Butyrates- Choosing the right Butyrate product

Under modern systems of poultry production, birds are inevitably exposed to considerable stress before and during their productive lifetime. The gastrointestinal tract of newly hatched chicks is immature and sterile. Its functioning along with the growth of microflora commences when it starts ingesting feed. At this time, the chick is very susceptible to pathogenic microorganisms (Adams, 2004). Likewise, in productive phase, the bird goes through a huge stress due to production, performance, environment, vaccines, medications etc., which challenges immunity. Harmful microbiota of the gut take advantage and flare up to affect the performance; at times their numbers may increase to a life threatening level.

Under such circumstances, antimicrobial feed additives such as antibiotics are often used to suppress or eliminate harmful organisms in the intestine, and to improve growth and feed efficiency (Jin et al, 1997). However the use of antibiotics as a routine feed additive has been banned in recent years because of public concern over possible antibiotic residual effects and development of drug resistant strains of bacteria (Leeson, 2007). This has led to the application of non-antibiotic chemical substances (Yang et al, 2007) and one of the significant choices available is organic acids (both individual as well as blends of several acids).

Amongst the organic acids, short chain fatty acids (SCFA) are considered as a potential alternative to antibiotic growth promoters (Van Immerseel et al, 2005). Butyric acid is one such SCFA which has a higher bactericidal activity (Leeson, 2007). SCFAs pass through the bacterial cell wall and once inside the cell, they dissociate and liberate H+ ions resulting in decrease in the intracellular pH leading to their death. Butyrate functions as a major energy source for cells in the lower gut of animals, including poultry and plays a vital role in development of the intestinal epithelium. Butyric acid possesses the following properties:

1. Support for healthy gut wall
2. Antibacterial activity
3. Anti-inflammatory function
4. Improves immunity and gut homeostasis
5. Stimulates pancreatic secretion

Butyric acid is volatile and corrosive, that is why salts as Sodium Butyrate are used. Sodium Butyrate acts as a source of energy for the enterocytes. This results in better development of the intestinal villi and a healthy gut lining. Leeson et al (2005) found numerically longer villus in the duodenum of birds receiving butyric acid in diets as compared to control birds. Energy supply to intestinal epithelial cells is important due to the fact that the intestinal mucosa is one of the most rapidly replicating tissues in the body. The gut epithelium is permanently in close association with microbes and their byproducts. There is a constant immunological challenge, which makes the barrier defense function of the epithelial layer very important (Hamer et al, 2008).
At an early stage of life butyrate is an important factor in the development of the gastrointestinal tract. Claus et al, 2006 fed butyrate to healthy growing piglets and demonstrated that targeting butyrate into the small intestine improves villi development, gut morphology and function. Also, butyrate in blood stimulates the pancreatic secretion of Insulin, helping the glucose metabolism and resulting in an improved feed intake.

Butirex C4 (Sodium Butyrate) acts mainly in the small intestine, the absorption site for most key nutrients

Volatile Fatty Acids (VFAs) can inhibit the growth of bacteria under the group of enterobacteriaceae (Salmonella, Escherichia coli etc.). This is because the un-dissociated form of these acids can freely diffuse across the bacterial membrane. Butyric acid dissociates inside the bacterial cytoplasm thus releasing free hydrogen ion and reducing the pH, which causes internal cell damage and death of bacteria. In addition to this, butyrate acts through other mechanisms also to help reduce infection. For example, antimicrobial peptides, also known as Host Defense Peptides (HDPs) are a critical part of innate immunity (Brogden,K.A. et al, 2003). Butyrate can enhance disease resistance to Salmonella enteritidis in chickens by inducing synthesis of various HDPs (Sunkara, L.T. et al, 2011). Another mechanism for the effect of butyrate is down-regulation of expression of invasion genes in Salmonella, which reduces the ability of the bacteria to attach to host cells of the intestinal epithelium (Van Immerseel et al, 2006).
Concentration of BUTIREX C4 is able to reduce the level of E.coli by 50% (in vitro P. Galfi & S Neogrady 1992)

Butyrate has a role as an anti-inflammatory agent, primarily via inhibition of nuclear factor kB (NF-kB) activation in colonic epithelial cells. NF-kB regulates many cellular genes involved in early inflammatory responses (Canani, Di Costanzo et al, 2011).

Butyrate also plays an extensive role in gut homeostasis, including support for the gut barrier function. Butyrate facilitates the creation and maintenance of cellular tight junctions (Peng, L. et al, 2013) that is the closely associated area between two cells whose membranes join together. These junctions form a mucosal barrier that is more efficient in nutrient absorption and more resistant to attack by invading pathogens.

Butyrate enhances the immune status of the birds. Apart from its gut barrier function, antimicrobial and anti-inflammatory actions, there have also been reports of more direct effects of butyrate on the immune system of mammals, suggesting that butyrate interacts with the cytokines (the messaging system of immunity). Butyrate may also regulate or modulate immunity in broiler chickens (Zhang, W. et al, 2011).

Butyric acid is available as Sodium or Calcium salts in coated and uncoated form. The primary challenge with plain or uncoated butyrate is that most of it gets dissociated in the stomach itself. Moreover it gets immediately absorbed by the enterocytes in the proximal part of the digestive tract hardly reaching the distal part. Coating claims to make the salt stable in the stomach and to ensure the availability of butyrate throughout the length of the digestive tract. The coating used, most often, is vegetable fat. Using fat coating technology has distinct disadvantages.
First, the percentage of active ingredient in the product is lowered considerably. Secondly, the ability of the coating to withstand pelleting temperatures is questionable. Third, any Butyrate that presents itself in the small intestine in a coated form requires effective lipase activity to dissolve the fat coating which is generally inadequate in young birds.

Apart from these two forms of coated Butyrates, there is another category of Butyrates, termed as “Glycerol esters of Butyric acid”. The challenge still persists, as this form requires effective Lipase activity in the intestine to release butyric acid from the glycerol ester molecule. Even in the presence of Lipase, the release of the three butyric acid molecules bonded with glycerol is not likely. Moreover, data pertaining to the stability of Glycerol esters of Butyric acid at pelleting temperatures is also not available.

An ideal Butyrate product should meet the following conditions:
(a) It can withstand pelleting temperatures
(b) Pass undissociated through the stomach
(c) Remain available in its active form through the entire length of the gut

These conditions are met adequately by BUTIREX C4, a revolutionary product from Novation, Spain marketed in the Subcontinent by Avitech.

BUTIREX C4 is a Buffer Matrix Sodium Butyrate, containing a very high level of activity (54%). BUTIREX C4 is protected by the physical-chemical structure of buffering salts which prevents it from dissolving and disassociating in the fore-gut. The Sodium Butyrate in BUTIREX C4 is made available, mainly in the small intestines. BUTIREX C4 has proven ability to remain stable at pelleting as well as extrusion temperature (120°C).

BUTIREX C4 promotes feed intake by stimulating early pancreatic secretions including insulin. Insulin increases the glucose uptake by the cells, blood glucose reduces and hence there is an increased appetite and feed consumption by the chicks. BUTIREX C4 acts as a readily available source of energy for enterocytes and improves the health of the enteric wall and the villi. It is also proven in vitro that BUTIREX C4 promotes the proliferation of intestinal epithelium. (Peter Galfi study, 2012). BUTIREX C4 is the only product proven for this kind of activity.

Apart from the above, BUTIREX C4 inhibits the growth of Salmonella and promotes growth of Lactic Acid producing bacteria and other beneficial bacteria facilitating ideal eubiosis. BUTIREX C4 is supported by a number of well documented studies.

Contributed by the Avitech Product Management Team.
References available on request.

For more information please contact:
Email: marketing@avitechnutrition.com
Website: www.avitechnutrition.com