Reduce feed costs by optimising fat digestion in broilers

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When rearing broiler chicks, the aim is for quick and efficient growth, resulting in high energy and protein rich rations. Up to 10% of the ration may consist of fat so that the required energy can be supplied.

When the fat proportion is reduced while maintaining the energy content in the ration (through more efficient fat digestion), the feed cost will decrease.

Absorption of fat

After intake of the feed, the fat goes through the stomach to the small intestine. However, this fat (non-polar) cannot be absorbed directly by the aqueous (polar) contents of the small intestine. This requires, among other things, bile salts and lipase.

The bile salts are secreted by the liver and will divide the fat into smaller fat particles (Fig. 1), increasing the total contact surface of the fat. Therefore bile salts are considered natural nutritional emulsifiers.

In a second step, the fat molecules (triglycerides) are separated into monoglycerides and free fatty acids by the enzyme lipase, secreted by the pancreas.

After this, the different reaction products are surrounded by bile salts to form micelles. These micelles can be absorbed in the small intestine and are transported, through the bloodstream, as a source of energy to the desired muscles and organs.

In young animals, and therefore also in broiler chicks, insufficient bile salts are present to decompose the fat supplied and to convert it into small micelles. As a result, not all fat is absorbed in the small intestine and is therefore lost.

The efficiency of fat digestion is also affected by the unsaturated/saturated fatty acid ratio. Unsaturated fats are better absorbed by the small intestine since they can more easily be converted into micelles than saturated fats.

Fat digestion is promoted by increasing the proportion of unsaturated fats in the fat source of the feed. One should be aware that not all fat sources are of good quality. It is therefore advisable to analyse fat for peroxide content and the proportion of free fatty acids.

A large proportion of free fatty acids in the feed is not desired since this involves drawing on a larger part of the bile salt reserve for conversion into micelles compared to monoglycerides. Ideally, fat of good quality contains less than 5-10% free fatty acids. Rancidity of fat can be prevented by a low inclusion rate of radicals. Vitamin E, ascorbic acid as well as Vitanox Feed are good candidates for preventing any oxidation.

Effective emulsifiers

Emulsifiers consist of a hydrophilic and a hydrophobic part. Their role is stabilising a mixture of two liquids that cannot normally be mixed (for example oil-water).

The most important factor that can demonstrate the efficacy of nutritional emulsifiers is the hydrophilic-lipophilic balance (HLB).

This balance has a scale ranging from 0-20 (0 very lipophilic and 20 very hydrophilic). Since the intestine is an aqueous environment in which fat needs to be dissolved, a product with a high HLB value is desired.

Therefore technical emulsifiers (lecithin, lysolecithin) are less effective in dividing fat in an aqueous environment (Fig. 2).

Vitamul will increase the fat digestion in a ration. The lower the quality of the fat (for example high proportion of free fatty acids and/or oxidation products), the stronger this effect.

The same can be said of fat with a low unsaturated/saturated fatty acid ratio (U/S ratio).

In an experiment, the metabolisable energy MEn (N-corrected) was measured in a control group and in a group where Vitamul was added to the feed.

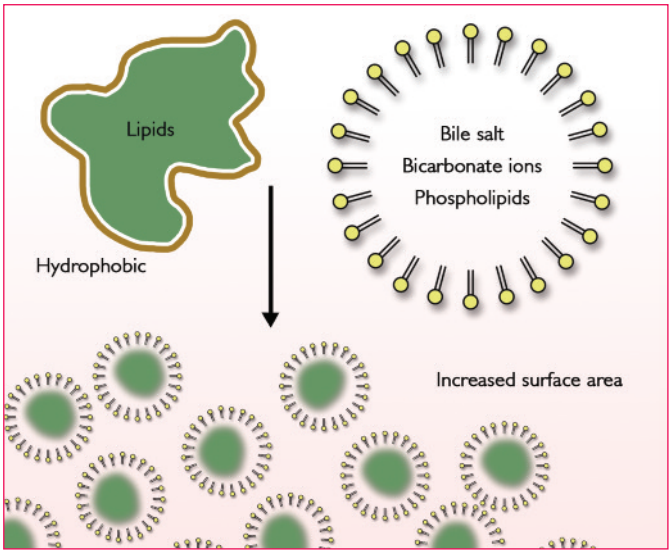

Fig. 1. Division of fat into smaller fat particles by bile salts.

In addition to a quantity of soy oil, this feed also contained a highly saturated fat source rich in free fatty acids.

This resulted in a feed with U/S = 1.6 and 20% free fatty acids. An average difference of 113 kcal per kg of absolute dry matter (ADM) was measured after adding Vitamul to the ration (Table 1).

By optimising the fat digestion through Vitamul, 45-120 kcal can be saved per kg of feed (depending on the quality of the fat source).

This may reduce the feed cost by €3-10 per ton of feed (including Vitamul).

Please note that the savings depend on the raw material prices of corn and fat. A dose of 500g of Vitamul per ton of finishing feed is recommended. ■

Fig. 2. Representation of different emulsifiers on the hydrophilic-lipophilic balance (HLB).

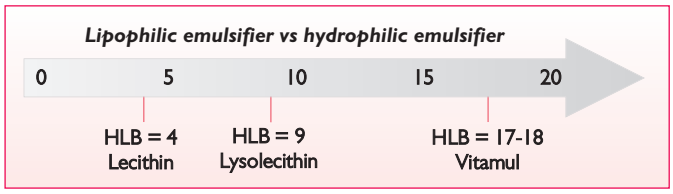

Table 1. Results after adding Vitamul to an existing feed with fat source (U/S = 1.6 and 20% free fatty acids). MEn = Metabolisable energy (N-corrected); ADM = absolute dry matter.

Experiment	MEn (kcal/kg ADM)	MEn difference (kcal/kg ADM)	MEn difference (%)
Control	3177		
Vitamul	3290	113	3.6