Understanding rumen protected fats in the diet

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As milk yields increase, the need to raise energy intakes to support additional production requires either higher dry matter intake (DMI), greater energy density in the diet, or both. But if DMI is constrained, whether by the genetic intake capacity of the cows and/or limitations imposed by the production system (for example low energy forage), what is needed is a way to raise the energy density of the overall diet. The aim is to increase energy intake without the need to consume more feed volume.

Fats and oils

This is where fats have such a vital role to play. Put simply, fats and oils are the most energy dense feed ingredients available, so are ideal for boosting energy content. The problem is that they can only be utilised by the rumen in small quantities when fed in a 'free' or 'un-protected' form, such as rapeseed oil or soyabean oil.

Even relatively modest quantities will coat the fibre in the rumen sufficiently to prevent access by the microbes necessary for fibre breakdown.

The result is sub-optimal rumen fermentation, reduced energy supply and a reduction in butterfat percentage.

Hence the need for rumen-bypass fats, also called rumen protected fats, which pass through the rumen without affecting fermentation, but can still be digested in the cow's intestine.

Silage quality

This winter, in the UK in particular, there was good demand for protected fats, since overall silage quality was very average, mostly around 10.5MJ ME/kg DM.

The same was true for average maize silage analyses, with insufficient sunshine to produce the starch that drives maize silage energy content, so it too was relatively low in energy.

The net result was that winter rations for high yielding cows often had an energy density of only perhaps 11.7MJ ME/kg DM, making it harder for the cow to milk to her genetic potential. So the ability to boost energy content safely by adding relatively small quantities of protected fat – typically 0.25-0.50kg/cow/day – with minimal substitution effect, was extremely valuable.

Provided the other nutrients are suitably balanced, adding 0.5kg of protected fat into the ration could raise the overall energy intake enough to support an extra 2.0-2.5 litres of milk.

Adding a starch source to raise energy intakes by the same amount would require significant quantities of cereal to be added due to its lower energy content and higher substitution effect, likely resulting in acidosis.

So, if protected fats look to be a suitable option for boosting rations this summer or for next winter, the question becomes which one to choose.

● 100% fats

The most energy dense are the 100% fats, at around 37MJ ME/kg DM. As the name suggests, these consist of fat and nothing else, containing saturated fats with a high melting point. If the melting point is 55°C, for example, compared to a rumen temperature of around 39°C, the fats will pass through the rumen still in their solid state, digested only by the fat-specific enzymes in the small intestine.

These fats have little or no impact on palatability, which is particularly important where DMI is near its limits.

● Calcium soaps

The second main group are known as calcium soap fats, and are produced by combining palm oil with calcium to produce the 'calcium soap'. The result is a complex that is predominantly indigestible in the rumen, but can still be digested in the small intestine.

● Other fats

Finally, there are a number of 50% fat products also on the market, although current pricing means these are generally poorer value than the 100% fats.

These 50% fat products usually consist of the fat– often a blend of protected fats and un-protected fats – absorbed onto a fibrous carrier.

Fatty acid profile

The final question that needs to be answered in choosing a particular product is: what job does it need to do?

Of the two most important groups, the calcium soap products generally contain a balanced fatty acid profile (i.e. they contain several different types of fatty acids), so will primarily drive yield in early lactation cows.

There is also likely to be a positive impact on body condition and a small effect on milk fat percentage. With the 100% fats, however, there are both balanced fats and those that contain a higher proportion of what are known as C16 fatty acids.

The 'C16' part of the name refers to the length of the fatty acid molecules, with this particular chain length being beneficial in promoting the production of milk fat. 100% fats with a high C16 content (over 85%) are therefore used where milk fat percentage requires a boost.

Cost:benefit ratios

Once this has been determined, the cost:benefit ratios of the various options can be considered.

Most of the protected fat products came back in price significantly last year on the back of falling palm oil prices, with Magnapac (a calcium soap product), for example, being considerably cheaper than the 100% fats Golden Flake (a balanced fat), and Butterfat Extra (a high-C16 fat). Just remember that you are buying more fat with the 100% products.

Despite recent milk price changes in the UK, payments for butterfat have not altered in proportion. As a result, high-C16 fats still remain a popular product for producers on a compositional contract, or for those who struggle to achieve butterfat minimums.

If rations lack structural fibre, or a herd is on a straightforward grass-plus-concentrates diet, butterfat levels can drop below the milk fat threshold, particularly in the spring.

In these cases, a high-C16 fat can be a valuable tool to help raise milk fat percentage. And even if a high-C16 fat is required to maintain butterfats, but you still want to take advantage of the current opportunities to boost milk output, consider feeding half as much high C16 fat, making up the remainder with a balanced fat to get the best of both worlds.

Maximise income

In the majority of cases, however, the priority in today's market is to raise yields to maximise additional income, and both balanced calcium soap and 100% fat products can provide a valuable payback.

For herds where the cows are managed as two or more groups, addition of protected fat to the diets of the early lactation or high yielding cows will clearly give the greatest benefit in terms of milk output. But that does not mean the extra energy is wasted on lower yielding animals.

The yield response may not be the same, but the additional energy supplied will still provide the cow with a boost. This may mean improved body condition and therefore potential fertility improvements, or improved butterfat content, for example.

What is clear is that in a large number of herds, yields have risen to the extent that an energy boost in the form of a protected fat will give an economic return. Just as importantly, it appears that market conditions mean that this summer, most producers will probably benefit from the additional yield available by feeding a protected fat. ■