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FEED ADDITIVES CAN IMPROVE THE DIGESTIVE PROCESS

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Mannan Oligosaccharides (MOS)

Carbohydrates (starches, fibers) are very similar in molecular structure. Changes in how molecules are attached on one another can designate whether the resulting structure is a starch (more soluble) or a fiber (less soluble). Most of the time these compounds are found either in the plant cell or in the cell wall. Aside from their nutritional value, in many cases these structures can have other functions as well in the digestive tract or in the body

Mannan Oligosaccharides are extracted from the cell walls of yeast cells (which can be considered plants). The most common of these yeasts is *Saccharomyces cerevisiae*. This is a variety of yeast that is commonly fed to most species of food animals. In the yeast cell wall, MOS are present in complex molecules that are linked to the protein component of the cell. To get technical for a moment, there are two main locations of MOS in the surface area of the yeast cell wall. They can be attached to the cell wall proteins as part of –O (oxygen) and –N (nitrogen) glycosyl groups and also constitute elements of large α-D-mannanose polysaccharides (α-D-Mannans), which are built of α-(1,2)- and α-(1,3)-D-mannose branches (from 1 to 5 rings long), which are attached to long α-(1,6)-D-mannose chains.

OK, all that means approximately nothing to the typical producer. What that means is the structure that is created on the surface of the cell is very attractive to water and creates variable 'brush like' structures that can fit to various attachment locations in the animal's digestive tract. It also allows for binding to receptors on the surface of bacterial membranes affecting the bioactivity of these molecules. The MOS-protein combinations are involved in interactions with the animal's immune system and as a result enhance immune system activity. They also play a role in animal antioxidant and antimutagenic (cell mutation) defense.

The point to all this is that the MOS structures, which can be extracted from the yeast cell wall, can serve to attach to surface areas on animal's intestinal wall. In some cases this MOS attachment can aid with nutrient absorption. In other situations it can prevent pathogenic organisms from binding to the intestinal membranes where they can invade the body (competitive inhibition). Finally, MOS can function to enhance the performance of the immune system.

The initial interest in using MOS to protect gastrointestinal health originated from work done in the late 1980s. At this time researchers looked at the ability of mannose, the pure version of the complex sugar in MOS, to inhibit salmonella infections. Different studies showed that salmonella can bind to mannose. The binding to mannose reduces the risk of pathogen colonization in the intestinal tract.

The digestive tract is the largest organ in the body and is home to billions of microorganisms. Even more so in the case of the ruminant which includes the rumen as part of its digestion system which is a huge fermentation vat, full of microbes. Nutrition must not only provide the necessary nutrients, it must also support a balanced microflora. In recent years consumers and the media have placed an ever greater emphasis on wellness, energy levels and overall well-being for both animals and humans. MOS is considered a natural nutritional supplement offering a novel approach to support the microflora and thus improve overall health and well-being.

In food animals, gut health plays an additional role. A healthy gut enables more efficient use of feed, thus improving feed efficiency. One particular potentially important function for MOS, based on the previous description is a possible replacement for fed antibiotics. As we have discussed here, for years antibiotic drugs have been added to the diets of food animals at non-therapeutic levels in the absence of disease, in order to enhance the feed conversion ratio, accelerate growth and protect the animal's health, therefore increasing profitability for producers. With the current global push to reduce the use of medically important antibiotics as feed additives for farm animals, there is significant interest in "natural" nutritional concepts. Based on a large body of research MOS has established itself as a one of the more important natural additives in food animal production.

The first trial ever reported with MOS was with young bull calves. Newman and co-workers reported improved feed intake and better growth rates. The health status of young calves is one of the most important factors contributing to growth and performance. Diarrhea in young calves is a major issue in the dairy sector. In many cases, an *E.coli* infection of the intestine is often involved. As MOS can bind *E. coli*, it can modify and help to improve the composition of the intestinal microflora. This resulted in a reduction in fecal *E. coli* counts and improvements in fecal scores in calves fed MOS. These improvements were coupled with an increase in concentrate (dry feed) intake and better performance. In addition to the changes in the gut, several workers also noticed improvements in respiratory health, which can also contribute to better performance. Conversely, one trial reported no effects on live weight gain despite increased feed intake. Higher live weight gain, similar to that gained with the use of antibiotics, has been achieved following supplementation of milk replacer with MOS.

Mature dairy cows fed MOS had better immune protection against rotavirus and were able to pass some of this protection on to their calves. The transfer of immunity from the cow to the calves is critical in order to protect the calf from many different diseases. It can be assumed that these positive effects can also be noted in beef cows and calves.

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CELMANAX™ SCP is manufactured using a revolutionary enzymatic hydrolysis process. This process yields highly bioavailable Refined Functional Carbohydrates. By including CELMANAX™ SCP in your feed program, your cattle will receive a full dose of yeast culture plus MOS (mannan-oligosaccharide) and beta-glucans. These components will help prepare the immune system to respond quickly in the event of a health challenge. This has been shown to decrease medicine costs through reducing the incidence and/or severity of the illness.

By placing the immune system in a state of readiness, CELMANAX™ SCP can be effective in reducing the incidence and/or severity of bovine respiratory disease (BRD) and scours caused by E. coli or salmonella. By including CELMANAX™ SCP in the diet, shorter recovery rates and decreased severity of coccidiosis can be observed, allowing animals to return to performing at their maximum potential much quicker.

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