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Cattle Colostrum Management

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- So much more than immunoglobulins

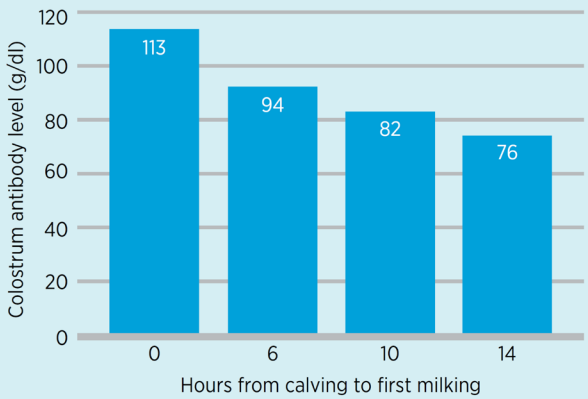
Colostrum is the term given to the form of first milk secreted by cows during the first few days post-calving. It not only contains immunoglobulins (specifically IgG), but also multiple hormones and growth promoters such as growth hormone, insulin-like growth factor (IGF-1), leptin, prolactin and relaxin. Colostrum also contains more fat and protein, and less carbohydrates than milk.[1]

The importance of colostrum intake has long been known but ensuring that calves receive adequate colostrum in modern-day farming systems remains a challenge. One way of trying to overcome this challenge is to have a colostrum management plan focusing on the 3 Q's.

The 3 Q's of colostrum management:

1. **Quality**. Colostrum with a high quantity of antibodies, as well as low bacterial counts, is essential. Various factors can influence the quality and include collection soon after calving (Fig. 1) and collection from multiparous animals and/or animals which have been part of a good immunisation program etc.[2,3] Hygienic and correct collection/storage are essential in keeping bacterial counts low. Pasteurisation (60°C for 60 minutes) of colostrum will also improve hygiene and significantly reduce bacterial counts, without affecting the quality.[3] In fact, a study (Kryzer, 2015) demonstrated a significantly improved apparent efficiency of absorption by calves, and higher final serum IgG levels when measured at 24 hours of age, compared to calves that received unpasteurised colostrum.[3] Average total bacterial counts (TPC) should be below 100,000 cfu/ml.[2,3] This may be achieved in unpasteurised colostrum by feeding right away or freezing/ refrigerating within an hour. Frozen colostrum can be stored for up to 1 year and overheating during the thawing process should be avoided (not higher than 60°C). Refrigerated colostrum can be kept for up to 2 days, or up to 6 days with potassium sorbate added.[3] Pasteurised colostrum can be kept refrigerated for at least 8 to 10 days.[3]

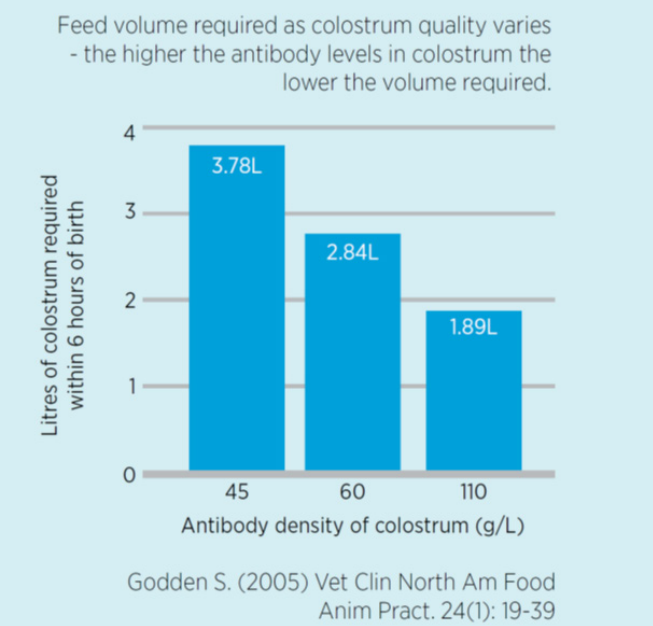
Antibody levels in colostrum gradually decline after calving. Colostrum should be collected or the calf suck as soon as possible after calving.



Moore M. *et al.* (2005) J Am Vet Med Assoc 226(8): 1375-1377

2. **Quantity**. The quantity required is dependent on the antibody concentration of the colostrum in question (Fig. 2).[7] The quality can be estimated using a colostrometer, which uses specific

gravity to estimate IgG content and the required amount of colostrum (specific gravity >1.050 approximates IgG concentration >50 g/L IgG). Current recommendations are to feed 4 litres of colostrum to new-born calves, followed by 2 litres every 12 hours for the next 3 days if possible.[2,3] The method of colostrum feeding also plays an important role in the quantity of colostrum received by the calf. Hand feeding calves early with a nipple bottle or oesophogeal feeder overcomes this issue.[3]



3. Quickly. Colostrum intake of the 4 litres recommended above should occur as early as possible (1- 2 hours) in the new-born calf but must happen within 6 hours of birth.

From 6 hours onwards, there is a progressive decline in the exceptional process of non-selective absorption of large molecules such as immunoglobulins by enterocytes. By 24 hours the process is completely "closed".[3]

Monitoring systems to determine calf colostrum intake are also essential in any management plan. To achieve a successful passive transfer of immunity, a minimum of 100g of IgG is required in the first feeding, preferably more.[3,4]

Herd-based tests using a hand-held refractometer, checking serum total solids (STS), are useful and show good correlation serum IgG. Serum samples can be taken between 6 hours post colostrum intake and 7 days of age, with a minimum of 12 calves being tested.

The target serum IgG level is 10 mg/ml, which correlates to 5.5 g/dL of serum protein concentration. Table 1 illustrates how to interpret the results from the herd test.[3,4]

Table 1

Herd-based testing for failure of passive transfer

No. calves <5.5 g/dL total serum protein	Percentage of calves tested	Interpretation
0 out of 12	0%	FPT is not a herd problem
1 out of 12	8.30%	FPT is not a herd problem
2 out of 12	16.70%	Borderline concern for FPT
3 out of 12	25%	Borderline concern for FPT
4 out of 12	33.30%	FPT is a problem
5 out of 12	41.70%	FPT is a problem
6 out of 12	50%	FPT is a problem

McGuirk S. (2004) Vet Clin North Am Food Anim Prac. 20:593–603

Failure of Passive Transfer

When calves do not receive enough colostrum (IgG), the term Failure of Passive Transfer (FPT) is used to describe this. Several research studies conducted have documented that an FPT results in increased mortality/morbidity, decreased calf growth rates, increased culling during first lactation and decreased milk production in the 1st & 2nd lactation.[2]

High rates of FPT have been reported in calves left to suckle the dam naturally. The potential reasons for this are numerous, such as; first-time mothers, mastitis, injury or illness.

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Future life productivity

The reason for the above does not only have to do with the failure of passive transfer (of course the increased mortality and morbidity would), but the other production parameters relate to the "other" contents of colostrum. Immunoglobulin concentration in bovine colostrum has always been the standard measure of colostrum quality, with most of the focus on the benefits attributed to the IgG's present and less so to the growth factors, such as IGF-1, responsible for gut development in the calf.[1]

Colostral IGF-I has been thought to play a key role through the stimulation of mucosal growth brush-border enzymes, intestinal DNA synthesis, increased villus size, and an increase in glucose uptake.[3] Monitoring FPT (IgG's) in calves allows a simple way to indirectly measure other growth factor intakes, correlating to future production. Having said that, even though the target of passive transfer may be attained (10 mg/ ml serum IgG @ 24h) by giving 2 litres of poor quality colostrum (Morin et al. 1997), more colostrum will be better. This would be due to a higher intake of IgG, various growth factors, hormones and cytokines. The effects of colostrum on future life productivity have been clearly demonstrated in multiple studies. Faber *et al* (2005) ran a study that gave Brown Swiss heifers either 2 litres or 4 litres of colostrum at birth, followed by the same management procedures thereafter.[5]

A few important observations were made from the study:

- Those animals fed 4 litres gained significantly greater average daily gain (ADG) compared with herdmates fed 2 litres (1.03 kg vs 0.8 kg; P <0.001).[5]
- Animals fed 4 litres of colostrum at birth produced significantly more milk compared with those fed 2 litres at first and second lactations respectively (P<0.05) when lactation records were adjusted as 305-d mature equivalent (ME).[5]
- Overall, feeding an increased volume of colostrum at birth resulted in an extra 550 kg's of actual milk produced over the two lactations.[5]

While we may focus on passive immunity transfer when we talk about colostrum, a quote by Fernando Soberon summarises the reality quite well.

"While Ig's are important, colostrum provides the newborn calf with much more than Ig's. Components of colostrum are important signals to the neonate from the dam that enhance feed efficiency and nutrient utilisation, along with appetite for long-term productivity" [6]

Focusing on these other factors when discussing colostrum with your clients may help cement the recommendations that you have been preaching to them about for years, resulting in healthier and more productive animals in the future.

References:

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Events / Gebeure

2019 Faculty Dance

Jade Anthony

Faculty Dance is an annual event organised by the students of Onderstepoort Faculty of Veterinary Science, University of Pretoria.

This annual event is hosted in April and involves an evening where all veterinary and para-veterinary students are invited to take part in celebrating the years completed together and the years to still look forward to.

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