Diet may reduce mastitis risk

A dairy cow’s diet — especially essential trace minerals — plays a role in minimizing mastitis.

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The National Mastitis Council (NMC) estimates that around $184 per cow per year is lost due to mastitis, a disease that results in reduced milk production, discarding milk that already had been produced and incurred treatment costs for both drugs and veterinary services.

Considering that there are more than 9 million cows in the U.S., that amounts to around $1.65 billion each year. On top of this, the cost of mastitis is passed along through the chain of production to the processors and vendors of cheese and other dairy products. These products face lower yields, shorter shelf lives and reduced consumer acceptance.

The majority of modern mastitis prevention efforts have primarily focused on management practices. Among these efforts is the five-point plan that was developed in the U.K. in the 1960s and, more recently, an attempt to address the housing of cattle — which, in the U.S., is considered largely substandard by NMC — through the use of better bedding material.

Careful management is the best way to prevent contagious and environmental mastitis. According to NMC, the best situation for reducing teat exposure to environmental pathogens is to either pasture graze heifers or design housing to mimic the conditions of a well-grown pasture.

Traditional management methods are only effective at preventing parts of the causes of mastitis, and as a result, there are still gaps to fill that can be quite costly.

Diet also plays an important role when it comes to optimizing the animals’ natural defense system, especially essential trace minerals. Feeding essential trace minerals to animals can help them be better prepared with the best opportunity to optimize its natural defenses and aid in the prevention of costly pathogenic exposure that leads to an increase in somatic cell count (SCC).

A 2007 study using a mixture of organic and inorganic selenium, zinc and copper supplemented cows, leading to higher organic selenium supplemented cows, showing no effect on SCC.

In a trial published in 2012 (Scalletti and Harmon, 2012), purposeful infection of a mammary quarter of Holstein heifers with Escherichia coli strain 722 was used to test the effects of copper supplementation in organic and inorganic form on a neutrophil’s ability to handle contaminated conditions. These animals were fed a basal diet in the control group (no copper supplementation) or a diet supplemented with 10 mg/kg of copper in both the organic copper sulfate or copper proteinate form. In all subjects, bacterial counts increased sharply from six to 12 hours post-infusion, peaking at the same level at 12 hours. Copper proteinate-supplemented animals showed consistently lower bacterial counts after 24, 72 and 96 hours than those either supplemented with inorganic copper sulfate or in the control group.

Furthermore, this lower bacterial count was associated with lower clinical scores in infected heifers, indicating a less damaging, less stressful and less lengthy period of sickness for the subjects receiving copper supplementation. Copper proteinate-supplemented cows also had greater milk production compared to the control and copper sulfate-fed cows.

Seelenium-deficient feedstuffs are a common problem globally. This is due to selenium-deficient soil, which, in turn, produces plants deficient in selenium. This has a direct effect on animals; therefore, supplementation is necessary to improve feed performance.

It is well known that insufficient dietary selenium is associated with a number of dairy production and reproductive health problems in affected cattle. These include elevated SCC, increased outbreaks of clinical mastitis, retained placentas and the potential for cytokine storms. Selenium plays a significant role in optimizing an animal’s natural defense system; therefore, selenium deficiency can be further correlated with the reduced ability of neutrophils to kill phagocytized pathogens or the dairy cow’s ability to fight infection.

A comparison of selenium supplementation (Ibeagha et al., 2009) in the form of both inorganic selenium and organic selenized yeast, showed no significant difference in neutrophil phagocytosis was observed. However, and more importantly, higher respiratory burst activity was shown in both from neutrophils in selenium-supplemented cows, leading to higher levels of intracellular kill, with the highest levels being reported in cows supplemented with an organic form of selenium at 0.5 mg/kg.

So, while all cows had neutrophils capable of capturing infectious pathogens, selenium-supplemented cows had a significantly increased ability to actually kill these captured pathogens.

In addition, selenium-supplemented cows showed two trends in neutrophil apoptosis — programmed cell death — indicating poor functionality of the normally short-lived immune cells. In the case of inorganic sodium selenite, apoptosis was increased threefold over the unsupplemented control to around 15%. When looking at organic, seleniumized yeast supplementation, neutrophil apoptosis was numerically lower than the control cows at 5%. This indicates that selenium supplementation is best done through an organic form, which has the strongest positive effect on intracellular kills and little impact on cell apoptosis.

It is common sense that any animal needs proper nutrition for good health and well-being. While all around good nutrition, in addition to appropriate housing, is ideal for raising cattle, different mineral supplementation strategies can be used to solve different problems associated with deficiencies in the cows’ diets.

Manganese and zinc have been shown to help heifers maintain a low SCC and bacterial count (Kinal et al., 2007). Copper supplementation is effective for reducing the severity of an already commenced infection and returning the animal to normal more quickly. Organic selenium acts on a cellular level to increase the efficiency of immune cells even in non-immunocompromised animals, positive cow health, and helping to prevent new ones.

References

GATHERING information from more than 65 countries across six continents and a number of production systems, IDFA/IFCN World Mapping of Animal Feeding Systems in the Dairy Sector — compiles a large set of data on dairy animal feeding systems that will serve as a valuable resource for dairy processors, animal feed professionals, dairy farmers and their advisers as well as policy-makers.

Animal feeding is the first step in the production of milk and, therefore, affects the rest of the production chain. Given its importance, there are many partners organizations — the International Dairy Federation (IDF), U.N. Food & Agriculture Organization (FAO) and International Farm Comparison Network’s (IFCN) Dairy Research Network — collaborated and undertook complementary approaches to map dairy feeding systems in the world.

This mapping may be useful for projects aiming to reduce the carbon footprint of the dairy chain, those looking at the impact of animal diets on human health and nutrition and those influencing animal health, welfare and productivity, the announcement said. According to IDF president Dr. Jeremy Hill, “This publication will serve as a key reference to assess environmental impact, identify better-performing systems, optimize milk composition, enhance animal health and welfare and also to improve economic sustainability of milk production. This is a major effort that will continue for many years to come, and I encourage everyone in the industry to use this report as a source of reference.”

For Dr. Torsten Hemme of the IFCN Dairy Research Network, the key strength of the partnership is that each organization brings specialized expertise and resources to the table and applies them to a common goal. “The partnerships working together not only allows for leverage geographic coverage but also capturing the true diversity of animal feeding systems,” Hemme said. “While IFCN looked at typical feeding systems and their economic factors, IDF issued a detailed expert survey to its member countries. FAO approached animal nutrition experts to identify geographic coverage and also capturing the feeding ‘basket’ for a range of ruminants. The culmination of the data is an impressive insight into dairy feeding systems globally.”