ISSUE FOCUS



EFFECTIVE PATHOGEN CONTROL WITH **FRA® GUT BALANCE**

Olga Dansen, MSc Head of R&D FRA®melco B.V.

Broilers receiving FRA® Gut Balance in their diet grow faster and more efficient, according to research conducted by FRAmelco. This feed additive shows results with significant higher final body weight. According to FRA® researchers, the improved performance and economical advantage found in this trial is attributed to effective pathogen control by the carefully selected combination of glycerides in FRA® Gut Balance.

A healthy gut is the basis for healthy animals and contributes to a high vitality in broilers. This enables them to grow towards their genetic potential. For years, antibiotic growth promoters have been used to control pathogenic pressure and to optimize output in poultry production. However, because of the threat of antibiotic resistance and the implications for human health, the use of antibiotic growth promoters is restricted in many countries worldwide.

As a substitute, feed suppliers have mainly focused on adding organic acids or their salts, like short chain fatty acids (such as propionic acid and butyric acid) and medium chain fatty acids (such as caprylic acid and capric acid). And with success, because these organic acids are well known for their positive effect on intestinal health and growth performance. They cause dietary acidification, resulting in the inhibition of intestinal pathogenic bacteria that are competing with the host for available nutrients.

THE INNOVATIVE ALTERNATIVE: GLYCERIDES

Since quite some years, researchers are convinced that even better results can be achieved with organic acids when administered in a new, innovative form. That is why FRAmelco developed FRA* Gut Balance. FRA* Gut Balance consists of carefully selected *glycerides* of conventional organic acids as: propionic acid, butyric acid, caprylic acid and capric acid. While the free form - or the salt only acts in the acid environment of the stomach, research shows that glycerides of these organic acids, also have effect in the lower - neutral - parts of the intestinal tract. Moreover, they possess stronger antibacterial effects.

FRA® Gut Balance contains a smart combination of glycerides of both short chain and medium chain fatty acids and is the key to overcome bacterial challenges from both gram-negative and grampositive bacteria. The product is designed to balance the intestinal microflora and to promote overall gut

GLYCERIDES EXPLAINED

Glycerides, and more specifically 'alpha-monoglycerides', are well known for their strong antimicrobial properties and have been proven to be a proper alternative to the preventive use of antibiotics. Alpha-monoglycerides are a class of glycerides that are composed of a fatty acid linked to the first position of a glycerol molecule. It is precisely this ester bond at this position that gives them their strong antibacterial properties. These glycerides show much stronger antibacterial effects compared to their corresponding free fatty acids, e.g., alpha-monocaprylin and alpha-monocaprin compared to caprylic acid (C8) and capric acid (C10). This is because conventional organic acids, like formic acid, propionic acid, and acetic acid, need to be undissociated to enter the bacterial cell to carry out their disturbing effects. Because of their specific molecular structure, alpha-monoglycerides are pH independent and consequently do not dissociate at pH values found in the gastrointestinal tract.

health and zootechnical performances. It is therefore often used as alternative for AGP's.

HIGHER GROWTH RATE

To confirm the effect of FRA[®] Gut Balance in the absence of antibiotic growth promoters a broiler trial was performed in collaboration with the University of Selçuk in Turkey. The results show that adding FRA[®] Gut Balance during the production cycle led to a significant higher final body weight of more than 5 % and a significant lower feed conversion ratio (FCR) of 18 points, see Table 1. With a calculated return on investment (ROI) of 9, FRA[®] Gut Balance is of great economical advantage for broiler farmers.

PATHOGEN CONTROL

Why expect better growth results in broilers receiving FRA[®] Gut Balance? Because of effective pathogen

control in the entire gastrointestinal tract. Broilers face various bacterial challenges in daily practice. Varying from Gram-positive, such as *Clostridium perfringens*, *Streptococcus suis* and *Enterococcus*, and Gram-negative bacteria, such as *Escherichia coli* and *Salmonella*. In the battle against both types of bacteria, it is important to be aware of the differences in their structure. This means that a diverse approach is needed to inhibit their growth and potentially kill them.

Gram-positive bacteria typically have a simple membrane structure. The molecules that construct bacterial membranes and glycerides of organic acids are both amphiphilic by nature. Therefore, they can easily interfere with each other. Glycerides will settle in the bacterial membrane, disrupting its structure, see Figure 1. Especially glycerides of medium chain fatty acids are known to be effective against Gram-positive bacteria.

Table 1. Effect of FRA® Gut Balance Dry on growth performance of Ross 308 - broilers (day 0-42).			
Fungal species	Control	FRA® Gut Balance ^{\$}	Difference
Weight day 0 (g)	51.4	51.1	
Weight day 42 (g)	2075.8⁵	2185.8°	+5.29 %
ADWG* (g/bird)	48.2 ^b	50.8°	+5.39 %
ADFI** (g/bird)	96.5 ^b	92.3ª	-4.35 %
Feed conversion ratio	2.00 ^b	1.82°	-18 pnts
Mortality (#)	3	3	

^s Dose level 3, 1.5 and 0.75 kg of FRA® Gut Balance Dry p. ton feed in the starter, grower, and finisher phase respectively ^{a, b}: Different superscripts in the same row indicate significant differences ($P \le 0.05$)

*ADWG = Average daily weight gain **ADFI = Average daily feed intake

ISSUE FOCUS



Figure 1. Glycerides easily interfere with cell membranes of Gram-positive bacteria, causing serious alterations, increasing its permeability, and inhibiting transmembrane signaling, which will result in the cell to die.

Where Gram-positive bacteria have relatively simple cell membrane structures, Gram-negative bacteria, such as *E. Coli* and *Salmonella*, typically have more complex inner and outer membrane structures,

making disruption of the cell membrane more difficult. Still, glycerides can enter the bacteria like organic acids do - and alternate the DNA structure of the bacteria from the inside. After that, the cell loses its ability to produce invading proteins and infect the host, see Figure 2. Especially glycerides of short chain fatty acids are highly effective against Gram-negative bacteria.



Figure 3. FCR from day 0 – 28 of broilers challenged with coccidia and treated with FRA® Gut Balance Dry.

IMPROVED PERFORMANCE

From another broiler experiment at a research facility, it was also concluded that FRA® Gut Balance improved feed conversion ratio and weight gain in broilers, as shown in Figure 3. In this experiment, broilers were broiler growth performance. Because FRA[®] Gut Balance contains a smart combination of specific glycerides it is the key for broad spectrum pathogen control and has demonstrated to be a successful tool in antibiotic-free diets.



Figure 2. Despite the complex membrane structure of Gram-negative bacteria, glycerides can enter the pathogenic cell. Disturbing its metabolism by causing DNA alterations and inhibiting the production of invading proteins.

naturally challenged with *Clostridium perfringens* derived from the environment and at day 18 artificially infected with coccidia. The improved growth performance found in this trial shows that FRA[®] Gut Balance was

> able to compensate for the secondary negative effects originating from the coccidia and *Clostridium perfringens* infections.

IN CONCLUSION

The popularity of products containing glycerides of organic acids, like FRA® Gut Balance, is increasing. Because of their unique molecular structure, these glycerides are highly antibacterial throughout the entire gastrointestinal tract, thereby supporting

FRA® GUT BALANCE

Effective Pathogen Control with FRA® Gut Balance



Increased profitability Increased body weight Decreased FCR

> Read why glycerides in FRA® Gut Balance are unique in their kind as they effectively target Gram+ and Gram- bacteria.

www.Framelco.com

ANTIBIOTIC **REDUCTION**

FRA^{®MELCO}