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Protected butyrate. No odor and low dissociation in the stomach.

High stability to do its action in the small intestine and colon.

The high concentration and protection make it the most cost-effective product on the market. This data is easily calculated, taking into account:

- The price per kg.
- The concentration (40%)
- And the percentage of dissociation in the stomach (only 10-15%)

And it serves to compare it with other products (odorless, of course).

40% of sodium butyrate protected with fat. This fat is degraded in the intestine to release butyrate at the right place.

Follow this presentation to learn more about sodium butyrate and performa 40.

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TARGETS

performa 40 has a number of major actions (associated butyrate):

- Increases feed intake.
- Increases the action of all the enzymes throughout the digestive tract.
- Increases development of beneficial intestinal flora, and inhibit the growth of pathogenic bacteria and fungi (prebiotic effect).
- Natural source of energy for intestinal cells.
- All this leads to improvements in performance of the animals.

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ACTIONS:

Effects attributed to butyrates* include:

- Better nutrient digestibility which results in an increase in performance
- Stimulation of secretion of digestive enzymes
- Optimization of intestinal microbiota and an improvement of the epithelial integrity and defense systems
- Tissue development and repair in the digestive tract
- Down-regulation of bacterial virulence
- Control of gut health disorders caused by bacterial pathogens, especially in young animals.

* P. Guilloteau et al. (Nutrition Research Reviews (2010), 23, 366-384).

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1) Smell: Attraction / Appetite / Early consumption of feed

2) Germs: Favours the development of acidophilus/ Penalizes the non acidophilus

3) Villi: Increases the length of intestinal villi / Integrity of mucous / Increases absorption surface

4) Pancreas: Stimulation of Endocrine & Exocrine secretions

- Insulin amylase
- glucagon protease
- somatostatin lipase

5) Small Intestine: Stimulation of intestinal enzyme (lactase, malatase and sucrase)

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DOSES

When?	Kg per ton.
Weaned piglets until 12 kg	1 – 2 kg.
Piglets from 12 to 25 kg	1 – 1,5 kg.
Pigs from 25 to 110 kg	0,5 - 1 kg.
Sows	0,5 - 1 kg.
Ruminants pre-weaned	1 – 2 kg.
Ruminants post-weaned	0,5 - 1 kg.
Broilers	0,5 – 1,5 kg.
Layers	0,5 – 1,5 kg.
Rabbits	0,5 – 1,5 kg.

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Butyrate: main actions

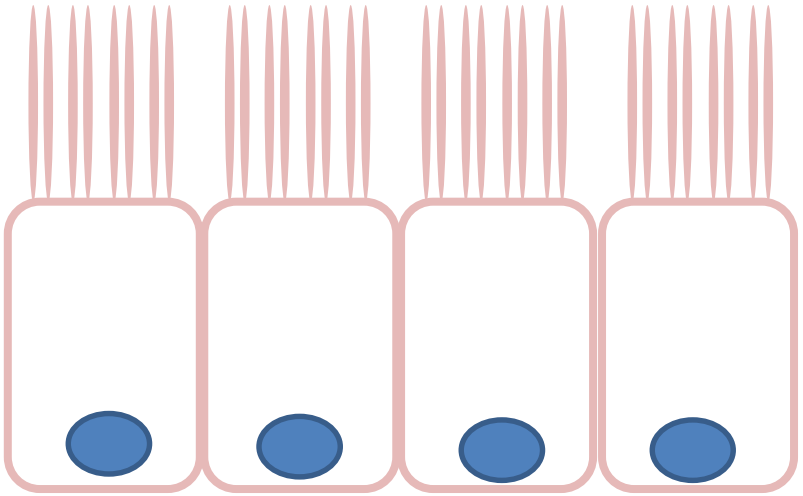
- Villi preservation and growth
- Intestinal enzime production
- Benefits in the flora

Main results:

- More consumption
- Best feed conversion rate
- Less diarrhea
- Recovery after antibiotic treatment
- Less wet beds (poultry) → less pododermatitis in broilers
- Better calcium absortion
- Higher milk and feed intake in calves

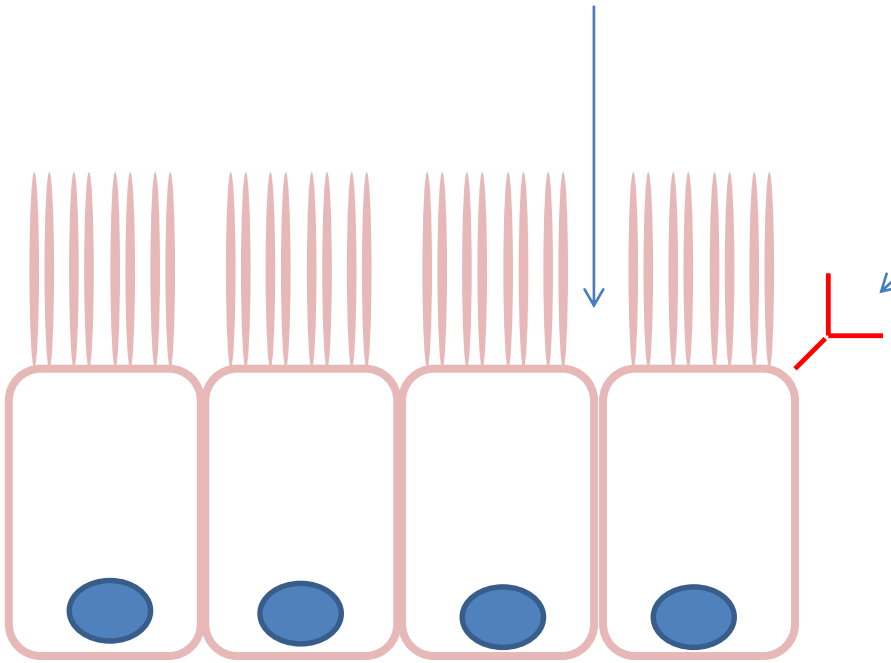
With the intestinal wall integrity we mean:

- A correct villi border
- A correct link among the cells
- A correct “behavior” of the cells (correct function)



This link between the cells must be intact to avoid the penetration of Bacteria and their toxins

This border must be as high as possible to propitiate a correct absorption of nutrients



These are the receptors that Bacteria use to link to intestinal cells

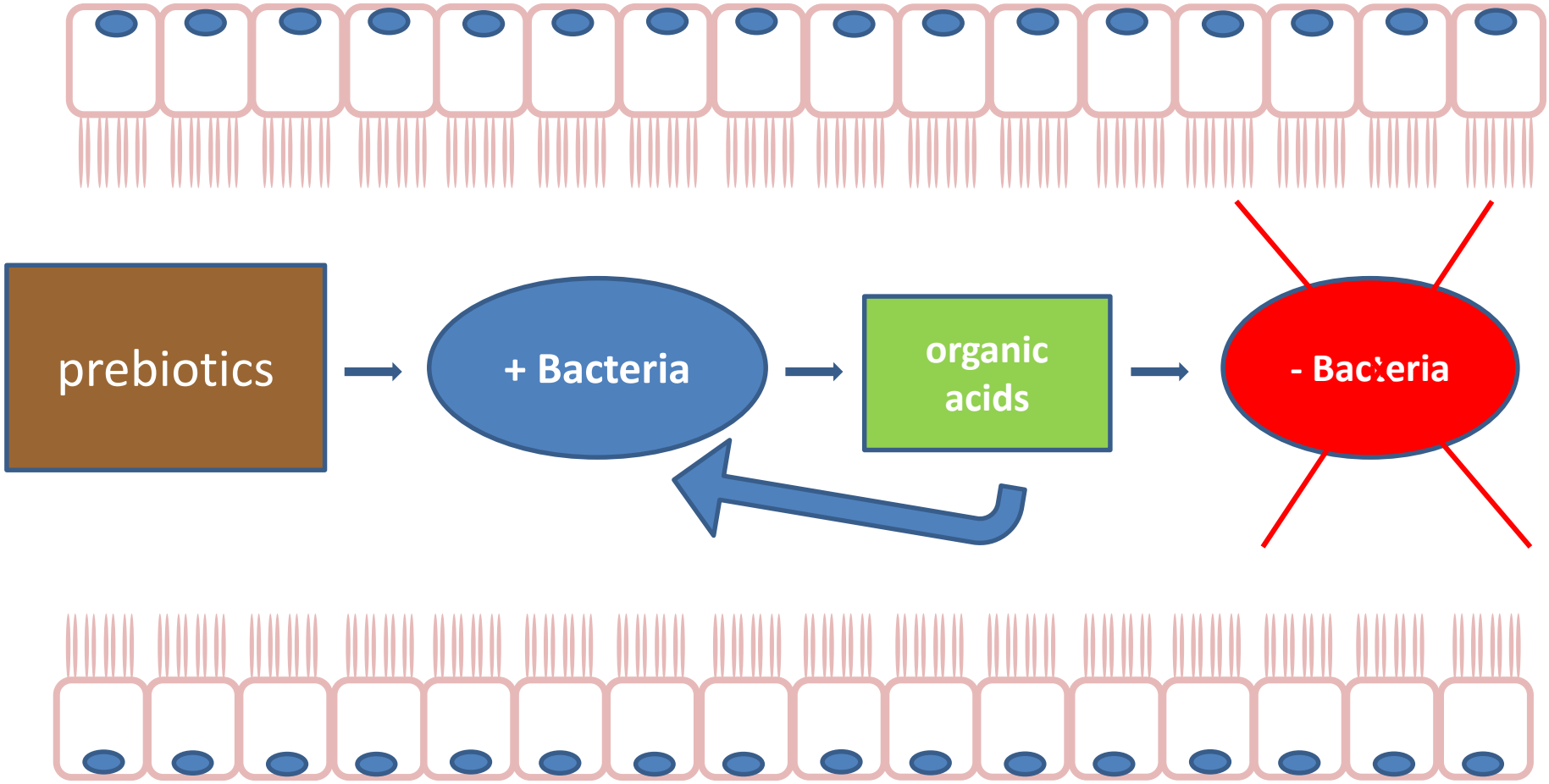
Management of the intestinal micro flora is also a target (health and performance).

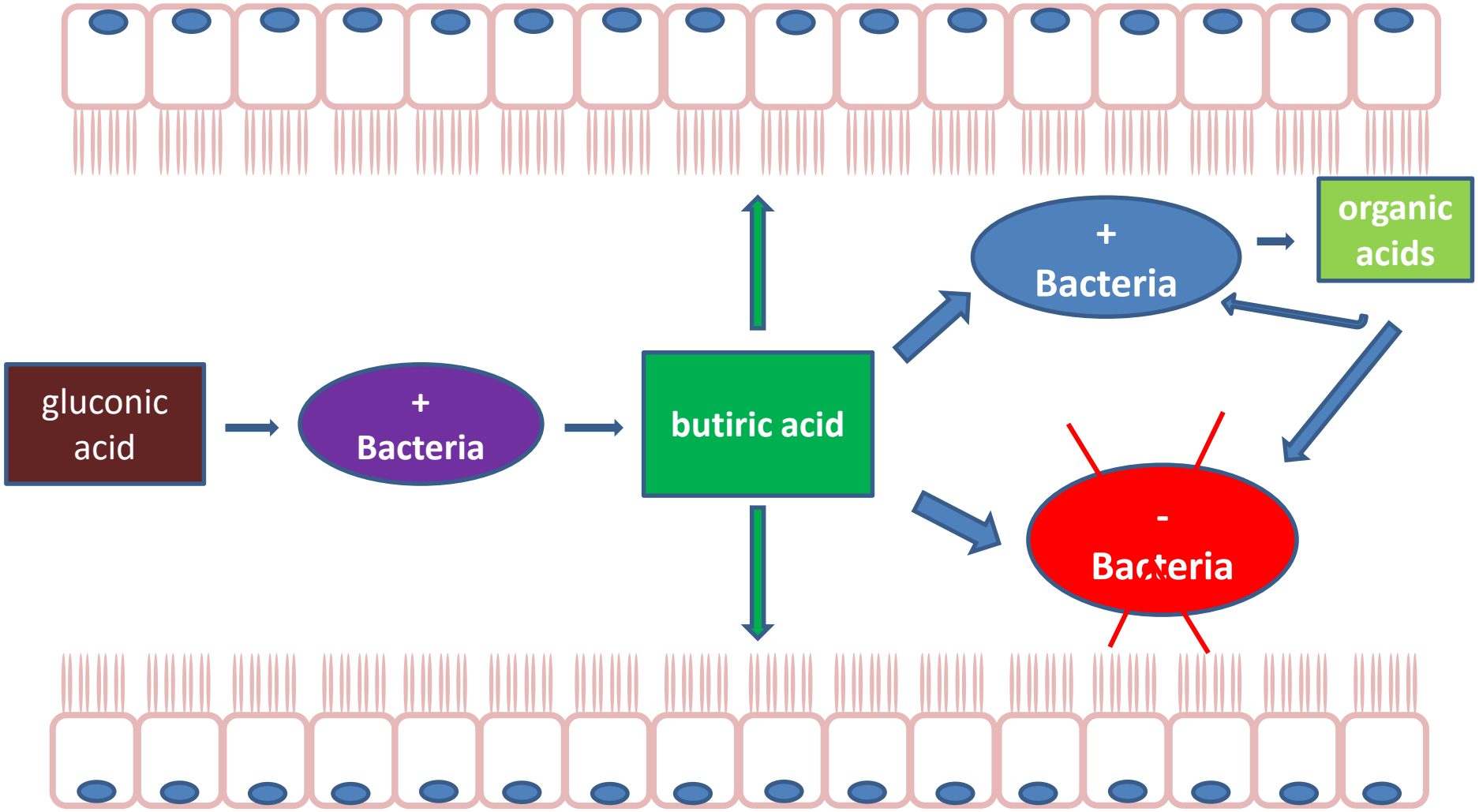
We manage micro flora in two senses:

To decrease the number of negative bacteria *(E. coli, Salmonella, Campylobacter, Shigella…)*

To increase the number of positive ones (*Lactobacilli, Bifidobacteriae)*.

The balance of intestinal micro flora





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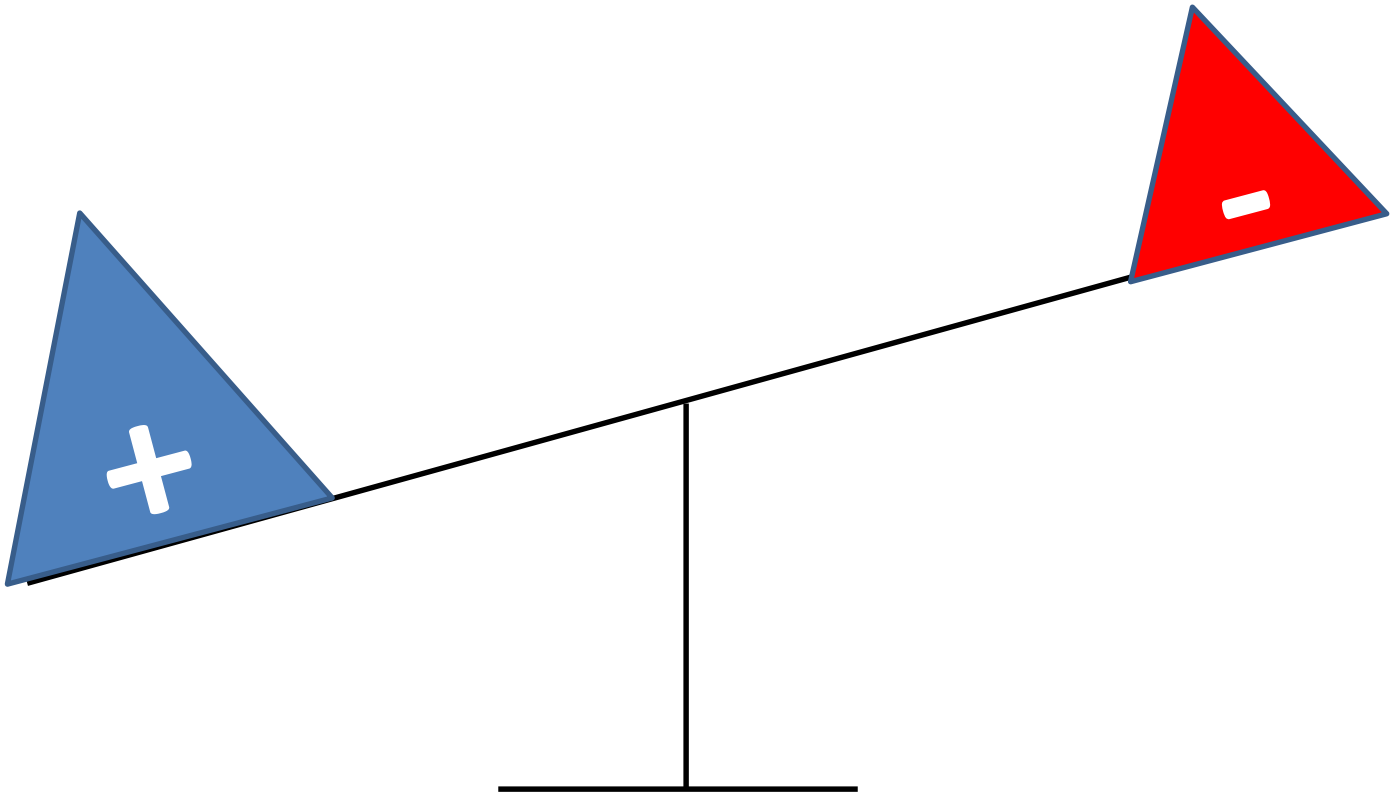

Action against Bacteria: stimulation of **G +** acidophilus… Inhibition **G -** non acidophilus…

Test of variation of concentration of butyric acid, lactic acid and totals in stomach and different portions of intestine, between diet control and diet with n-butyrate (Galfi et al., 1993).

Concentration of n-Butyric acid (nmol/l)						
	Stomach	Jejunum	Ileon	Colon asc.	Colon desc.	Caecum
Control	0.37	0.45	4.79	33.46	25.55	27.87
Butyrate	1.31	0.94	3.47	39.16	28.83	28.24
Total Concentration of Volatile fatty acids (nmol/l)						
	Stomach	Jejunum	Ileon	Colon asc.	Colon desc.	Caecum
Control	7.5	18.17	34.57	166.16	129.84	136.57
Butyrate	13.91	27.57	51.53	239.37	181.85	180.63
Concentration of Lactic acid (nmol/l)						
	Stomach	Jejunum	Ileon	Colon asc.	Colon desc.	Caecum
Control	8.99	31.41	85.57	49.21	18.38	8.48
Butyrate	12.07	46.7	171.72	69.81	39.77	19.97

		Enterobacterias	Lactobacilos
Yeyuno	Control	3.7	4.1
	Butirato 1kg	3.0	4.6
Ileon proximal	Control	4.0	6.1
	Butirato 1kg	3.7	6.4

(Valores expresados como Log 10 unidades, microbiología)

. Nollet, 2002, unpublished

Which butyrate is the best?

The best is to have the possibility of selling all of them, and to have options to accomplish the customer's needs in every moment.

We can choose what they need, or we can let them choose what they want

Concentration and protection:

With these 2 parameters we can calculate the activity of each product

Initial concentration of butyrate X %	X	Protection = non disociation in the stomach and intestine Y %	=	Real activity in the intestine Z %

If you add the price to these figures, you will get and show to customers the real price per unit of activity.

PRODUCT	% BUT	% NON DISOCIATED	% REAL	DOSE (g) TO GET 500 g NETO
andBUT 95	95%	25%	24%	2105
PERFORMA 40	40%	90%	36%	1389
ADIMIX	30%	90%	27%	1852

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The active component is butyric acid, a short chain fatty acid or volatile fatty acid, natural component of animal metabolism.

Butyric acid presents particular and complex biological and cellular active actions which other organic acids, commonly used in animal nutrition, do not have (Kruh, 1982) (like hyperacetylation of histones, gene expression, induction of proteins, including enzymes, hormones…).

The butyric acid is liquid and very volatile at environmental temperature; while sodium butyrate is a stable non-volatile powder up to 250ºC.

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For the sodium butyrate to develop its main actions, it has to get undissociated to the intestine.

Other sodium butyrates (non protected) gets dissociated very quickly in the stomach and does not reach the intestine, place of action. So they simply act in the stomach as a common (and expensive!!!!!) acidifier.

We has developed a specific manufacture method that enable us to produce a sodium butyrate which gets to intestine undissociated: **performa 40**

From the nutritional point of view, the pure form of the sodium butyrate at 98% is less active than performa 40 (at 40%) (from 3 to 4 times less active).

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Compared with other protected butyrates, performa 40 is cheaper, because with pour unique protecting technology we can get 40% (instead of only 30% of main competitors)

The smell is very low.

Compared with monobutirin our price is cheaper, and there are no differences in results.

BIBLIOGRAPHY

There are many articles and references that can be found on the use of butyrate in animal feed.

Summarizing, we can say that butyrate is an additive that improves the intestinal health of the animals, since very important operates at two levels, the cell wall integrity (intestinal villi) and the gut microflora (favoring positive bacteria).

This improves intestinal health means fewer digestive problems and improvements in production.

To choose the correct butyrate is very easy, pay attention to the initial concentration, the stomach percentage of dissociation and the price. With these threes parameters, you will not fail.

Butyrate biblio references (general)

The addition of broiler feed with an additive based on encapsulated calcium butyrate give promising perspectives for optimizing the technical and economical results.

Actes des 9èmes Journées de la Recherche Avicole, Tours, France, 29 et 30 mars 2011 2011 pp. 247-250

Butyrate biblio references (pigs)

Sodium butyrate improves growth performance of weaned piglets during the first period after weaning.

Andrea P., Mauro Morlacchini, Gabriele Casadei, Pier Paolo Gatta, Giacomo Biagi, Aldo Prandini DOI: 10.4081/ijas.2002.35 | Published: 2009-12-21

The purpose of the present work was to evaluate whether the addition of sodium butyrate to feed could facilitate weaning and growth response in piglets. For 56 days two groups of 20 piglets (9.2±1.4 kg LW) were fed an acidified basal diet (containing formic and lactic acid at 0.5 and 1.5 g/kg of feed, respectively) without (control group) or with sodium butyrate (SB) at 0.8 g/kg. Average daily gain (ADG), daily feed intake (DFI), feed efficiency (FE) and live weight (LW) were recorded. In the first two weeks, butyrate supplementation increased ADG (+20%; $P<0.05$) and DFI (+16%; $P<0.05$). During the subsequent period (15 to 35 days) animals fed SB had a higher DFI but lower feed efficiency (+10% and -14%, respectively; $P<0.05$) than animals fed the control diet. No other benefits were observed thereafter. The data presented showed that the use of sodium butyrate facilitated only the initial phase of adaptation to a solid diet in piglets.

Feeding trial in pigs with a diet containing sodium n-butyrate.

Gálfi P, Bokori J. Department of Physiology, University of Veterinary Sciences, Budapest, Hungary. PMID:2100936.

Pigs weighing 7 to 102 kg were fed a diet containing 0.17% sodium n-butyrate. The diet increased the average daily body gain of pigs by 23.5%. Due to its dietetic effect, feed consumption increased by 8.9%. Specific feed utilization was reduced by 11.8%. The experimental diet markedly reduced the percentile proportion of coliform bacteria in the ileum as compared to Lactobacillus ssp.: it decreased the coliform count and increased the counts of Lactobacillus spp. The diet increased the length of ileal microvilli and the depth of caecal crypts. It raised the concentration of immunoreactive insulin in the blood plasma. The feed supplemented with sodium butyrate did not alter adversely the clinical indices tested. It reduced feed costs by 9% and increased the returns from sales by 13%. As the additive is normally produced by microbial fermentation in the large intestine, it is not alien to the body. Sodium butyrate exerted its favorable effect in 3,6 - to 24,2 - fold lower concentrations than the organic acids (citric acid, fumaric acid, propionic acid) used earlier. With respect to its favorable biological and economic effect, sodium n-butyrate can be recommended for use in pig feeding as a growth promoter.

Supplemental Sodium Butyrate Stimulates Different Gastric Cells in Weaned Pigs.

Maurizio Mazzoni, and others.

American Society for Nutrition

The performance and health of young calves appear to prosper when the short-chain fatty acid sodium butyrate is added to milk replacer during the summer, according to research from the University of Minnesota's Southern Research and Outreach Center in Waseca, Minn. It also may be an acceptable alternative to Rumensin in calf starter.

Effect of sodium butyrate on the small intestine development in neonatal piglets feed by artificial sow.

A. Kotunia[1], J. Woliñski[1], D. Laubitz[1], M. Jurkowska[1], V. Romé[2], P. Guilloteau[2], R. Zabielski[3]

[1]The Kielanowski Institute of Animal Physiology and Nutrition, Polish Academy of Sciences, Jab³onna, Poland. [2]INRA-UMRVP, Domaine de la Prise, SaintGilles, France. [3]Department of Physiological Sciences, Warsaw Agricultural University, Warsaw, Poland.

Feeding of neonates with artificial milk formulas delays the maturation of the gastrointestinal mucosa. Na-butyrate has a complex trophic effect on the gastrointestinal epithelium in adults. These results suggest that supplementation with Na-butyrate may enhance the development of jejunal and ileal mucosa in formula-fed piglets.

Cecal Infusion of Butyrate Increases Intestinal Cell Proliferation in Piglets

C. Lawrence Kien, et al.

The effects of colon-derived butyrate on intestinal cell proliferation are controversial. In vitro studies suggest an inhibitory effect, and in vivo studies suggest the opposite, but neither type of study has been based on a physiologically relevant, intracolonic supply of butyrate. In this study, piglets (*n* = 24) were fed sow's milk replacement formula and randomized into 4 equal groups: *1*) control; *2*) cecal butyrate infusion at a rate equal to that produced in the colon; *3*) inulin supplementation at a concentration previously found to lower cecal cell proliferation; and *4*) butyrate infusion plus inulin supplementation. After 6 d of oral feeding, cecal butyrate infusions were initiated for a period of 4 d. Cecal, distal colonic, jejunal, and ileal cell proliferation, apoptosis, and morphology were evaluated and serum concentration of glucagon-like peptide-2 (GLP-2) was measured. Butyrate or inulin did not affect GLP-2, weight gain, apoptosis, intestinal injury scores, cecal or colon crypt depth, and jejunal or ileal villus height. For cell proliferation, there was a significant interaction between inulin, butyrate, and tissue (P = 0.007). Inulin modified the effect of butyrate (butyrate × inulin interaction in cecum, P = 0.001; in distal colon, P = 0.018; in ileum, P = 0.001; and in jejunum, P = 0.003). In the absence of inulin, butyrate caused a 78– 119% increase in cell proliferation in the ileum, distal colon, jejunum, and cecum ($P \leq$ 0.002). Thus, at an entry rate into the colon within the physiological range, butyrate caused increased intestinal cell proliferation, but inulin tended to block this effect. Thus, intracolonic butyrate may enhance intestinal growth during infancy.

Butyrate biblio references (layers)

Eggshell strength was lower in eggs from the control than from the treatment group. The percentage of eggs produced by the control group was significantly lower than that by the supplemented group. Percentage of dirty, cracked and misshapen eggs, and the hatchability percentage of the control group were also significantly lower than in the group receiving SCFA.

It was concluded that dietary supplementation of SCFA to layer breeder hens from 66 weeks of age onwards improved eggshell strength, reduced the percentage of dirty, cracked and misshapen eggs and increased the hatching percentage of the eggs. The positive responses were suggested to be largely due to the butyrate in the SCFA.

Short Communication Effects of short chain fatty acid (SCFA) supplementation on performance and egg characteristics of old breeder hens

E Sengor, M Yardimci, S Cetingul, I Bayram, H Sahin, I Dogan

Butyrate biblio references (layers)

Effect of Dietary Organic Acid Supplementation on Egg Production, Egg Quality and Some Blood Serum Parameters in Laying Hens

From the obtained data can be concluding that organic acid supplementation of laying hens diet improve live body weight, improve persistence of lay and from economical point of view we can concluded that organic acid addition amazing increase the economical efficiency of layer production.

M.A. Soltan

Butyrate biblio references (humans)

Butyrate Enhances the Intestinal Barrier by Facilitating Tight Junction Assembly via Activation of AMP-Activated Protein Kinase in Caco-2 Cell Monolayers

Luying Peng, Zhong-Rong Li, Robert S. Green, Ian R. Holzman, and Jing Lin

Department of Pediatrics, Mount Sinai School of Medicine, New York, NY 10029-6574; Department of Pediatric Surgery, Yuying Children's Hospital of Wenzhou Medical College, Wenzhou, China 325027; and Department of Medical Genetics, Tongji University School of Medicine, Shanghai, China 200092

Bibiography (calves)

Sodium-butyrate as a growth promoter in milk replacer formula for young calves.

Guilloteau P, Zabielski R, David JC, Blum JW, Morisset JA, Biernat M, Wolinski J, Laubitz D, Hamon Y. INRA, UMR 1079, Système d'Elevage, Nutrition Animale

In milk-fed calves, the effects of sodium-butyrate (Na-butyrate) to replace flavomycin on growth performance and some mechanisms involved were studied. Pancreatic and intestinal morphology, digestive enzyme activities, plasma gut regulatory peptide concentrations, and expression of their receptors in the gastrointestinal tract were measured.

Supplementation with Na-butyrate enhanced growth rate and improved feed conversion into body weight gain compared with the flavomycin group. Supplementation with Na-butyrate was likely associated with an improvement in efficacy of the gastrointestinal tract digestive capacities expressed by enhanced production of digestive enzymes and increased absorptive capacities in the upper small intestine.

In conclusion, beneficial effects of Na-butyrate on maturation of gastrointestinal functions were shown in milk-fed calves and may be applied to young mammals of other species.

Effect of sodium butyrate supplementation in milk replacer and starter diet on rumen development in calves.

Gorka P, Kowalski ZM, Pietrzak P, Kotunia A, Kiljanczyk R, Flaga J, Holst JJ, Guilloteau P, Zabielski R. Department of Animal Nutrition, University of Agriculture in Krakow, Poland. Rumen development is an important factor determining early solid feed intake and performance in cattle. The present study aimed to determine the effect of sodium butyrate (NaB) supplementation in milk replacer and starter diet on rumen development in rearing calves. Addition of NaB to milk replacer and starter diet had no effect on daily growth rate, but reduced the weight loss observed in C calves in first 11 days of age. Additionally, the NaB calves weighed more at the end of the study and tended to have higher growth rate in the whole trial period ($P<0.15$). The NaB calves showed a tendency toward higher reticulorumen weight ($P=0.13$) and higher reticulorumen weight expressed as a percent of whole stomach weight ($P=0.02$) as compared to control. Histometry analysis indicated larger rumen papillae length and width ($P<0.01$) in NaB group, and no change in muscle layer thickness, as compared to control. Plasma glucagon-like peptide-2 relative increase was higher in NaB group than in C group, and may be involved in rumen development. In conclusion, supplementation of the diet (milk replacer and starter diet) with NaB may enhance rumen development in neonatal calves.

Sodium butyrate in calf milk replacer shows positive effects

Calves have improved performance, health

The addition of encapsulated sodium butyrate in milk replacer and prestarter has been shown to improve the performance and health of suckling calves, according to research published in the *Journal of Dairy Science*.

Sodium butyrate increased the average daily weight gain during the first 21 days of life and avoided weight loss during the first week of life, according to the data. In addition, the sodium butyrate increased the intake of prestarter feed during the first 21 days. Calves fed sodium butyrate had longer ruminal papillae, and the rumen weight compared to the total body weight was also modified. The need for antibiotic or electrolyte therapies were reduced when butyrate was used and the treated animals had improved fecal scores, according to the research.

Butyric Acid in Aquaculture.

Several publications have addressed the effects of short change fatty acids (SCFA) and heir salts On the health and performance of farm animals. These SCFA are commonly known by their specific antimicrobial activity, however the effects of SCFA go beyond modification of gut micro flora, and other benefits such as improved digestive enzyme activity, increased pancreatic secretion, enhanced development of intestinal epithelium and intestinal barrier integrity, or anti-inflammatory properties, have been described and attributed to likely causes of enhanced performance, particularly when supplementing butyric acid in its sodium salt form.

Butyric acid is naturally produced and present within the intestine of both carnivorous and herbivorous fish (Holben et al. 2002; Mountfort 2002), here you´ll find some Bibliography regarding the use of Butyric acid in its different forms of presentation in aquaculture:

Effect of partially protected butyrate used as feed additive on growth and intestinal metabolism in sea bream (Sparus aurata).

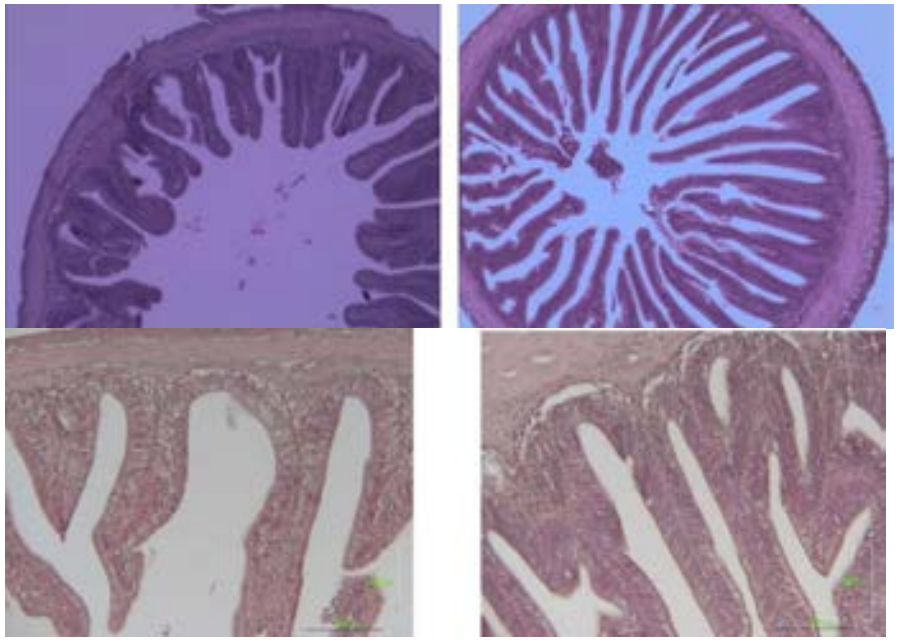
Robles R[1], Lozano AB, Sevilla A, Márquez L, Nuez-Ortín W, Moyano FJ.

In the present work, growth parameters and changes in more than 80 intestinal metabolites have been quantified in juvenile sea bream fed a butyrate-supplemented diet. Results showed a significant increase in the weight of fish receiving butyrate, while metabolomics provided some clues on the suggested effects of this feed additive. It seems that butyrate increased the availability of several essential amino acids and nucleotide derivatives. Also, the energy provision for enteric cells might have been enhanced by a decrease in glucose and amino acid oxidation related to the use of butyrate as fuel. Additionally, butyrate might have increased transmethylation activity. This work represents an advance in the knowledge of the metabolic consequences of using butyrate as an additive in fish diets.

Owen et al. (Biarriz 2006), tested Na-butyrate as a feed additive in the tropical catfish (Clarias gariepinus). They added at 0.2% to two diets differing in their major protein source (fishmeal or defatted soya).

Slightly higher growth and improvement in FCR were observed in catfish fed the fishmeal diet supplemented with Na-butyrate, compared with the control diet. Na-butyrate supplementation also appeared to increase the proportion of Gram-positive bacteria in the hindgut of C. gariepinus.

A protective effect of butyrate on the European sea bass intestine histological structure has been observed and such effect could be extended to the liver as well.



**Distal Intestine of Seabass fed basic diet, withour and without butyrate. (Ematoxiline-Eosine x4)*

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Thanks!!!!!

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