Intestinal modulators favour immunity in the dairy cow

First, colostrum guarantees protection to the animal; then you need to supplement your diet. The first eight weeks are crucial for the development of the immunological system of the animals. Supplementation of calves in creep feeding with MOS promotes immunity.

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Few livestock farmers understand the importance of the microbiota for the development and health of cattle throughout their lives. When these animals are born, their intestinal microbiome is sterile, but as soon as the calf encounters external contaminants, mainly from their mother, their intestines become populated by micro-organisms, mainly enterobacteria and Gram positive coccus.

In the rumen-reticulum, this process of colonisation occurs in a slow and complex way, taking weeks or even months to establish itself, until a pattern is present. In the intestines, the micro-organisms are installed in an immediate and dynamic way, with no specific pattern. The first colonisation (first eight weeks) will define functional efficiency, nutrient absorption capacity, and the development of the bovine immunological system throughout their lives.

This process is influenced by the animal's genetics, environmental factors (time of year, place of birth), the age of the mother, and her body condition at birth and the time of gestation; by colostrum quality and the moment in which it is ingested; by treatment of the mother or the calf with antibiotics, before and after birth.

In any case, some simple care helps in the good development of the intestinal microbiota. It is important, for example, that in the first few hours after birth, the neonate excretes meconium, a dark greenish-coloured faecal material produced by the foetus.

This excretion is only possible when the animal ingests colostrum, which has a laxative, antiseptic, immunological and nutritional action. The faster this occurs, the greater the absorption by the intestines of maternal immunoglobulins (defence cells), which will protect the calves for months.

Colostrum is also rich in MOS, an oligosaccharide (sugar) that resists both acid digestion of the stomach and the enzymatic digestion of the duodenum (the initial part of the small intestine) and helps in the development of the neonate intestinal microbiota.

MOS selects beneficial micro-organisms that must multiply in the intestines and inhibit the multiplication of the undesirable ones, especially of the pathogenic bacteria that can cause inflammatory, clinical or subclinical processes, causing irreversible damage to the intestinal villi.

After drinking colostrum and beginning to suck, calves are relatively protected, but it is important that they receive, after 30 days of life, in a creep feeding system, supplements containing intestinal modulators capable of strengthening their immune system and ensuring good rates of growth.

Modulator and its effects

A series of immunological response modulators, such as GOS (galactooligo-saccharides), FOS (fructooligosaccharides), LOS (L Lactulose), inulin, PDX (poly-dextrose), the previously mentioned MOS (mano-oligosaccharide) and the β-glucans, have been included in mammalian diets, including humans.

These last two obtained from cane yeasts are the most used in calf diets.

Modulation of the immune response occurs with increased serum (blood) and intestinal levels of the body's defence cells, the immunoglobulins, in response to pathogens, whether opportunistic and/or invaders.

Among the mechanisms of action of the intestines modulators are:

- The adsorption (retention) of pathogenic bacteria, especially those of type I fimbriae, such as salmonella and E. coli. Decreasing their adherence to the intestinal mucosa, these modulators 'kidnap' pathogenic bacteria and carry them together by faeces.
- Binding to macrophages (defence cells), the modulators deflate a chain reaction, which results in cell activation and cytokine release, via the classic inflammatory response.

As result, the animal's ability to obtain the innate immune response (first reaction of the defence system to an autogenic invader) increases, which is much more biologically 'cheap' in energy and enzymes, and can avoid the use of the 'expensive' specific immune system, major energy spender, and enzymatic reactions.

The more efficient the innate immune system, the more resistant the animal is to

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the invader's pathogens and energy and enzyme expenditure will be less.

- Intestinal modulators also promote increased immunoglobulins synthesis (antibodies), especially IgA, present in blood, mucus, saliva, and colostrum.
- Among the intestinal modulators, β-glucans has a strong action on mycotoxins, especially in the aflatoxin group, being excellent adsorbents of them, as much as aluminium silicates, but without the drawback of binding to essential minerals and vitamins present in the diet, impairing the metabolism of these substances, as occurs with the silicates.

One source of MOS and β-glucans is yeast. Yeast has been widely used in ruminant's nutrition as a functional feed additive and there is extensive literature proving its benefits.

ImmunoWall (ICC Brazil Company; www.iccbrazil.com) is pure cell wall from Saccharomyces cerevisiae yeast originating from sugar cane fermentation process for ethanol production.

This final product is highly purified and with high concentrations of MOS (around 20%) and β-glucans (around 35%), it has an excellent cost-benefit relation.

ImmunoWall has already been tested and approved in over 20 studies in universities and research centres in Brazil and abroad.

It is a product present in various countries, and it can be used as a strategy in food biosafety, which can reflect on the improvement of animal performance.

Knowing the role of the microbiota

Ruminants have two types of microbiota, ruminal and intestinal. The second is less known by producers, but it is as fascinating and essential as the first, especially for the modulation of the immune system, as already described. It is an immense, rich and little-known set of micro-organisms (bacteria, fungi, yeasts, protozoa, viruses, parasites), which interact all the time with their host (animal) and changes in gender, number and degree according to age, the type of diet ingested, hormonal activity, the environment and other factors affecting the bovine, whether of internal and/or external origin, for good and bad.

Science has 'known' and researched micro-organisms since the mid-17th century, but more from the point of view of pathology, that is, as causes of diseases and inflammatory processes harmful to their hosts. It was only in the middle of the 20th century that some scientists began to see certain micro-organisms as beneficial, especially for the immune system, composited by defence cells, major guardians of the individual's health.

This explains why, today, more attention is given to the intestinal microbiota, whose density varies greatly throughout the day, due to the multiple cycles of multiplication and death of trillions of micro-organisms. It is predominantly composed of bacteria, but all of its members are important.

An intriguing role, for example, is bacteriophage viruses, which maintain symbiotic relationships with bacteria, transferring to them genetic codes more beneficial to intestinal balance. Without this balance, there is no health.

The regulatory role of the microbiota is of extreme importance. It helps to maintain an adequate pH in the intestine, through the synthesis of organic acids that create an unfavourable environment to the pathogenic bacteria; assists in the balance between cations and anions in the diet; in the absorption of nutrients by the villi and in water metabolism; favours electrolyte balance (sodium and potassium); promotes protein metabolism as well as lipid, energy, macromineral and micro mineral; participates in the synthesis of B vitamins, the metabolism of vitamins A and E and helps in the inactivation of mycotoxins.

It also functions as a physical-chemical barrier against pathogens, controlling its population; promotes the proliferation of lymphoid tissues in the intestinal mucosa; helps in the control of body temperature and in the formation of healthy faecal matter. ■