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Whey protein concentrate and skim are equivalent sources of dairy protein in milk replacers for high performing young calves fed up to 1,050g of milk solids per day.

his latest independent research finding, confirmed in a recent trial (2019) by AFBI at Hillsborough, Northern Ireland, will be well received by calf rearers traditionally wedded to skim. It has been known for more than 20

years that at a basic nutritional level, feeding a good quality whey-based milk formula results in calf growth at least as good as that achieved with high quality skim-based products.

However, calf trial work in the late 1990s only examined milk feeding levels in line with historical recommendations (of 10-12.5% of bodyweight). What about modern high milk fed calves?

According to this latest experimental study involving 80 Holstein Friesian calves fed four different milk replacers from birth to 56 days of age, well formulated skim and whey-based milk replacers certainly definitely deliver comparable animal performance.

Volac research scientist Dr Jessica Cooke says: "This new work [see Table] clearly shows once and for all that the presence of skim, and therefore the clotting effect of casein, is not the fundamental element within a calf milk formula influencing optimum calf growth.

"There was no significant difference between the different milk replacer formulations. If the important milk

components are processed at low temperatures and with careful manufacturing techniques, as they are at Volac, both skim and whey proteins will be highly digestible by the milk fed pre-weaned calf and will deliver good performance."

Importantly though, Dr Cooke stresses that good nutrition and calf performance are linked to more than just the type of dairy protein included in the finished milk formula.

She says: "Important differences in amino acid and fatty acid profiles, amount of lactose, vitamins, minerals and trace elements, processing conditions and overall digestibility also all contribute to calf performance."

Skim milk and whey protein

Skim milk powder is simply whole milk with the fat removed and contains 80% casein and 20% whey, while whey

SIX KEY POINTS

▲ Not all whey is the same. High quality concentrated whey protein (such as Volac's Imunopro[®] calf milk base) contains the valuable bioactive components for optimum performance and will give calves the best opportunity for growth and development O Dairy ingredients are the main **C** source of protein in modern calf milk replacers; these include both skim (casein) and whey

Be confident in a switch to whey for young calves



protein is a highly valuable co-product of cheese production

However, Dr Cooke explains calf rearers should always be cautious about how whey protein is described when comparing milk replacer bag labels.

She says: "Liquid whey from cheese production can be processed in a variety of ways, leaving different types of whey, including whey powder, delactosed whey and concentrated whey protein.

"Different types of whey range in both protein and lactose content. For example, whey powder only contains 12.5-13% protein, compared to Volac's concentrated whey protein, which

O can digest and utilise milk

replacers based on whey as the

as skim-based products, despite

the whey proteins not forming a

4 quality skim or whey as the

main dairy protein can both deliver

clot in the abomasum

good calf performance

main dairy protein just as efficiently

Milk replacers including good

typically contains 35% protein. Consequently, it is important to realise that any whey powder in a finished milk formula will not contribute the same level of dairy protein to a calf compared with one based on concentrated whey protein, such as Volac's Imunopro[®]."

Dr Cooke says at Volac's factory in Wales, incoming whey from cheese manufacturers using milk from British farms is concentrated through a unique, low temperature ultrafiltration and evaporation process. This concentrated whey protein contains a number of important beneficial ingredients, such as immunoglobulins and lacto-

The processing method of U the dairy protein (for both skim and whey) is fundamental for digestibility and calf performance Whey protein contains naturally O occurring bioactive proteins (for example, immunoglobulins and lactoferrin) which help support the calf's immune system and positively influence the young animal's growth and development

ferrin, which help support the immune system, growth and development of the young calf

When whey is the only source of dairy protein in a milk formula, no clot will form within the calf's abomasum. Dr Cooke points out that the development of a firm abomasal casein clot in calves fed diets based on skim was previously believed to benefit digestion because of the slow release of nutrients from the abomasum.

She says: "However, we now know

that the clotting effect of casein is not required for optimal calf performance. While rennin specifically breaks down casein protein, there are other mechanisms which enable the calf to digest and utilise whey proteins. Whey protein is naturally digested very effectively by the calf in the small intestine."

Processing issues

The whey fraction of colostrum and whole milk contains valuable bioactive proteins (for example, immunuglobulins and lactoferrin), which are not present in casein.

Dr Cooke says these functional proteins are essential for calf health (supporting defence mechanisms) and influence the beneficial growth of the young animal.

"However, care must be taken to minimise the protein denaturation of these valuable bioactive proteins during manufacture. More than 45 years ago it was shown that at processing temperatures of 85degC, more than 60% of whey proteins were denatured within 30 minutes, while at 65degC only 15% of proteins were denatured¹

"Fortunately, Volac's modern low temperature ultrafiltration process ensures a high proportion of the naturally occurring immunoglobulins found in

Table: Growth and health of calves fed four milk replacers differing in sources of dairy protein (skim milk powder and/or whey protein concentrate) up to eight weeks of age

	Milk replacer composition			
	66% skim	44% skim	22% skim	0% skim
Number of calves	20	20	20	20
Bodyweight (kg) at birth	40.8	41.3	41.7	41.5
Bodyweight (kg) at weaning (day 56)	73.2	74.5	71.9	73.5
Daily liveweight gain (kg/day)				
Days 0-14	0.38	0.34	0.31	0.4
Days 14-56	0.64	0.66	0.61	0.63
Number of scour episodes*	0.75	0.63	0.54	0.39
Number of respiratory episodes**	0.44	0.71	0.67	0.57

Source: AFBI, Hillsborough, Northern Ireland (2019). Notes: Milk replacer (26% crude protein; 16% fat; mixed at 150g/litre) fed at five litres/day (days 5-10), seven litres/day (days 11-34), five litres/day (days 35-49), two litres/day (days 49-55). Ad lib calf starter and water available from birth with the addition of chopped straw from day 56. *Scour episode defined as the number of sustained periods over which a calf has had scour (score of more than 2) for which it has received treatment. **Pneumonia episode was defined as calf displaying symptom of over a sustained period of time for which it received a treatment

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liquid whey are retained in the company's latest finished whey protein concentrate-based milk formulas." In summary, this means that when processed under carefully controlled conditions, both skim and whey protein concentrate-based milk replacers can deliver excellent calf performance, but on the other hand, poorly processed milk-derived protein (be it skim or whey) can have very poor digestibility and increase the risk of health issues. Dr Cooke says: "The key is to evaluate value for money carefully when purchasing a calf milk replacer Look for a proven track record of performance and recognise a precisionformulated product based on concentrated whey protein will provide everything the modern, high milk fed calf needs in early life."

UNIQUE PACKAGE FOR CALF REARERS

VOLAC has been at the heart of the UK and Irish dairy industry for more than 50 years. In that time Volac has developed into a highly trusted primary manufacturer within world agriculture and become integral to a highly sustainable, value-added national milk circle:

• About 10% of the milk produced by British dairy herds (from about 153,000 dairy cows) goes for cheese manufacture Volac invests about £45 million annually in British cheese makers by buying back more than a billion litres of their whey co-product every year. That's about half the whey produced by cheese manufacturers in England and Wales • Volac turns this valuable whey into a unique concentrated milk protein (Imunopro®) Imunopro[®] forms the basis of Volac's new precision-formulated calf milk replacers, which allow British and Irish dairy farmers to rear the next generation of high performing milking cows highly effectively

Imunopro® helps dairy farmers grow better cows more economically and sustainably. It sets calves up for a lifetime of productivity when they reach the adult milking herd. Fed correctly, following Volac milk formula feeding recommendations, this means healthier, faster growing calves; a younger age at first calving; and, ultimately, more milk produced per cow thanks to increased longevity in the herd.

For more information on Volac's Feed for Growth initiative, visit feedforgrowth.com

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