the calf's ability to reach its full genetic potential and higher lifetime milk production.

Measuring colostrum quality

The first step in insuring calves receive adequate passive transfer is to measure colostrum quality. This can be done quickly and easily on-farm using a Brix refractometer, which provides accurate results regardless of the temperature and frothiness of the sample. A Brix refractometer provides an approximate measurement of igG concentration, expressed as a percentage (Figure 1). A reading of 22% equates to approximately 50 g/L of igG and is considered the 'cut-off' for quality colostrum.

Figure 1. Colostrum quality as viewed through the eyepiece of a Brix refractometer.



23% BRIX HIGH QUALITY COLOSTRUM | 18% BRIX POOR QUALITY COLOSTRUM | 13% BRIX VERY POOR QUALITY COLOSTRUM

Feeding colostrum

The ability of the calf's intestine to absorb large antibody molecules begins to decrease rapidly within six hours of birth and stops completely within 36 hours of birth. In order to achieve successful passive transfer, a minimum of 4 L of high quality colostrum (≥22% Brix) must be offered to the calf within 12 hours of life (Table 1). Colostrum containing lower levels of immunoglobulins must be offered in greater quantities to achieve passive transfer.

Measuring passive transfer

The process of achieving passive immunity is referred to as passive transfer. Feeding poor quality colostrum and/or delayed intake means calves will not receive sufficient levels of immunoglobulins (i.e. ≥10 mg/mL serum igG levels or 52 g/L serum protein) to achieve passive transfer. Measuring the serum igG levels of calves can provide valuable feedback to the efficacy of your colostrum management program. If you are considering measuring your progress, blood samples should be collected from calves between aged between 36 and 60 hours old. Once the serum is separated, a Brix Refractometer may be utilised to assess the sample. A Brix reading of at least 8.4% indicates successful passive transfer. Note that dehydration may result in high levels of protein concentration and thus the false assurance of successful passive transfer. Check calves for symptoms of dehydration (e.g. dry nose, mouth and/or sunken eyes) before testing. The so-called 'tent test' is a good way to check for dehydration. Pull up a fold of skin on the neck and quickly release. Well-hydrated skin will immediately return to its previous position, whereas skin that takes a few seconds to return to its previous position may indicate the calf is dehydrated. Providing blood samples are collected within the correct time frame and calves are not dehydrated, the Brix refractometer has been shown to achieve over 94% accuracy in determining successful passive transfer.

Table 1. Recommended administration rates and timing of colostrum.

Brix reading	Comments	Volume and timing
≥22%	High quality colostrum. Ideal for increasing immunity in newborn calves.	2 x 2 L within first 12 hours of life.
18–22%	Medium quality colostrum. Only feed to newborn calves if no alternative is available. Higher volumes will be required to deliver adequate igG levels to the calf.	2 x 3 L feeds within first 12 hours of life.
≤18%	Poor quality colostrum. Not suitable for feeding to newborn calves. Consider feeding to calves that have already received two feeds of high-quality colostrum and are more than two days old. This colostrum is not being fed to increase immunity but as a source of nourishment.	As required.

CopRice model farm

CopRice operates a 'model farm' in northern Victoria to examine the effectiveness of integrated nutritional strategies and new formulations under 'real world' conditions. Each year, our nutritional team implements dozens of projects that aim to optimise animal health, fertility, productivity, environmental sustainability and profitability. With our model farm partners, the DeCicco family, CopRice nutritionists began measuring colostrum quality in the model farm herd in spring 2019. A total of 89 cows were milked within 12 hours of calving and colostrum quality was measured using a Brix refractometer. The Brix content of the colostrum samples ranged from 12% to 34%, with 47% of the samples assessed to be high quality (≥22% Brix), 30% medium quality (18–21% Brix) and 12% poor quality (≤18% Brix). High quality colostrum was fed to newborn calves as two 2 L feeds within 12 hours of life. Serum samples were then collected from calves to assess the rate of passive immunity transfer using a Brix refractometer. Impressively, only 9% of calves demonstrated failure to passive transfer, well below the published industry level of 30%.

Managing nutrition to improve colostrum quality

CopRice nutritionists then considered steps that could be undertaken to further improve colostrum quality, such as mitigating heat stress and ensuring close-up cows received the very best nutrition during colostrogenesis (i.e. prepartum transfer of immunoglobulins from maternal circulation into mammary secretions). Dry cow management should aim to assist the cow in maintaining its body condition and improve her general health during late gestation. This ensures that the cow has adequate body reserves for early lactation. A good nutrition program should replace essential macro and micro-minerals lost during the previous lactation to support tissue regeneration, mammary involution, boost immune function, and most importantly, boost the production of quality colostrum. During the summer months, pastures often lack sufficient levels of essential nutrients. CopRice Lac Cycle Dry Cow Mineral Lick was offered to the autumn-calving portion of the model farm herd from drying-off through to three weeks before calving. Fed ad-lib, this lick contains a rich source of high-performance vitamins and natural and organic macro and micro-minerals. Nutrients include calcium, magnesium, phosphorus, sulphur, sodium, chlorine, cobalt, copper, chromium, iodine, manganese, selenium, zinc, iron and vitamins A, B1, D3 and E.

Autumn 2020

Of 78 individuals who calved in the autumn of 2020, 74% produced colostrum with a Brix reading of greater than 22%, a 27% improvement on the spring calving group (Figure 2). The Brix content of the colostrum samples ranged from 15% to 38%, with distribution heavily weighted to samples that tested above 22%. Care was also taken to ensure that collected colostrum was fed to calves within two hours of calving, due to the fact that the concentration of immunoglobulins is highest immediately after calving and decreases over time. Unfortunately, covid-19 regulations prevented the collection and analysis of serum samples. CopRice will continue monitoring colostrum quality and passive immunity transfer in Spring.

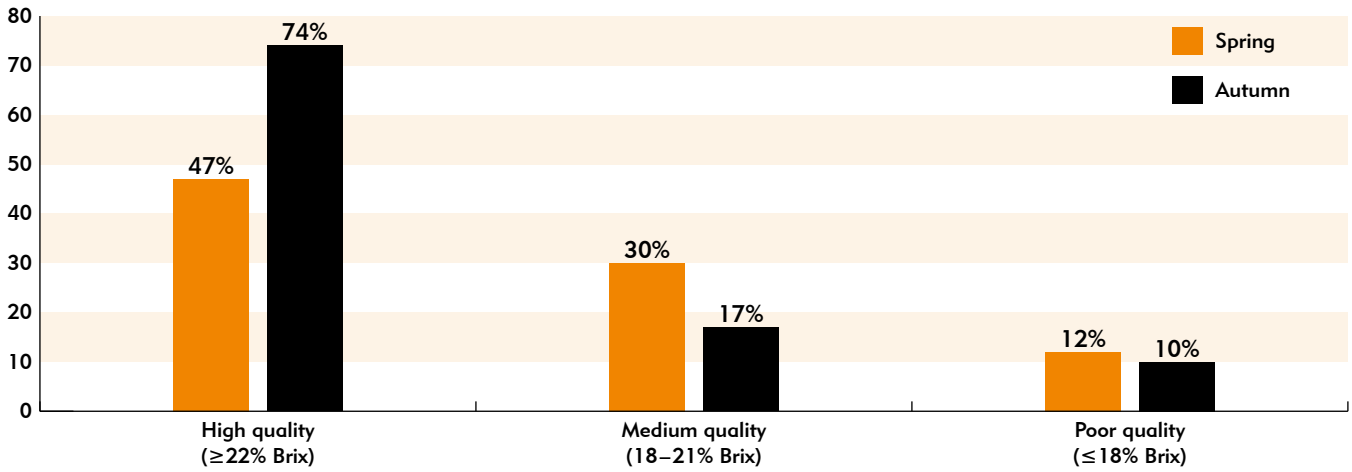


Figure 2. Measured colostrum quality in model farm herd.

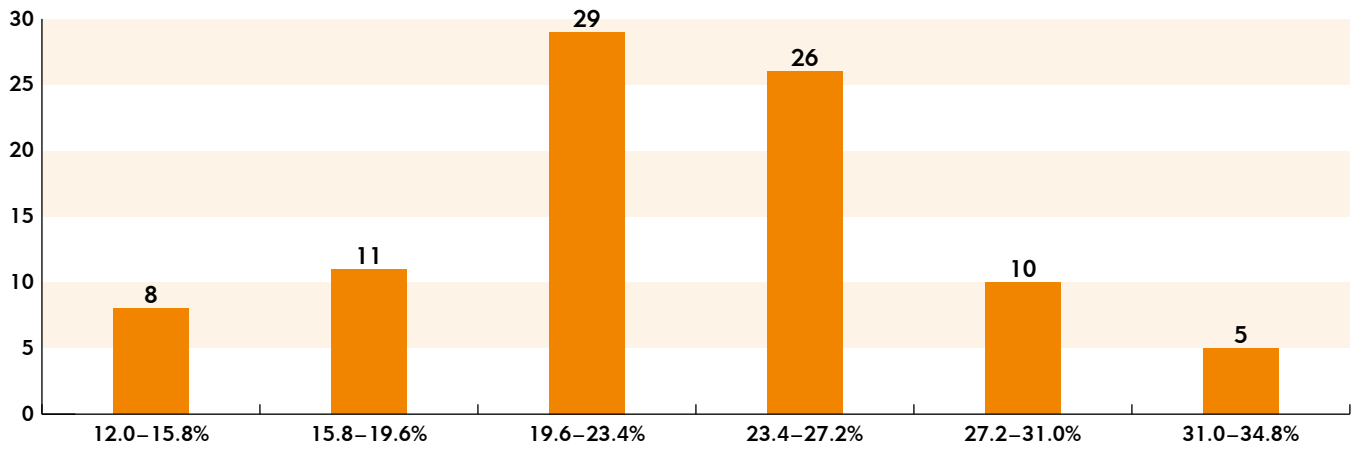


Figure 3. Distribution of measured colostrum quality in model farm herd, Spring 2019.

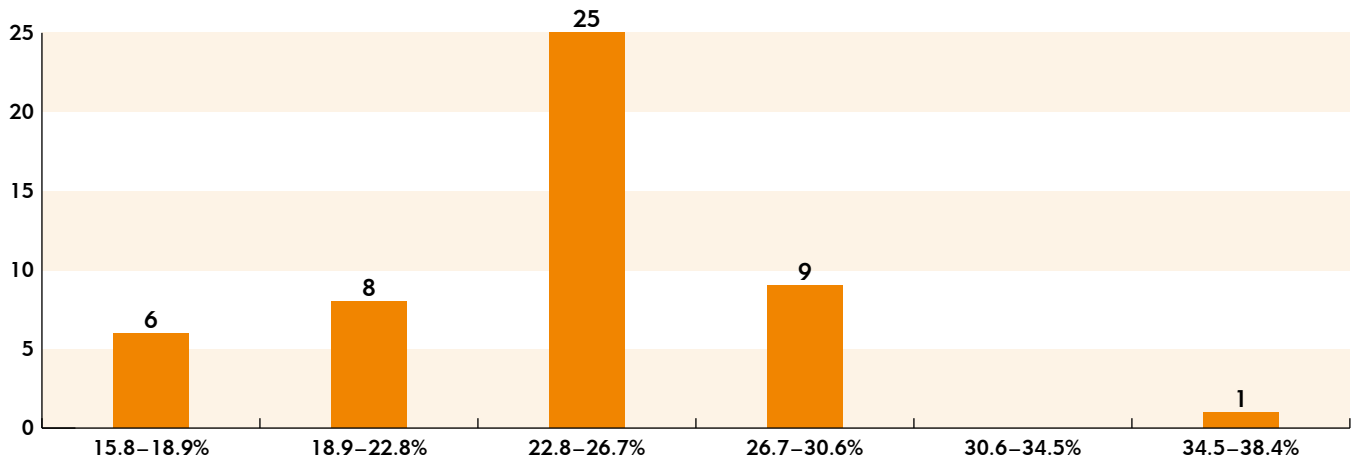


Figure 4. Distribution of measured colostrum quality in model farm herd, Autumn 2020

Your CopRice nutritional advisor can show you how to measure colostrum quality using a Brix refractometer and implement nutritional strategies to optimise colostrum quality. Likewise, your veterinarian can show you how to collect blood samples from the calf to test blood serum protein levels.

CopRice Model Farm Manager, Ellen Fitzgibbon, is an accredited advisor for the Dairy Australia InCalf Program and a committee member of the Australian Association of Ruminant Nutrition. Originally from north-east Victoria, she graduated from La Trobe University with a Bachelor of Veterinary Bioscience (Hons), majoring in ruminant nutrition and reproduction. Ellen's research on markers of fertility in colostrum was awarded Ag Institute Australia's Richardson Memorial Award in 2015 for outstanding contribution to agricultural research.