

IMPROVING INTESTINAL HEALTH WITH TRIBUTYRIN AND ALPHA-MONOBUTYRIN

Sustainable and efficient animal production is important in poultry husbandry

However, in commercial flocks, animals are subjected to multiple stress factors such as high stocking densities and suboptimal climate conditions which makes them highly susceptible for pathogens. This results in decreased growth performance, high mortality rates and a lower profitability. The use of antibiotics is restricted due to the increasing number of resistant bacteria and therefore other solutions must be found. A dietary feed supplement which supports intestinal health by stimulating intestinal development, modulating the immune response and reducing the growth of pathogenic bacteria, thereby improving animal performance and production is of high interest.

FRA[®]melco B.V. is world leader in the production of glycerides for animal feed. Butyrate glycerides (butyrin) come in multiple forms of which tributyrin and alpha-monobutyryn are the most potent. Both tributyrin and alpha-monobutyryn derive from the esterification of butyric acid with glycerol. Depending on the reaction time, pressure and temperature, different butyrate glycerides are formed which possesses different properties. As the name implies, tributyrin consists of three molecules of butyric acid which makes it highly concentrated in butyric acid.

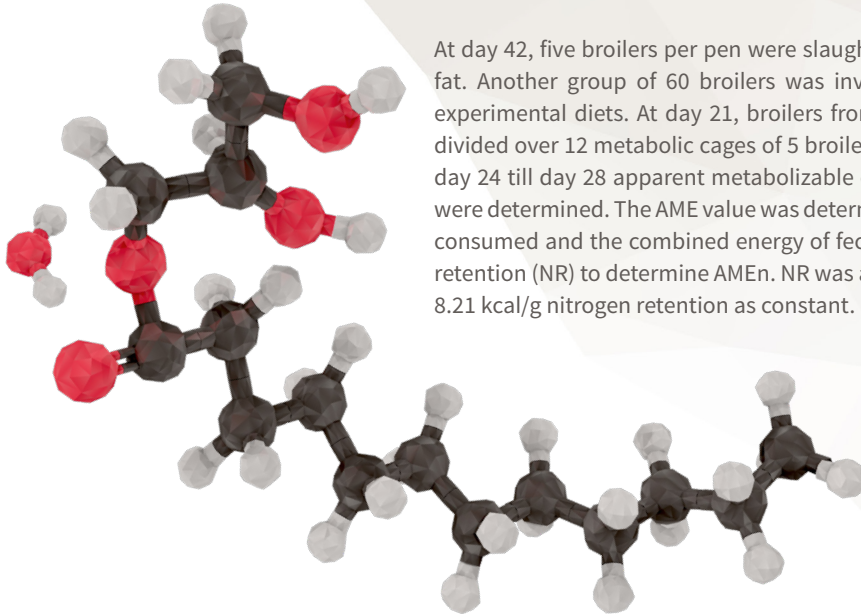
Tributyryn is a fat, which under the action of lipase will release butyric acid in the small intestine. Tributyrin has already proven to promote villi growth, gene expression of tight junction, microflora diversity and to reduce oxidative stress and inflammation. In contrast to tributyrin, alpha-monobutyryn contains only one molecule of butyric acid positioned at the first carbon atom of the glycerol backbone. This molecule can interact with the bacteria and control the pathogenic activity. Alpha-monobutyryn is also pH-independent, meaning it will not dissociate in the gastro-intestinal tract due to the pH level, in contrast to fatty acids which are pH dependent. The combined effect of tributyrin and alpha-monobutyryn (FRA[®] Butyrin Hybrid Dry) on broiler performance, intestinal health and apparent metabolizable energy (AME) was tested at Bangkok Animal Research Center.

FRA[®]MELCO



» MATERIAL & METHODS

Four hundred-thirty-two (432) newly hatched male broilers of genetics Cobb 500 were allocated to a control and treatment group with 8 repetitions of 27 animals each. A practical corn-soybean meal diet was used as basal diet. Feed of the treatment group was supplemented with 0.1% FRA® Butyrin Hybrid Dry from day 0 till day 14. Feed and water were provided ad libitum. Body weight gain, feed consumption, feed conversion ratio (FCR), livability, European Production Efficiency Factor (EPEF) and feed cost per gain (FCG) were determined for the entire trial period of 42 days. At 21 days of the study, two broilers per pen were euthanized and dissected to collect cecal samples. Samples from each pen were pooled to determine bacteria counts of *Lactobacillus*, *Clostridium perfringens*, *Escherichia coli*, and *Salmonella*.



At day 42, five broilers per pen were slaughtered to determine the percentage of abdominal fat. Another group of 60 broilers was involved in the AME study and received the same experimental diets. At day 21, broilers from the control and treatment group were equally divided over 12 metabolic cages of 5 broilers each, resulting in 6 repetitions per group. From day 24 till day 28 apparent metabolizable energy (AME) and nitrogen corrected AME (AMEn) were determined. The AME value was determined as the difference between total gross energy consumed and the combined energy of feces and urine. A correction was made for nitrogen retention (NR) to determine AMEn. NR was assumed to be 20% of body weight gain/6.25, with 8.21 kcal/g nitrogen retention as constant.

» COMBINATION TRIBUTYRIN & ALPHA-MONOBUTYRIN IMPROVES ANIMAL PERFORMANCE, PRODUCTION EFFICIENCY AND ECONOMICS.

The results on general performance are shown in Table 1. After a production cycle of 42 days the broilers in the control group reached a body weight of 3305 gram with a FCR of 1.587. The obtained broiler performance in this trial is well above the Cobb500 genetic standards. It is not uncommon that broilers reach higher performance levels at trial facilities compared to commercial farms, because of lower pathogenic pressure, lower stocking density, better hygiene and management. The exceptional broiler performance is substantiated by an EPEF which exceed the 400-threshold easily. Despite the high performance level of the control group, supplementing the diet with FRA® Butyrin Hybrid Dry for only 2 weeks at the start, resulted in a further improvement of EPEF at the end of the trial, which was mainly the result of the significant improvement in FCR. Moreover, feed cost per kilogram weight gain expressed in Thai Baht was significant reduced from 68.63 cents per kg to 67.85 cents per kg when the diet was supplemented with butyrate glycerides. At slaughter the abdominal fat percentage was significantly reduced from 1.84% to 1.58%. As abdominal fat is discarded at processing, this will save substantial amount of waste. For instance, in the Netherlands 10,000 tonnes of abdominal fat are produced by chickens and discarded at processing each year.

T1 Table 1

Data on general performance and abdominal fat percentage of the control group and FRA® Butyrin Hybrid Dry

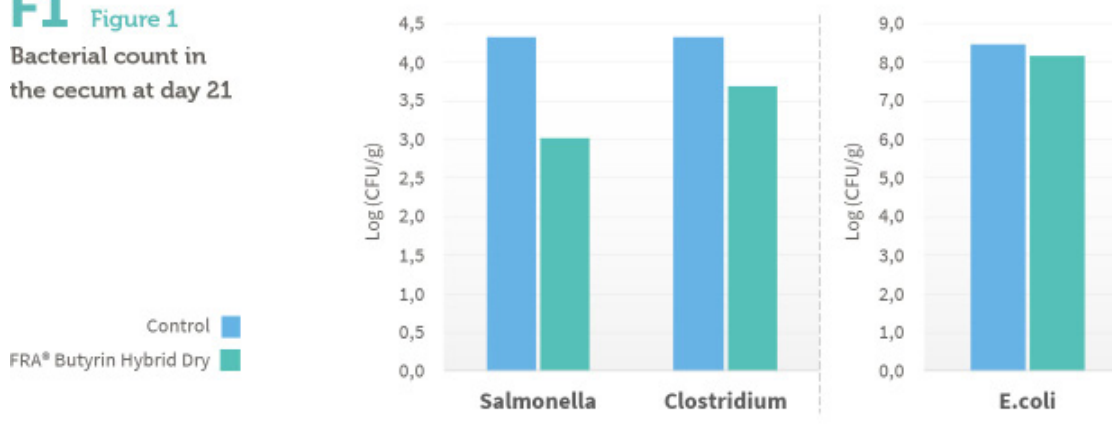
	Control	FRA® Butyrin Hybrid Dry
Body weight day 0 (g)	47	47
Body weight day 42 (g)	3305	3310
Body weight gain (g)	3259	3263
Feed intake (g)	5171	5116
FCR	1.587 ^b	1.568 ^a
Livability (%)	94.91	95.37
EPEF	470.62	479.78
FCG (Baht cent/kg)	68.63 ^b	67.85 ^a
Abdominal fat (%)	1.84 ^b	1.58 ^a

^{a,b} Means within a row with distinctive superscripts differ significantly (P<0.05)

» TRIBUTYRIN & ALPHA-MONOBUTYRIN DECREASES CLOSTRIDIUM PERFRINGENS, E. COLI AND SALMONELLA IN CECUM SAMPLES.

Clostridium perfringens is a Gram-positive bacterium and the primary pathogen associated with necrotic enteritis by producing toxins that cause gut lesions. *C. perfringens* favorable colonizes the cecum, which also contains the highest density of the broiler microbiota. Changes in the microbiota can reflect the onset, development or presence of diseases. A healthy microbiota is therefore key for broiler health and performance. In this study, the effect of FRA® Butyrin Hybrid Dry on the microbiota in the cecum was checked. (Figure 1). The cecum count of *C. perfringens* was reduced with almost 15% from 4.33 Log CFU/g to 3.69 Log CFU/g. Also an effect on *E. coli* and *Salmonella* was seen with a reduction of 3.4% and 5.6% respectively. In contrast, there was no difference in the *Lactobacillus* count. From this trial it could be concluded that butyrate glycerides were able to decrease the presence of the enteric pathogenic bacteria *C. perfringens*, *E. coli* and *Salmonella*.

F1 Figure 1
Bacterial count in
the cecum at day 21



» TRIBUTYRIN & ALPHA-MONOBUTYRIN IMPROVES THE APPARENT METABOLISABLE ENERGY (AME)

The AME study was conducted in parallel from day 24-28 for both the control and treatment group (Table 2). AME and AMEn were significantly increased when butyrate glycerides were fed to broilers. This was reflected by the improved FCR, ton of feed from confinement until weaning.

T2 Table 2

The effect of FRA® Butyrin Hybrid Dry on dietary AME and AME_n from 24 to 28 days of age

	Control	FRA® Butyrin Hybrid Dry
AME as dry (kcal/kg)	3553 ^b	3600 ^a
AME _n as dry (kcal/kg)	3351 ^b	3393 ^a

^{a,b} Means within a row with distinctive superscripts differ significantly (P<0.05)

IN CONCLUSION

the combination of tributyrin and alpha-monobutyryn significantly improved FCR, AME and AMEn and reduced abdominal fat. Furthermore, the product reduced *C. perfringens*, *E. coli* and *Salmonella* counts in cecum samples while maintaining the *Lactobacillus* count. All these effects are indications of a healthier gut, stimulating animal performance. With a significant reduction in feed costs per kilogram gain the application is cost effective, with a return on investment of 11.66.

