

Enhancing the immune response for a more resilient dairy herd

When dairy producers think about immunity, often the first thing that comes to mind is vaccination. It is true that properly timed and administered vaccines are key components of any dairy producer's disease prevention program. However, vaccination can not do the job alone. Vaccines have significant value in bolstering the animal's immune defence system, but over time, immunoglobulin (IgG) antibody levels decrease, leading to inconsistent protection from disease-causing pathogens.

by **Elliot Block,**
Director of Technology,
Arm & Hammer Animal
and Food Production.
www.ahanimalnutrition.com

It is important to remember that, unlike antibodies, threats from bacterial pathogens do not decline over time. In fact, these threats are an everyday occurrence in a dairy operation, leaving potential gaps in immune response when IgG levels wane.

Ever-present challenges

For example, research in 2007 showed that 13.7% of healthy US dairy cows tested positive for salmonella, even though they did not appear to be sick. The same study found salmonella in 39.7% of dairies tested.

Clostridia are other ever-present pathogens. Analysis of bovine manure samples at the Arm & Hammer laboratory showed that more than 99% of all bovine manure samples analysed tested positive for clostridia and 83.5% of samples from cows and 69.5% of samples from calves tested positive for pathogenic *Clostridium perfringens*. Under these high pathogen loads, dairy animals become increasingly vulnerable to high-stress events such as hot weather or pen moves that can hamper immunity and lead to clinical diseases.

Dairy animals are particularly susceptible to immune deficiencies during the early weeks of life and during the transition phase immediately after calving. Transition cows with poorly functioning immune systems are



more likely to become infected with a new organism, have a chronic subclinical infection escalate to become clinical, or have a fairly minor infection become more severe. These conditions all lead to more time in the sick pen, lower productivity, higher labour and treatment costs, and reduced profitability for the dairy producer.

Although biosecurity, sanitation and other management practices can help keep pathogen loads in check, there is no way to remove them completely from a modern dairy operation. Under these pressures, the goal of every dairy producer should be to create a more resilient herd, with animals that are able to withstand the multiple pathogens and stressors they face, remaining healthy and productive throughout their lifetimes.

The first line of defence

When working to develop a more resilient herd, it is important for dairy producers to understand the importance of gut health. The gut is a critical piece of the animal's immune system. In fact, 70% of a bovine animal's immune defence cells are associated with the gastrointestinal tract.

Whether a disease is caused by *E. coli*, aflatoxin, salmonella or some other pathogen, the gut is the primary point of attack in the animal's body since intestinal cells are the first cells to be exposed to pathogens. Although each pathogen's effect on the animal is different, once ingested pathogens have a single target – the gut

lining. Therefore, the gut is the first line of defence against most diseases.

A healthy gut lining provides real time resilience against the risk of disease-causing pathogens and toxins entering the animal's system. Gut health goes hand-in-hand with vaccination to deliver an optimal immune response to help keep calves and cows out of the sick pen and maintain them as productive members of the herd.

Nutritional solutions for gut health

Interest is growing globally in using nutritional solutions to enhance gut health for a better immune response. Maintaining a healthy gastrointestinal tract is crucial to ensure nutrients are absorbed at an optimum rate and the tract can provide efficient protection against pathogens through its own immune system.

Additionally, a healthy gut avoids energy drains from unnecessary immune responses so animals can maintain health and performance.

By managing immune response more proactively and effectively in the gut, producers may be able to enhance dairy cattle health and performance and reduce the need for antibiotic treatments. Feed additives are one way to help maintain a healthy gut by managing the natural microbial populations and immune response in the digestive system. A strategic nutritional approach can help prepare the immune system so animals can respond

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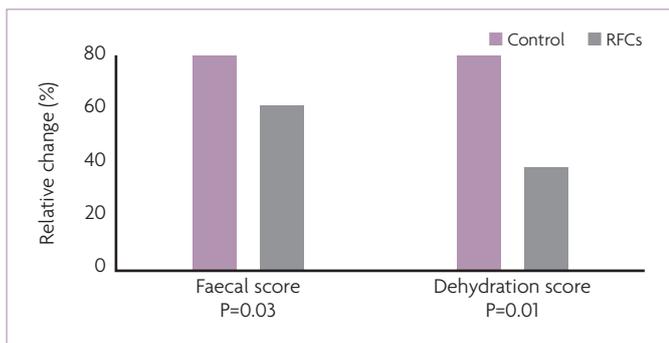


Fig. 1. Effect of RFCs on crypto-infected calves.

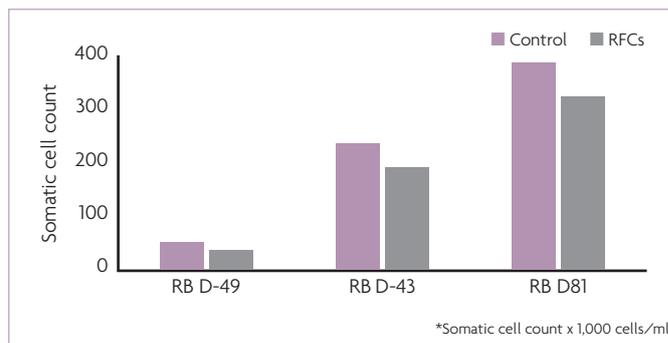


Fig. 2. Effect of RFCs on somatic cell count.

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quickly and effectively – becoming more resilient to potential challenges.

Feeding Refined Functional Carbohydrates (RFCs) is one way to support gut health, leading to improved animal health and efficiency. RFCs work in multiple ways in the animal's body, blocking sites for attachment by pathogens, while supporting beneficial bacteria found in the intestine.

RFCs bind (agglutinate) pathogens, rendering them harmless to the animal. The RFCs can either bind to or block the receptors of certain pathogens and prevent them from attaching to the intestinal wall and causing disease. The organisms then pass harmlessly through the digestive system and are excreted.

The pathogens remain deactivated, helping to break their life cycle and reduce the odds of reinfection. RFCs also support optimal rumen fermentation and digestion and reduce the effects of toxins, such as mycotoxins, in feed. RFCs consist of components harvested from yeast cells (*S. cerevisiae*) using specific enzymes.

This enzymatic hydrolysis yields:

- MOS (Mannan oligosaccharides), which support consistent growth of beneficial

bacteria like lactobacillus and also bifido-bacterium.

- Beta 1.3-1.6 glucans help support the immune system and bind mycotoxins, which provides protection to intestinal cells.

- D-Mannose binds pathogenic bacteria like *E. coli* and salmonella.

- Other RFCs help prevent certain protozoa like eimeria (coccidiosis) and cryptosporidium from attaching to the intestinal wall and causing disease.

Results of better gut health

When gut health is supported through the multi-functional nature of these additives, less energy is needed for fighting infections and supporting the immune system. With these positive health influences, more energy is available for growth and milk production. Multiple research studies demonstrate the positive effects of supporting immunity through gut health from calthood through lactation.

For example, when fed to young calves RFCs have been shown to reduce scouring caused by *Cryptosporidium parvum* (Fig. 1).

RFCs benefit lactating cows as well. In

three separate studies, cows fed RFCs had numerically lower somatic cell counts than control groups (Fig. 2).

Enhancing immunity through nutrition

In conclusion, nutritional tools to maintain a healthy gut can support animal health and efficiency by enhancing immunity so the animal is better able to stave off infections. Maintaining a healthy gut enables dairy calves and cows to devote energy to growth and milk production – instead of mounting immune responses that detract from nutrient uptake.

In addition, changing consumer preferences and government regulations may require cattle producers to adjust their antibiotic protocols now and in the future.

By managing immune response more proactively and effectively, dairy producers may be able to reduce dependence on antibiotic solutions, while creating a more resilient herd. ■

References are available from the author on request

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Ambic Equipment Limited
1 Parkside, Avenue Two,
Station Lane, Witney,
Oxfordshire, OX28 4YF, UK

Tel: +44 (0) 1993 701936/7
Fax: +44 (0) 1993 779039
Email: sales@ambic.co.uk

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