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IPVS 2004

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VIV China

7.-9.9, China

World Nutrition Forum

3.-6. November 2004
Salzburg, Austria

IUPAC Meeting

17.-21.5., USA

Space

14.-17.9., France

> LITERATURE

Partanen, K. and Mroz, Z. (1999). Organic acids as an alternative for prophylactic medication of pig diets. *Nutr. Res. Rev.* 12, p. 1 - 30.

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Ravindran, V. and Kornegay, E. (1993). Acidification of weaner pig diets: a review. *J. Sci. Food Agric.* 62, p. 313 - 322.

> IMPRESSUM

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Newsletter

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> EDITORIAL

Many parameters govern the survival and reproduction of bacteria in food, one of which is the pH. It is therefore not surprising, that the effect of acidifier and phytobiotics in livestock production is not a new field to researchers and farmers, but is recently gaining increasing popularity, mainly originated from the ban of most antibiotics for the use in animal feeds.



Despite of this, livestock production is still facing huge losses worldwide due to problems from bacterial related disorders, non-hygienic feed stuffs and the resulting low feed intake. Feed quality is hereby a major key to overcome these above mentioned problems and achieve optimum animal performance.

It is therefore highly important to secure this quality.

Under these circumstances acidifiers consisting of a balanced combination of high-quality acids are a promising option for replacing antibiotic feed additives adequately in combination with other feed additives such as phytobiotics. Results from recent trials worldwide proved the effect of such combinations and showed therefore a promising alternative for the post-antibiotic era.

Convince yourself in this newsletter with some of the sustainable solutions our company can offer to replace AGP's, since BIOMIN is always a step ahead ...the natural way!

Christian Lückstädt

Biotronic® and phytobiotics – leading to a new feeding concept

Biotronic® product line

The proposed ban on the use of antibiotics in livestock as antibiotic growth promoters (AGP) is just a step ahead. Solutions are urgently needed to overcome the widening gap between customer concerns on health security, animal welfare and regulations on one hand and economic livestock production on the other hand. Feed acidifiers and especially blends of acids can play a very important role in modern livestock production worldwide, however there is no single feed additive available to replace AGP's. However synergistic effects can be achieved in combination with the right feed additive. BIOMIN's challenging way to achieve this goal is outlined in the following.

Biotronic® – successful combinations with Biomin® P.E.P.

The potential of organic acids in forage preservation as well as in livestock nutrition has been known for decades and is documented by many scientific experiments. Acids, including propionic acid, make a fundamental contribution to feed hygiene, since they suppress the growth of mould and thus restrict the potential effect of mycotoxins. Consequently feed safety is guaranteed by adding an organic acid. However, other acids and their salts have also been added to the feed for a long time, for instance formic acid, sorbic acid and fumaric acid. A strong bactericidal and bacteriostatic effect has been demonstrated for formic acid, the shortest-chain organic acid. These effects are

based on the one hand on a reduction of the pH-value by adding the acid to the feed, and after its intake in the animal too, and on the other hand on the antimicrobial effect of the acid. The effect of the individual acids varies widely and is based on their degree of dissociation (Fig. 1). Each acid has a specific pK-value that states the pH-value at which the acid is 50 percent dissociated. With the aid of this value it is possible to determine the action of each single acid at a certain pH-value.

Feed safety – mode of action of organic acids

Based on these fundamentals it is possible to distinguish acids which act more antimicrobial at a certain pH-value (for instance Acid B, highly undissociated), from acids that lower the pH-value – and are thus largely dissociated (for instance Acid A). Lowering the pH-value in the feed leads to a lower buffer capacity and thus promotes digestion in the animal, since less hydrochloric acid has to be produced in the stomach to activate the pepsin and thus optimal protein digestion is ensured. Stable digestion also promotes a balanced intestinal flora – eubiosis. Furthermore a lower production of hydrochloric acid by the animal itself saves energy which can be spent for other metabolic processes instead.

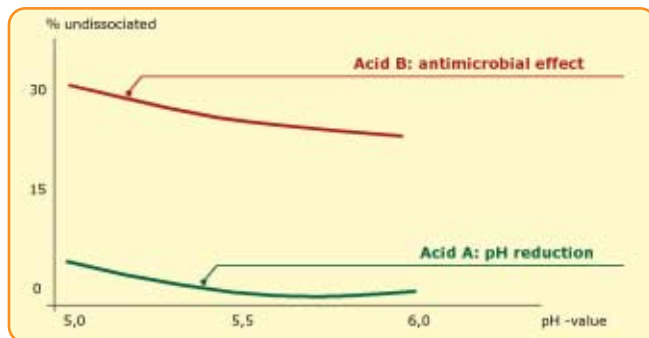


Figure 1: Effect of dissociated and undissociated acid

In addition reducing the pH-value creates more difficult conditions for the growth of potentially dangerous bacteria (Fig. 2), since the growth of these gram-negative pathogenic bacteria is related to the surrounding pH-value (pH-level below optimal level for bacterial growth). Thus reducing the pH-value also has an indirect anti-microbial effect.

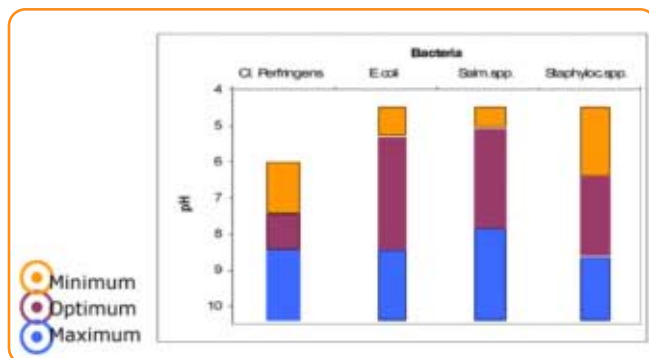


Figure 2: pH-optima for pathogenic bacteria

However, this is based on the capacity of organic acids in their non-dissociated condition to break through the cell walls of gram-negative bacteria and penetrate into the cell. In the cell the acids dissociate into a hydrogen cation and an acid anion. The cation also reduces the pH-value in the interior of the cell, which then has to be corrected under high energy loss for the cell, and the anion interrupts the DNA synthesis of the cell core directly. This dual impact mechanism effectively obstructs bacteria reproduction.

Improved digestion and feed uptake – Phytogetic feed additives

Phytogetic feed supplements or feed additives are of plant origin, whereby extracts mainly from herbs and spices are used. The digestion promoting and appetising effects of certain herbs and spices has been part of human nutrition for a very long time. The chemical analysis of the composition of herbs and spices reveals a great variety of different chemical substances, which not only have different aromatic characteristics, but also a variety of biological effects, e.g. antioxidative, fungicidal, anti-microbial and physiological effects.

The use of phytobiotics is gaining increasing popularity for the inclusion to animal feeds, mainly originated from the ban of most antibiotics for the use in animal feeds. On the opposite to antibiotics, phytogetic feed additives have a greater impact on the different factors which promote the growth of pathogenic bacteria. Their mode of action is therefore more indirect and is based on a more holistic approach, which can support the endogenous defence mechanisms of the animal, and thus can be considered a more sustainable solution in the long run. Phytogetic feed additives can have a positive influence on saliva production and production of gastric acid and can thus not only increase appetite and feed intake, for instance in weaned piglets, but can also have a positive effect on the release of digestive enzymes and support digestion. Hence, there is a synergistic effect between phytobiotics on the one hand and organic acids on the other in the improvement of the digestion, mainly in the stomach. This holds true particularly in weaners. Furthermore, in case of a healthy digestive system fewer nutrients reach the colon and thus there are also less nutrients

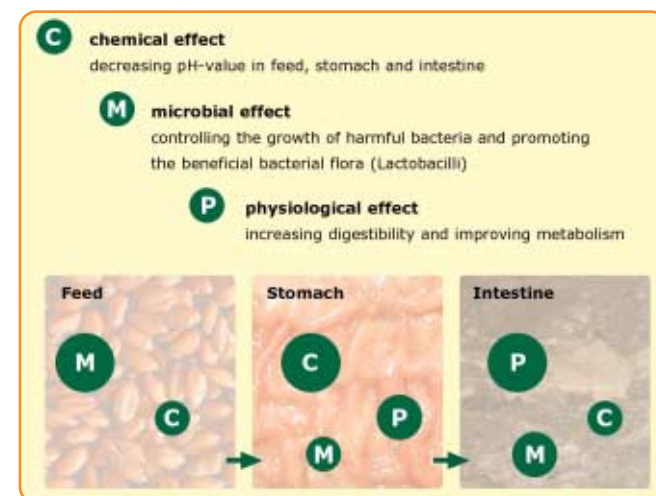


Figure 3: Effects in Feed – Stomach – Intestine

available for the growth of potential pathogens, which mainly reside in this part of the digestive tract (Fig. 3). Also the type of nutrients, which get into the digestive system, influence the composition of the intestinal micro-flora. Fructo-oligosaccharides can only be used by specific bacteria, in this case bifido bacteria. Therefore fructo-oligosaccharides in the feed have a positive influence on the composition of the micro flora in the gastro-intestinal tract. This holds particularly true for pigs, where low amounts of non-digestible oligosaccharides in the diet are able to manipulate the gut microbiota positively.

Biotronic® and Biomin® P.E.P. combinations

Biotronic® and Biomin® P.E.P. products are GRAS, which means they are non hazardous and completely biodegradable. They require no withdrawal time as they don't produce hazardous residues. Furthermore the combined product line stands for its user friendly application and mixture. The use of Biotronic® is recommended for the control of

gram-negative bacteria, including *E. coli* und *Salmonella* in the gastro-intestinal tract of pigs. The product acts preventive against diarrhoea and other bacteria related digestive disorders, especially after weaning. It supports furthermore a healthy gut micro flora. An increase in appetite and related to this, an improved feed uptake can be noticed due to the addition of Biomin® P.E.P. This leads to an improved feed conversion and finally to an economical livestock production in the farm. Besides, the Biotronic® takes up and removes possible toxic metabolites from the gut and can have therefore a beneficial effect on litter consistency. The recommended dosage of the products is between 2 kg and 5 kg per t finished feed (Tab. 1, Tab. 2).

Mortality in the treated group was significantly reduced by 55%, compared to the control group. The improved results in the treated group are due to a heavy *E. coli* infection in the control group. These results prove that safe feed can lead to improvement of livestock performance and thus logically prove that it is economically expedient to use acid-phytobiotic combinations in livestock production.

Table 1: Results of Biotronic® and Biomin® P.E.P. university trial in Kingsville, USA

Biotronic® and Biomin® P.E.P. trial with weaned piglets (n = 192), USA, 2003; duration 56 days; treatment: **3 kg Biotronic, USAcid and 2 kg Biomin P.E.P. 1000** per t of feed; control: 1 kg anti-biotic growth promotor per t

	Control	Biotronic, + P.E.P.	Difference (%)
Initial weight (kg)	6,7	6,6	-1,5
Final weight (kg)	30,5	30,4	- 0,3
Avg. daily weight gain (g)	420	426	+ 1,4

Table 2: Results of Biotronic® and Biomin® P.E.P. field trial in Rendsburg, Germany

Biotronic® and Biomin® P.E.P. trial with weaned piglets (n = 84), Germany, 2003; duration 35 days; treatment: **3 kg Biotronic, SE forte and 2 kg Biomin P.E.P. 1000** per t of feed; control: without acid-phytobiotic blend

	Control	Biotronic, + P.E.P.	Difference (%)
Initial weight (kg)	9.4	9.3	- 1.1
Final weight (kg)	24.9	26.6	+ 6.8
Avg. daily weight gain (g)	442	495	+ 12.0
Feed intake (g / d)	790	830	+ 5.1
Energy intake / kg weight gain (MJ)	28.96	23.12	- 20.2
Feed conversion ratio	1.79	1.68	- 6.1

Conclusion

The above mentioned results clearly indicate, that with new sustainable feeding concepts, including acidifier and phytobiotics, successful and economical livestock production is also possible within the post-anti biotic era, which the

European Community is facing starting 2006. So better check on Biomin's solutions, since Biomin...

... cares for health in animal nutrition.