

More is not always better when it comes to protein in calf milk replacers

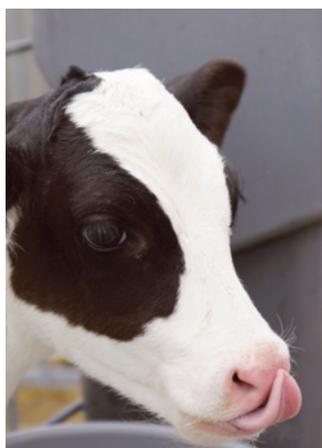
The standard rearing program – born in the USA – has been a 20/20 calf milk replacer (CMR) fed at a ration of two litres twice a day. As research shows that increasing pre-weaning growth positively affects lifetime cow performance, the focus is to achieve a higher growth in the first eight weeks of life.

by Kelly Vermeer MSc,
International Product Manager,
Joosten – young animal nutrition,
The Netherlands.
www.joosten.nl

Attempts to improve growth have led many companies to offer replacers containing up to 28% protein. However, more is not necessarily better when it comes to the crude protein level in calf milk replacers. There are four reasons why:

1. Looking at crude protein only is foolish

First, let us have a closer look at exactly what crude protein is. Crude protein is calculated after measuring the nitrogen content. Because each amino acid – the building blocks of protein – contains nitrogen, examining the total nitrogen content gives some insight into its protein level.



However, not all nitrogen refers to protein: there is also so-called non-protein nitrogen (NPN). Non-protein nitrogen, either as urea or ammonia, is of no benefit – and can be detrimental – to a non-functional ruminant, the calf. So the actual protein content of milk can differ from the amount of crude protein, according to a report from Cornell University.

Second, looking at protein only (whether crude or true), does not say anything about the different amino acids. Amino acids are the direct fuel for growth and different metabolic processes in an animal's body.

Every amino acid has its own specific function. Different protein sources, even components of milk protein specifically, have different amino acid profiles. These can be limiting in certain essential amino acids. So instead of checking protein levels, it is better to look at amino acid patterns. This has already been well researched in the pig and poultry sectors and it has allowed them to improve feed efficiency, reduce waste nutrients and minimise feed costs.

The most recent research shows that lower protein levels, but with an optimal balance of amino acids, improve growth rates in calves. Calves receive nearly all nutrients for growth from milk (replacer) and not from the small amount of starter feed they eat pre-weaning.

Research performed by Cargill using different amino acid profiles (mainly looking at lysine, methionine, threonine, arginine and histidine) in calf milk replacers shows that a CMR with a lower crude protein level (-4%), but high in specific amino acids, reflects in an increased average daily weight gain (18% increase in the first four weeks).

Calves were fed CMR (protein ranging from 20-28% and 17% fat at 0.7kg/day) and starter from day two of life until weaning. This research shows that lower concentrations of protein, but with specific amino acid profiles, gives better results and is more cost effective.

Besides formulating on amino acids, Joosten – young animal nutrition prefers to look at the total nutrient balance that a calf requires

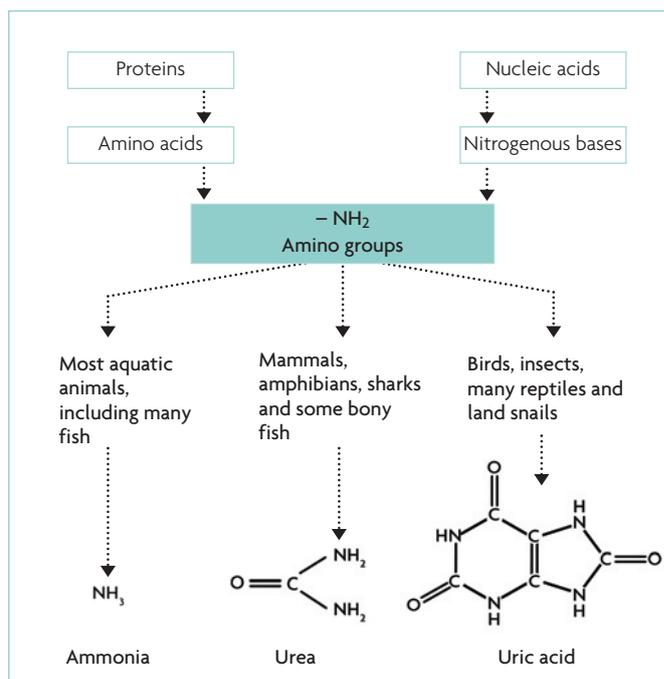


Fig. 1. The breakdown of proteins produces toxic ammonia. Mammalian livers convert this into urea to be excreted.

to grow; by only increasing the protein percentage, other important nutritional requirements for growth are not sufficiently addressed.

Translated into a concrete example: When you want to build a higher wall (calf's growth) you need amino acids that are building blocks but also 'workers' (other nutrients; like fat, minerals and vitamins).

Increasing only the quantity of building blocks will not increase the efficiency because of the lack of workers. You need both in a balanced proportion to build your wall.

2. Increasing protein levels by using milk protein is (too) expensive

On average, the optimum in quality protein vs final CMR price is 21-22%. In order to increase the protein level from 22% to 24% or even 28%, using with high quality dairy protein has a major impact on product price. The price can easily increase by €250-

400/Mt using the right quality of ingredients. To manage costs, high protein calf milk replacers often include protein sources other than dairy.

These are from vegetable sources in order to reach an acceptable price on farm. The labels will tell you that when ash levels are higher or crude fibre is above 0.0%, the product contains vegetable protein. In the first three to four weeks of life especially a calf is sensitive to digestive disorders, which are caused by, for example, high protein levels or inferior quality protein sources. For price and quality reasons, it is often much more sensible to purchase a product with 22% crude protein.

3. Protein can even become a toxin

Increasing only crude protein levels can turn protein from a nutrient into a toxin, impacting on the animal's

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	Scenario 1	Scenario 2
Concentration (g/L milk)	125	150
Crude protein level CMR (%)	25	22
Feed intake per day (l)	6	8
Protein/litre of milk (g)	31.3	33.0
Protein intake per day (g)	187.5	264

Table 1. Daily protein intake (g) of dairy calves based on two example scenarios.

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liver and therefore its health. Excess protein leaves nitrogen as a result, which is excreted by the calf at an energetic cost and is toxic (Fig. 1).

Studies have shown that calves fed milk replacers with high crude protein concentrations consume less starter, which can lead to stress during weaning and reduced rumen development. The higher amount of crude protein fed to pre-weaned calves also alters their nitrogen balance.

A recent study found that feeding a 26% crude protein calf milk replacer (compared to a 20% CP milk) reduced starter intake and lowered N efficiency by 8%. This was also found in a study by Bartlett et al. (2014), where calves fed a 26% crude protein CMR versus a 22% crude protein milk, were found to have higher levels of urea N concentration and a lower growth efficiency (G:F 0.55 vs 0.61).

This supports the fact that calves fed the 26% protein CMR consumed protein in excess of requirements, which resulted in higher AA catabolism. Excess nitrogen can be harmful for the animal, as well as the environment. It can contribute to acidification and eutrophication of water and soil. So, lowering protein input reduces nitrogen output – a 28% milk replacer creates more waste nitrogen than a 22% protein product. More waste is uneconomical and harmful for the calf and the environment.

Joosten formulate their calf milk replacers based on an optimal amino acid balance and not protein only, to help farmers achieve more efficiency and better results with care for a sustainable environment.

4. A calf eats grams of protein and not a percentage

It is well documented that achieving a high youth growth is essential for optimal development of the heifer calf. More growth can be achieved in several ways. Increasing the protein percentage is not preferred, due to the reasons mentioned above.

Joosten has the experience that implementing intensive feeding



schedules (feeding more grams of powder) is the most effective strategy in order to achieve more growth. In this way the protein intake of the calf will automatically be higher, safeguarding and also respecting the biological and nutritional balances between energy, protein, vitamins and minerals.

In Table 1 there are two scenarios to show the difference in protein intake per calf per day.

In scenario two, over 40% more protein per day is fed to the calves, with a lower crude protein milk replacer. Joosten has experience with customers in North-West Europe

who already feed Joosten Milk Elite at a dose of 160g/litre, feeding up to 10 litres/day.

This provides 1,600g of powder per day. Protein consumption is in this case 352g of protein: almost double the quantity described in scenario one and respecting the nutritional balances between the various nutrients.

Conclusion

Aiming for a high youth growth is the right strategy. However, it is better to do this with a balanced calf milk replacer, considering all nutrients and not only formulated on crude protein and fat.

Increasing growth results is most successful by simply feeding more grams of calf milk powder (especially in the first four weeks) or by increasing the number of litres fed per day, but is achieved more effectively by increasing the dry matter per litre of milk fed.

In this way, the correct balance of nutrients and amino acids is maintained but at a higher degree, thereby boosting pre-weaning calf performance. ■



References are available from the author on request