

Butyrate – a key molecule for promoting intestinal health

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Nowadays, we are convinced that intestinal health is crucial to our overall health and well being. For years, the correlation of failing gut health with discouraging zootechnical results in animal production and various abdominal diseases of our modern society, such as inflammatory bowel diseases (IBD), has been clear.

In animal production, as well as in human health, a lot of research has been conducted to identify the role of the gut. Risk factors, as well as some key molecules promoting gut health, have been determined in order to correlate them to some gut health related disorders. One of these well described key molecules promoting gut health is butyric acid.

Important factors

There is no secret about the key points in maintaining optimal gut health. The media, as well as nutritional companies in our current society are highlighting the importance of our intestinal health on a daily basis. The gut is the key factor in optimising your well being and overall health.

Therefore, several guidelines are underlined in our currently health focused culture:

Broiler	
Starter	Grower/finisher
750g/MT	500g/MT
Layer	
Week 2-44	Week 44-
500g/MT	1000g/MT
Breeder	
Rearing period	Breeding period
500g/MT	1000g/MT

Table 1. Standard recommendations for Butifour F.

- Maintain and sustain your natural microbiota.
- Promote your gut physiology and intestinal lining.
- Reduce inflammation, but boost your specific immunity.
- Stimulate efficient digestion and absorption of nutrients.

These principles are translated in different ways. For example, we are advised to guarantee a minimum daily intake of yoghurt (can be enriched with probiotics) and fibre, which is an excellent nutrient for your intestinal flora.

Or they are correlated with intestinal disorders, for example food allergies and lactose intolerance. But remember, as the intestinal system of humans and animals is all based on the same principle, these guidelines also refer to your poultry flock!

If we speak about pig, poultry or ruminant production, the concept remains identical: you need to optimise the intestinal health of your animals to obtain maximum zootechnical results.

But how can you meet and implement these main guidelines in poultry production? By using one well described and known key molecule, butyric acid, as a feed additive.

Butyric acid in poultry

Butyric acid is a substance with a biological role, consistently present in the intestinal ecosystem, as it is naturally produced by the intestinal microbiota.

Its biological role can be summarised by four principles. By coincidence these are the same guidelines proposed for human health, but here they offer a perspective on poultry production:

● Balance the intestinal microbiota

Butyric acid is produced by several beneficial bacteria present in the gut, for example by the Clostridiaceae cluster IV and XIVa. Adding butyric acid or butyrate to the feed will thus stimulate the beneficial flora, while inhibiting the pathogenic ones, such as Clostridium perfringens, a causative agent of necrotic enteritis.

In addition, butyrate has a specific action on salmonella. It has the ability to switch off the genes of the salmonella bacteria responsible for the attachment to, and the invasion of, the intestinal wall. As a result, salmonella will not be able to colonise the gut of your birds.

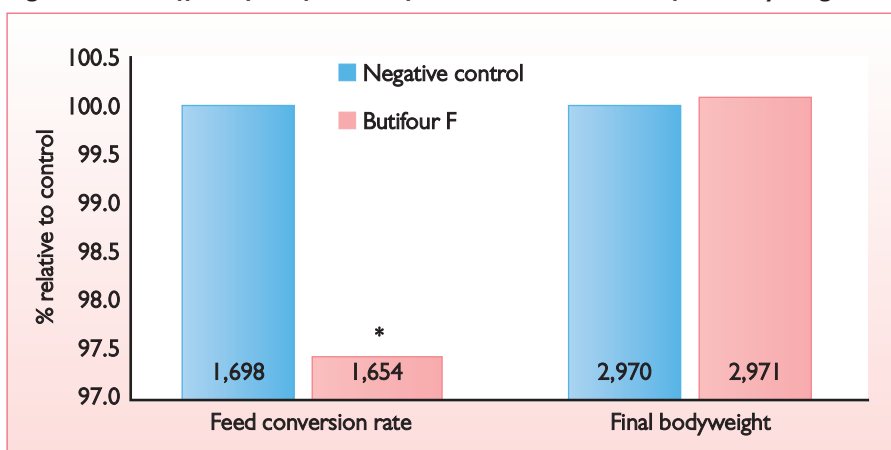
● Promote the intestinal barrier function

Butyric acid plays a key role in maintaining the intestinal barrier: the epithelial lining as well as the tight junctions, the glue between the epithelial cells, are promoted. Villi growth is triggered by a two way action of butyric acid: cell proliferation and differentiation is stimulated, while the natural death of the cells on the top of the villus, also known as apoptosis, is inhibited.

In addition, butyric acid is the preferred metabolic fuel of the colonocyte. An optimal intestinal lining is the perfect barrier against potential harmful pathogens and toxins.

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Fig. 1. Positive effect of Butifour F on feed conversion rate and final body weight.



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● **Modulate the immune system**

The immune system is one of the crucial and most complex systems of the body. On one hand, it has to protect the animal against harmful invaders, but on the other hand, an overreaction of this system implies a waste of nutrients, which will reflect in the performance results of your birds.

One ingredient which has the ability to direct this system to a status of protection and not overreacting is butyrate. Butyrate is known to stimulate the specific (acquired) immunity and prevents the non-specific (innate) immunity from overreacting. Inflammation, which is an overreaction of the immune system and a waste of nutri-

ents, will be reduced; while, on the other hand, the acquired immunity, which implies a specific reaction to invaders and a response to vaccination, will be stimulated.

● **Stimulate the nutrient digestion and absorption**

Efficient nutrient digestion and absorption is the key for optimal performance. Butyrate stimulates the secretion of digestive enzymes in order to obtain efficient digestion of the feed.

Nutrients will be absorbed by the intestinal mucosa, where the absorption surface and the functioning of the enterocytes are crucial. As butyrate stimulates villi growth and enterocyte differentiation, the absorp-

tive surface is enlarged and nutrients are efficiently absorbed.

It is no secret that while supplementing your broiler, breeder or layer feed with butyrate, these positive effects on gut health will be converted into excellent production results (reduced feed conversion rate, increased daily gain, improved laying rate, better eggshell quality, enhanced hatchability) on one hand and better health (reduced occurrence of diarrhoea, necrotic enteritis and salmonella) on the other.

Butyric acid, as such, cannot be supplemented to the feed due to its volatility and pungent odour, but butyrate – a salt of butyric acid – and preferably the calcium salt (calcium butyrate) counteracts these practical problems and can be routinely supplemented. Of course, to provide the gut with a sufficient amount of butyric acid, the calcium butyrate needs to be coated. We believe coated calcium butyrate is the key molecule in optimising gut health.

In addition, we identified other molecules which are able to reinforce the butyrate's actions, specifically for poultry. A new product, Butifour F, was thus developed by Impextraco.

Butifour F is especially designed to cover the needs of poultry production. Through Impextraco's poultry trial facilities in Brazil, we were able to design and test a new synergistic solution, based on coated calcium butyrate and enriched with another organic acid salt and natural ingredients. The natural ingredients are reinforcing the antibacterial action of calcium butyrate in the gut, downgrading the prevalence of bacterial intestinal disorders and mortality.

The efficacy of Butifour F in broilers was assessed in our poultry trial facilities. Some 800 day-old male Cobb broiler chicks were individually weighed and divided into two treatments, each one composed of 10 replicates of 40 animals with similar body weight. Three corn and soybean meal based diets were formulated according to bird age: starter (1-21 days of age), grower (22-35 days of age) and finisher feed (36-42 days of age).

Treatments consisted of a negative control (standard feed without the inclusion of Butifour F), and Butifour F incorporated at 750g/MT in starter and 500g/MT in the grower and finisher phase (Table 1 shows the standard recommendations; results are described in Fig. 1).

Butifour F improved feed conversion rate (-2.6%) significantly ($p < 0.05$). As the results on body weight were already optimal for the control group, a significant improvement was difficult to achieve. However, Butifour F still managed to obtain a numerical increase of the final body weight. With Butifour F, less feed is needed to obtain a maximum final weight – offering the perfect solution for your poultry integration! ■

*References are available
from the author on request*