Using calf milk replacer instead of cow's milk for better calf rearing

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Calf rearing management in the first few months of life has a considerable impact on growth, development, weaning age and ultimate (lifetime) production. For healthy calf rearing, the feeding regime is very important.

This starts with the supply of colostrum right after birth and the subsequent choice for either calf milk replacer or cow's milk. This article aims to provide more information about good colostrum management and some answers to why feeding calf milk replacer has many advantages compared to cow's milk.

Calves drinking from teat-buckets.

Colostrum

When a calf is born the immune system still has to be built up. This starts the first two days after birth with the intake of colostrum. After a calf is born it is important to milk out at least four litres of the first, high value, high density colostrum from the cow.

This good quality colostrum, with high levels of antibodies, should be given to the calf immediately or up to two hours after birth.

There is no transplacental passage from immunoglobulins towards the calf, and only the first 6-8 hours after birth will larger proteins be capable of passing the intestinal wall. From six hours after birth the production of hydrochloric acid starts in the abomasum, which decreases the efficacy of colostrum.

Besides this, the amount of antibodies in the colostrum rapidly decreases in time (Fig. 1).

The size of the abomasum is around 5% of the body weight. This means that a calf of 40kg body weight will have an abomasum that can hold two litres.

When feeding more colostrum than those two litres, the surplus of colostrum will end up in the rumen. For that reason colostrum should be given a minimum of three times a day in portions not exceeding 5% of body weight.

Feeding the colostrum with a teat-bucket will also prevent the colostrum from leaking into the rumen by prohibiting failure of the oesophageal groove reflex (Fig. 2).

In total a calf needs an amount of between 150-200g of antibodies. Using a measuring device for colostrum density, the exact quantity of antibodies in the colostrum can be measured. Good quality colostrum contains around 50g of antibodies per litre. A rule of thumb could be to feed in total 10-15% of the body weight of the calf. When more colostrum is available, the remainder could be acidified with 5-10% yoghurt or buttermilk and poured into a teat bucket for the calf.

It is advisable to freeze any left-over first colostrum to keep a certain amount in stock in case dense colostrum is insufficiently available. Frozen colostrum can be kept for one year and whenever needed can be heated 'au Bain Marie', preventing denaturation of the proteins at high temperature.

After feeding colostrum farmers have to make a choice between cow's milk and calf milk replacer to feed their calves. Many farmers tend to believe that feeding cow's milk is a more natural way of rearing a calf and, moreover, feeding cow's milk is often considered to be a good way of getting rid of excess milk (for example, milk above quota, antibiotic milk and milk with a high cell count). Nevertheless, feeding calf milk replacer has many advantages compared to cow's milk.

Calf milk replacer

The advantages of using calf milk replacer include:

- **Optimal levels of vitamins, minerals and trace elements.** The composition of cow's milk has changed over decades of breeding. The breeding objective towards a larger quantity of milk with a higher fat and protein content has been reached, but the level of vitamins, minerals and trace elements did not increase accordingly.

At this moment the amounts of vitamins and minerals in cow's milk, especially vitamins A and E, iron, manganese, magnesium, copper and cobalt do not comply with the needs of a young calf (Fig. 3).

Due to the ample level of vitamins, minerals and trace elements in calf

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Fig. 1. Colostrum quality and permeability of the intestinal wall.

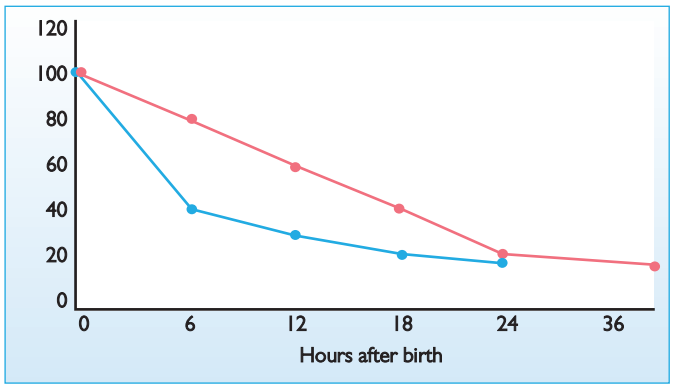
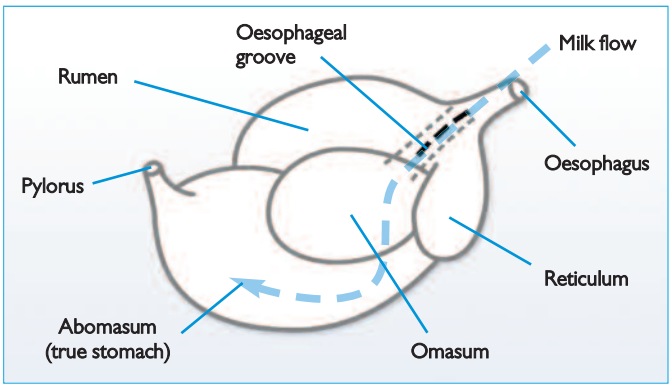


Fig. 2. Oesophageal groove reflex.



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milk replacer being in harmony with the calf's needs, there is no risk of deficiencies and there will be more resistance against disease.

● **Better development of the rumen.** Cow's milk has a higher fat content compared to calf milk replacer and besides has to coagulate and to be pre-digested in the abomasum, which takes 5-8 hours.

These factors are responsible for the fact that consumption of cow's milk leads to earlier saturation and does not encourage the calf to eat concentrates and roughage. In practice, this means that it takes longer to wean a calf fed cow's milk or, in case of early weaning, will lead to a severe weaning check.

Diluting cow's milk with water to decrease the fat content is dangerous, because the casein content will also be reduced, which initiates a risk of poor coagulation. Skimming the milk to decrease the fat is also a risk, because with the fat the fat-soluble vitamins will also be removed.

● **Safer product and easier to conserve.** Cow's milk has a much higher pH (around 6.8) compared to calf milk replacer (between 5.6-6.4). Due to acidification, calf milk replacers help to reduce problems at gut level and assist in a proper conservation of the product.

● **Free of antibiotics and pathogens.** Some farmers feed antibiotic milk or milk with a high cell count to their calves. When feeding antibiotic milk this will have an impact on the bacteria in the gut, often leading to negative effects on digestion. Moreover, when feeding sub dosage levels of antibiotics for a longer period of time, this could lead to resistance of certain bacteria to those antibiotics.

In the long term this might have an effect not only on the health of the calf, but also on human health. A higher cell count, due to for example paratuberculosis (Johne's disease), salmonella and E. coli, can lead to increased health problems (such as diarrhoea) and may also decrease pre-weaning growth.

● **Ideal drinking temperature and suitability for drinking machines.** When cow's milk is fed to calves directly after milking, the temperature is always lower than the required 40-42°C. When such low-temperature milk is fed in a bucket, the oesophageal groove reflex will not work properly and milk will leak into the rumen. Due to the limited conservation properties of cow's milk, calf milk replacer is more suitable for drinking machines, because it is always provided fresh.

● **Always a balanced milk of a constant composition.** Due to ingredients and nutrients being at a designated level, the quality of a good calf milk replacer is guaranteed. Because of this balanced composition no additives are needed.

● **Attractive economics.** Although the price of cow's milk will fluctuate, calf milk replacer in most cases will be cheaper than cow's milk. Based on calculations for a farm with 100 milk cows and a turnover rate of 30%, the costs of feeding calf milk replacer will be around €1,000 cheaper compared to cow's milk. When considering other factors like optimisation of calf rearing and shortening of the total calf rearing period with one month, an extra advantage of €1,250 is feasible.

When feeding cow's milk to calves, pasteurisation and purification by UV light are methods which are sometimes used to improve the quality of the milk. With pasteurisation the number of bacteria in the milk will be reduced, however levels of vital components like antibodies, immunoglobulins and vitamins will be reduced as well. Furthermore, a heavy bacterial load in waste milk will not be completely eliminated, and surviving bacteria can grow rapidly in warm milk. Moreover, the risk for paratuberculosis will not be fully reduced, nor will pasteurisation remove potential contamination by antibiotics in waste milk.

When using purification with UV light, paratuberculosis will also not be completely reduced. ■

Fig. 3. Amount of vitamins and minerals required for calves and their availability in cow's milk.