

Nutritional emulsifier increases digestibility, a meta-analysis

Nutritional emulsifiers are known for their effect on energy digestibility, especially in poultry. Increased fat digestion is of main focus, but the digestibility of other nutrients (e.g. crude protein) is also increased. A 'meta-analysis' was performed to determine the effects of a specific nutritional emulsifier on general digestibility of nutrients.

BY BRECHT BRUNEEL, CENTRAL TECHNICAL MANAGER, ORFFA ADDITIVES BV, THE NETHERLANDS

Total poultry production cost is highly dependent on feed cost. Efficient nutrient utilisation is therefore key. Although broilers are highly efficient in converting feed to meat, a part of the nutrients is not adequately digested and utilised but lost through excretion. Supplementing diets with a nutritional emulsifier provides an opportunity in this context, not only for the bird but also to lower the production cost. By incorporating matrix values of a nutritional emulsifier in the feed formulation programme, a cheaper feed can be obtained without impacting

performance. This type of additive is, more specifically, able to support the digestion in young birds where there is a possible lack in digestive enzymes. An emulsifier can also support digestion of lower quality fats, often the case at the end of production cycle, to formulate cheaper diets. In flocks with high pathogenic pressure it can even support digestion as certain digestive enzymes (e.g. bile salts) are prone to break down due to the effect of bacterial enzymes.

Efficiency in the gastro-intestinal tract

A wide range of emulsifiers are available in the market, but most are based on 2nd generation emulsifying molecules such as lysolecithins. Taking the hydrophilic-lipophilic balance (HLB) value into account, a well-known parameter to differentiate emulsifiers, these molecules seem less efficient to support energy digestion in the gastro-intestinal tract. To be efficient in the gastro-intestinal tract, where rather low amounts of fat are present in a huge amount of water, nutritional emulsifiers need a high HLB value. Orffa Additives has been able, thanks to day-to-day engineering, to produce a nutritional emulsifier with a high specific HLB value. Numerous metabolic studies have shown increased energy

Table 1- Meta-analysis of published faecal metabolic studies showing the digestibility enhancing effect of the nutritional emulsifier, Excential Energy Plus (added on top at 350g/ton of feed).

Not Analysed (NA) | 1) = increase of digestibility versus control group

Study	A	B	C	D	E	(Average)
Energy digestibility (AMEn, kcal/kg) 1)	+61*	+59*	+68*	+52*	+137*	(+76)
Dry matter digestibility (%) 1)	+1.78*	+0.89	+1.61*	+1.35**	NA	(+1.41)
Crude protein digestibility (%) 1)	+1.56	+0.87	+1.47	NA	+2.9*	(+1.68)
Crude fat digestibility (%) 1)	+1.49	+1.67*	+1.61**	+1.77*	+7.5*	(+2.81)
Metabolic period (days of age)	14-21	14-21	14-21	19-21	17-21	
Diet	corn, soybean meal	corn, soybean meal, meat and bone meal	corn, soybean meal	corn, soybean meal	corn, soybean meal	
Type of fat	soybean oil	soybean oil	poultry fat	soybean oil	mixed vegetable fatty acids, animal fat	
Amount of added fat (%)	3.0	3.0	4.0	4.5	8.8 (5.8 + 3.0)	
Dietary energy level (kcal/kg)	3078	3193	3266	3115	2940	
P-value	(*)P<0.05	(*)P<0.05	(*)P<0.05	(*)P<0.05	(*)P<0.05	
	(***)p<0.10		(***)p<0.10	(***)p<0.10		
Reference	(Teixeira et al. 2016, WPC, China)	(Teixeira et al. 2016, PSA, USA)	(Teixeira et al. 2016, PSA, USA)	(Teixeira et al. 2016, PSA, Brazil)	(Maertens et al. 2013, ESPN, Germany)	

1) = increase of digestibility versus control group



digestibility by this additive as well as an increased digestibility of dry matter, crude fat and crude protein. A subset of studies are reviewed here together for the first time.

Meta-analysis: Setup and results

In recent years, several faecal metabolic studies by Orffa Additives BV with male broilers (Cobb 500, Ross 708 and Ross 308) have been performed to examine the effects of the nutritional emulsifier, Excential Energy Plus. These studies have provided unambiguous results, but a quantitative (meta-) analysis of existing data was lacking. Current meta-analysis (Table 1) aims to quantify the measurable impacts of the nutritional emulsifier on the digestibility of the feed.

This meta-analysis involves 5 published metabolic trials run at various universities and independent research facilities around the world. Diets in these studies were formulated based on corn, soybean meal, wheat, meat and bone meal in varying concentrations. Added oils included vegetable oils (e.g. soybean oil, mixed vegetable fatty acids) and animal fats (e.g. poultry fat). The nutritional emulsifier, Excential Energy Plus, was always added on top at 350g/ton of feed for the duration of the metabolic period. After an adaptation period, faeces were collected at the end of the metabolic period for a number of consecutive days and analysed on energy, dry

matter, crude fat and crude protein content. Simultaneous analysis of faeces from birds fed diets without Excential Energy made it possible to calculate the specific effect of the nutritional emulsifier.

The results show that, under the specified trial conditions, the emulsifier is able to increase energy, crude fat, dry matter and crude protein digestibility to a high extent in all metabolic studies. The increase in energy digestibility seems to depend on the crude fat percentage in the diet. The application of the emulsifier in study E results in a very high increase in crude fat digestibility and can be linked to the high amount of added fat in the diet. Studies A, B, C and D show comparable added fat percentages and energy digestibility upgrades.

Saving energy and money

Energy is a major cost component in diets for high-performing animals. The nutritional emulsifier engineered by Orffa Additives BV can be used to improve energy, dry matter, crude fat and crude protein digestibility as shown and confirmed in energy-reduced validation tests. From a practical point of view, this means that nutritionists are able to formulate diets with a lower energy content and keep the same performance. This will result in lower feed costs and contribute to more economical and sustainable animal production.

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