The successful use of algotherapy in dairy cow production

Dairy cattle experience many different stresses throughout their life. It starts with the stress of birth and continues with weaning, vaccinations, movement from group to group, weather changes, and the stress of high production.

by Animal Care Technical Service, Olmix, France.
www.olmix.com

These stressors often upset the normal balance in an animal's body resulting in various kinds of metabolic disorder or disease. Good cow comfort along with digestive efficiency, digestive welfare, and strong immunity can provide improved production with less disease and reduced need for antibiotic treatment.

Olmix is a French marine biotechnology company that has been exploring natural ways to help animals be healthier and more productive. Scientists at Olmix have turned to marine algae, or seaweed, as a source of new products that can help accomplish this goal.

A source of nutrition and health

Seaweed is an abundant and renewable resource that has played a role in the lives of people and animals in the Brittany area of France for hundreds of years. Feeding seaweed to animals is nothing new, but Olmix is bringing a new scientific approach to how people and animals can benefit from seaweed.

Seaweed, or macro-algae, is a source of many nutrients including carbohydrates (mainly polysaccharides), proteins, lipids, minerals, and vitamins. Macro-algae are also particularly rich in biologically active compounds known as algae sulphated polysaccharides. The uniqueness of these algae sulphated polysaccharides comes from the complexity of their structure which are branched hetero-polysaccharides containing sulphate groups.

These are structurally different from polysaccharides that come from terrestrial plants, like starch and cellulose, which are simply straight chains of glucose molecules

without any branching or sulphate groups. The biological activity of the algae sulphated polysaccharides is due to their complex structure (branching), presence of multiple and rare sugars, and the sulphate content. Olmix has isolated several unique algae sulphated polysaccharides from green, red, and brown seaweed that have been incorporated into products that help manage some of the most common and economically important problems that dairy producers encounter.

Managing digestive troubles

Diarrhoea, whether from dietary or pathogenic origin, is one of the major issues dairy producers struggle with in young calves. The surface of the gastrointestinal tract is covered with a protective layer of mucus to help prevent diarrhoea causing bacteria like E. coli and salmonella from entering the body.

Olmix has developed a product called Diet which contains the algae sulphated polysaccharide known as MSPMUCIN along with montmorillonite clay and electrolytes. MSPMUCIN has been shown to increase the production of mucin by the goblet cells in the intestines.

This helps to thicken and fortify the protective mucus layer covering the intestinal epithelial cells and prevent harmful pathogens from entering the body.

The montmorillonite clay also has a protective action towards the gastro-intestinal mucosa, acts as an antacid, and adsorbs gas and toxins preventing them from entering the body.

Reducing metabolic disorders

Ketosis is a metabolic disease caused by a severe negative energy balance between feed intake and the energy required for maintenance and milk production. It is most commonly seen in cows that have recently calved and are in their third or higher lactation, but can be seen in younger cows and at any time.

This negative energy balance causes a mobilisation and degradation of body fat which puts a tremendous strain on the liver and results in ketone bodies building up in the bloodstream. β-hydroxybutyric acid (BHBA) is the main ketone body and is most commonly used to diagnose ketosis.

Clinical ketosis is easy to detect and easy to treat unless it is accompanied by hepatic lipidosis, also known as fatty liver. Signs of clinical ketosis include a rapid appetite and weight loss associated with a decline in milk production. Cows with clinical ketosis will have blood BHBA levels greater than 1.4mMol/L.

There is also a subclinical form of ketosis that does not show the obvious clinical signs of a sudden decrease in appetite and milk production. The best indication of subclinical ketosis is blood BHBA levels in excess of 1.2mMol/L.

Rapid and accurate cow side tests that can be performed in the barn are now available for measuring blood BHBA levels. Cows with either clinical or subclinical ketosis will produce less milk and have a much greater risk of metritis, displaced abomasum, fertility problems, and early removal from the herd.

Understanding the negative impact ketosis has on cow performance and milk production, Olmix developed a product known as DigestSea to help prevent both clinical and subclinical ketosis. It contains the algae sulphated polysaccharide known as MSPLIPID which has been shown to improve liver function and lipid metabolism.

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This is due to MSPLIPID interacting with Farnesoid X Receptors (FXR) which are found in the liver and intestinal cells. FXR is a key receptor for cholesterol, bile acids and lipid (triglycerides) metabolism. Adding MSP to an animal's diet increases FXR expression by three fold.

The exact mechanism of action is complex but the end result is detoxification of the liver, by improving the conversion of NEFA (non esterified fatty acids) into VLDL (very low density lipoprotein) which are directed to the udder instead of being used in the Krebs cycle and resulting in the production of ketone bodies. This results in decreased ketone body production and prevention of both clinical and subclinical ketosis.

Field studies with cows that received DigestSea for five days post-calving showed that all of the treated cows had blood BHBA levels below 1.2mMol/L, while several of the control cows experienced clinical or subclinical ketosis.

Boosting immunity

In addition to ketosis management and improving gut health, controlling herd immunity is another advantage of using algae extracts in dairy feed.

The algae sulphated polysaccharide known as MSPIMMUNITY has been

incorporated into Olmix's product called Searup. Studies conducted in collaboration with the French Institute of Agronomic Research (INRA) showed that MSPIMMUNITY can modulate the immune system by stimulating the expression of immune mediators (cytokines and chemokines) by intestinal epithelial cells. These immune mediators favour the proliferation, differentiation, and recruitment of immune cells involved in innate and adaptive immunity.

This suggests that this MSPIMMUNITY may be used to activate an immune response in the animal with the aim of improving their natural defences and reducing the use of antibiotics on farms. Using this product during times of stress, such as weaning or movement to a new group of animals, can improve the functionality of the immune system and potentially decrease the incidence of diseases such as diarrhoea and pneumonia. Modern dairy cows receive many vaccinations throughout their life, but many farms still struggle with respiratory problems during periods of environmental stress. This environmental stress, along with the immune suppression that comes with high production and possible mycotoxin contamination of feed, can lead to a failure of the cow's ability to respond properly to vaccination. Providing Searup to cattle at the time of vaccination can help to alleviate this immune suppression, increase the immune response to the vaccine, and give better protection against disease.

The dairy industry, similar to swine and poultry, is under pressure from both consumers and regulatory agencies to decrease the use of antibiotics. Algae sulphated polysaccharides in the form of MSPMUCIN, MSPLIPID, and MSPIMMUNITY provide efficient strategies to control digestive problems, prevent ketosis, and reduce suppression of the immune system. Products containing these compounds can play an important role in helping to achieve this goal of reducing the use of antibiotics.

An additional benefit is that we are utilising an abundant and renewable resource, and extracting unique, biologically active compounds that help animals to be healthier and more productive. ■

Local regulations should be consulted concerning the status of this product in the country of destination. All information only for export outside Europe, USA and Canada.