Understanding true energy value of fats

Formulating the most cost-effective diet relies on an accurate assessment of the energy contents of feeds. As Mark Townsend, UFAC-UK Regional Sales Manager in the South and South West explains, this must involve taking a closer look at fats and fatty acids.

“When formulating a diet, one of the key building blocks is a forage analysis, allowing you to take an accurate account of the quality of forage,” Mark explains. “Daily farmers know forage quality will vary and so plan to take account of it; yet many assume all fats will provide a similar energy content when looking to build a diet. Nothing could be further from the truth.”

While the gross energy content of fats and oils is constant at 39MJ/kgDM, independent studies highlight several factors that will determine the overall ME that is actually available to the cow. These are:

- **Actual oil and fatty acid content** – fat products contain differing amounts of actual fatty acids
- **Digestibility** – the digestibility of different fats and oils vary. Saturated fats have a lower digestibility than unsaturated fats. This affects the amount actually available to the cow.
- **Mix of fats** – blends of saturated and unsaturated fats have a synergistic effect on energy availability. In simple terms, blends of oils supply around 7% more energy than a single saturated oil product.
- **The carrier** – The carrier of the oils itself has an energy value.

<table>
<thead>
<tr>
<th>Source</th>
<th>ME that is actually available to the cow.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Calcium Soap</td>
</tr>
<tr>
<td>Energy content of fat/oils (MJ/kg)</td>
<td>39</td>
</tr>
<tr>
<td>Oil content (%)</td>
<td>99</td>
</tr>
<tr>
<td>Effective energy (MJ/kg)</td>
<td>38.6</td>
</tr>
<tr>
<td>Digestibility (%)</td>
<td>47</td>
</tr>
<tr>
<td>Digestible energy (MJ/kg)</td>
<td>16.33</td>
</tr>
<tr>
<td>Synergistic effect of blends</td>
<td>0</td>
</tr>
<tr>
<td>Revised digestible energy</td>
<td>16.33</td>
</tr>
<tr>
<td>ME contribution from carrier (MJ/kg)</td>
<td>0</td>
</tr>
<tr>
<td>Overall ME (MJ/kg)</td>
<td>16.33</td>
</tr>
<tr>
<td>Dry matter content (%)</td>
<td>99</td>
</tr>
<tr>
<td>ME supplied (MJ/kgDM)</td>
<td>16.5</td>
</tr>
</tbody>
</table>

**Product dry matter** – The actual dry matter content determines energy delivered.

The table compares the actual energy supply for three common fat supplements used on UK dairy farms – a high C16 product, a calcium soap and UFAC Dynalac which is a blend of fatty acids supplied on a carrier. Dynalac has a high digestibility and an ME of 27MJ/kgDM, despite having a lower oil content. Calcium soaps on the other hand, although typically quoted as being 33MJ/kgDM, are actually only 27MJ/kgDM, mainly because of the lower digestibility. The only way a calcium soap could be a 33MJ/kgDM product is if the fat was 100% digestible.

When you also consider that calcium soaps cost around 1750 on farm and Dynalac is £575, the economic consequence is considerable. While Dynalac works out at 2.13p/MJ, a calcium soap at 33MJ/kgDM will be 2.27p/MJ. However, at 27MJ/kgDM the cost is 2.77p/MJ.

When incorporating fats in diets, work out the true ME to ensure cows receive the energy they require and calculate pence/MJ to ensure you deliver the best margins.

Managing energy balance in transition cows

The 30 days immediately before and after calving have a huge influence over total lactation performance, David Bonsall, UFAC-UK Regional Sales Manager in Scotland and the North of England, says the key is ensuring dietary energy in the immediate pre-calving and post-calving period is sufficient to minimise negative energy balance and body condition loss.

“The big challenge is getting cows that will be calving imminently to eat enough as intakes are naturally suppressed,” David explains. “As dry matter intakes fall, so cows will become short of the primary energy sources they need: glucose and glycerol. Faced with insufficient dietary energy, cows resort to the shortest route available to fulfil the energy deficit by starting to mobilise fat, hence loss in body condition.”

When cows mobilise body fat it is metabolised to glycerol which is the essential precursor of glucose. Using body fat as an energy source is, however, an inefficient way to derive glucose as well as having longer term consequences for production and, particularly for fertility.

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As a highly palatable and free flowing meal, UFAC Glycerene is a unique glycerol product specifically developed to optimise transition and early lactation performance. Being rumen inert it is a more efficient ‘source of glucose for the cow. There is no risk of acidosis when it is included in the diet. A typical feed rate for a transition cow is 500g/day.

“Ensuring transition cow receive an adequate supply of glycerol in the most effective form will help offset the risks associated with depressed dry matter intakes and negative energy balance in the crucial days leading up to and immediate post calving, which will help set cows up for a successful lactation,” David comments.

To optimise energy balance in the important days leading up to and immediately post calving, try UFAC Glycerene. The most cost-effective way to provide glycerol, it is safe to use, and is the most efficient source of supplementary glucose.
Correct oil balance will drive fertility

Swapping a straight oil product for one containing the essential omega 3 oils from marine will help improve fertility this winter according to Mike Chown, National Sales Manager with UFAC-UK.

Getting cows back in calf quickly, based on strong exhibition of heat and high conception rates with low levels of embryo mortality will be high on ever farmer’s list of priorities this winter. Research shows that ensuring cows are receiving sufficient amounts of omega 3 from marine sources and reducing the omega 6: omega 3 ratio to the optimal 4:1 in the transition and fresh calving rations, can have a significant effect on fertility success without adding significantly to diet costs.

The principle omega 3s, EPA and DHA are not supplied in most current ruminant diets, so cows have to produce them from other sources. Modern thinking in the dairy industry is to rely on producing these long chain omega 3s from the shorter chain omega 3 (C18:3) that are found in reasonable levels in most feeds but lower quantities in conserved forages.

Research proves that this is not an effective process, leaving cows short of these essential fatty acids. In addition, as previously stated, effective diets need the optimum ratio of omega 6 to omega 3s, of 4:1. UK diets generally do not achieve this ratio for two reasons. The first is that grass is low in these essential oils and they are not routinely added to compounds and blends.

The second is that the rationale for adding dietary fats is to improve energy balance and/or butterfat percentage through the addition of saturated fats such as C16:0 and calcium soaps, while omega 6 would usually be supplied in vegetable oils.

Consequently, UK diets will tend to be deficient in long chain omega 3’s which will impact on reproductive performance.

Two main roles

Omega 3 and 6 oils play vital roles in dairy cow fertility particularly with regard to progesterone metabolism which is the hormone which plays several crucial roles in fertility.

The first role is ensuring a strong follicle which results in larger, more viable eggs and increased strength of bulling behaviour. Together, these will help reduce calving to conception interval.

Graph 1 looks at the effect of adequate supplementation with omega 3 and 6 on conception rates. The red column shows the optimum 4:1 ratio, while typical UK diets are represented by the orange column.

The decrease in conception rate is an increase of around 12%.

The second role is in reducing embryo mortality. Early embryo loss is a major contributor to extended calving to conception intervals, reduced pregnancy rates and increased culling. Progesterone is the hormone intimately involved in embryo implantation. The correct levels on omega 3 and 6 stimulate higher levels of prostaglandin which together help reduce early embryo mortality.

Graph 2 shows the effect of different fat ratios in the diet on embryo mortality. Feeding the optimum ratio of omega 3 and omega 6 reduced embryo loss by over half compared to typical UK diets.

By feeding sufficient omega 3 and omega 6 at the optimum 4:1 ratio it will be possible to influence the probability of getting cows back in calf more quickly. This can be achieved by varying the ratio of fats added to the diet.

For example, if a diet was being supplemented with 300g/day of a calcium soap, a cost effective solution would be to replace 100g of the calcium soap with 100g of UFAC Omega 3 supplement which provides long chain fatty acids which are not synthesised naturally, in the quantities required for reproduction and immunity. The energy provided would be the same but the fat balance would be greatly enhanced.

With calcium soaps costing around £750/tonne and omega 3 supplement also £750/tonne the diet cost remains unchanged, although a bit more time and organisation would be required at feeding as two fats would be added.

However, the benefits in terms on better reproductive performance, reduced semen costs, improved longevity and the opportunity to reduce heifer rearing costs can be considerable.

**New rationing system will bring major benefits**

For the first time, dairy farmers can now ration their cows with a system which will allow increased precision in diet formulation, leading to improved production and better rumen health.

The NutriOpt system is the result of extensive research by Trouw Nutrition and according to Technical Director Dr John Allen, it offers several major advantages over the systems currently in use.

*"The NutriOpt system uses extra information on the rate and extent of fermentation of feed ingredients in the rumen to better predict the impact on rumen pH and health. This also allows more accurate balancing of energy and protein supply to optimise rumen performance and feed efficiency. “Unique among rationing systems, it calculates the end products of digestion available to the animal, the volatile fatty acids from rumen fermentation, the nutrients that bypass the rumen and can be used in the small intestine and energy sources produced from fermentation in the large intestine. This means the system can more accurately calculate the energy available to the cow and more closely match supply and demand to produce more cost-effective rations.

"This includes more effectively determining the supply of glucogenic and ketogenic energy which drive fertility, milk yield and milk quality. “Together these mean NutriOpt represents a major development in dairy rationing systems which will help farmers develop more cost-effective diets to boost margins."