

Stimulating Conversation!

I just had the pleasure of hearing Dr. Pamela Reugg (University of Wisconsin) address a large audience of dairy producers, nutritionists, and veterinarians on the use of on-farm culturing systems for better decisions about treatments for mastitis and reduction of mastitis-related costs¹. Her review of many dairy farms found that typically there was an automatic application of an intra-mammary antibiotic. However, if the causative organism proved to be Gram negative (e.g., *E. coli*, or *Kelbsiella*, etc.), that antibiotic therapy was probably unnecessary. To paraphrase her, 'why spend money on an antibiotic when the cow's immune system will most likely clear that organism by itself?'

That 'stimulated' this mycotoxilogist to consider that while the subject of mycotoxins is often very confusing to dairy producers, so also is the topic of immune function. Now, I'm no immunologist, but it is an area I deal with when I am looking at the effects of fungal toxins on dairy cows. So, let me try to give you a brief perspective on immunity in cows (or any other animal!).

Most of us have some basic understanding of the function of antibodies. We vaccinate ourselves and our animals to potentiate certain cells to recognize foreign pathogens so that when exposure occurs, the body will respond rapidly with production of specific antibodies to help rid itself of that invader. Some also understand that a parallel protective system exists within immunity that is based on the action of some specialized cells. Often these

continued on p. 2



in this issue

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Some Good Advice p. 1

Stimulating Conversation! p. 1

Some Good Advice

Have you reached the point where you really don't want to even open a paper or turn on the news? The milk market today is causing a lot of alarm, perhaps even panic in some areas. So, as I thought about titling this issue of the newsletter, words like 'emergency' came to mind. I am just a simple microbiologist and decided I should see what the real experts had to say. What a great coincidence, then, when my March 3 issue of *Progressive Dairyman* arrived. I'd like to recommend three related articles in that issue to you, written by a dairy extension specialist, a lawyer, and a panel! Dr. Hutjens (University of Illinois) offered very practical considerations for protecting your long-term investment (healthy cows and reproductive efficiency) in hard times by paying judicious attention to balancing feeding strategies against milk components to have the best advantage when the market begins to recover. Among his recommendations were several suggestions for optimizing feeding efficiency and lowering feed costs without sacrificing those essential feed additives that provide for long term health and reproductive efficiency.

Dan Kohls reported on a round-table discussion directed toward best strategies in this market. His title: *Fix your dairy today; don't harm tomorrow*. And part of the message was simply that big ticket items are a place to put your attention. And it continues with "Don't focus on minor feed costs at the risk of compromising health..." But perhaps the scariest yet the sagest advice came from an attorney, Ben Yale, who offered a not-so-new theme but one that has always had much merit in the kind of times you face today. Simply stated, make maximum use of the down time to squeeze every bit of 'fat' out of the system. Become lean and aggressive to capitalize on the full potential of returns as the market shifts back.

Each of these folks suggested in their own expert ways that trying to save by cutting out what seems expedient rather than strategic may not even accomplish the short term goal and will cause extended loss longer term. In his closing "Take-home messages" Dr. Hutjens noted that cancelling a feed additive "...just to 'save' money..." might well be the economically harmful decision, although reviewing feed additives is important. Among additives used on an

as-needed basis is a mycotoxin-control product; which brings me back to my own area of expertise!

In prior issues of *Science in Practice*, we discussed molds and mycotoxins and some strategies to combat them. Consider your most recent test of total mixed ration (TMR), silage, or a by-product feed. Unless you consistently get 'zero' values, even a low mycotoxin value lets you know that feedstuff had or has conditions that are right for molds to grow and produce mycotoxins. Since you are able to test for just a small fraction of the major toxins and none of the less well known mycotoxins, any evidence that molds are at work should put a mycotoxin safety product into your 'as-needed additive' category. Let's put some real-world numbers to that thought. A very recent survey of dairy rations¹ did report those 'common' mycotoxins (DON and zearalenone) in silages: more than 1/3 had zearalenone and over one half had DON. But a large number of those same silage samples also were positive for mycophenolic acid and roquefortine C. Plus, those two mycotoxins, which you have probably never even heard about, were the principal contaminants of by-product feeds and occurred at levels exceeding 1,500 ppb each. In a nutshell, both of those toxins are associated with production, health, and fertility issues in livestock (dairy and others), but neither toxin has a quick, cost-effective test available. The bottom line is that mold activity is not entirely defined by how much DON or zearalenone you can test for, and despite so-called negative tests, if molds are active; your cows are at risk.

So, stop and review what you are using. Binders have a reasonable track record with aflatoxin but, at best, a very sketchy performance when it comes to *Fusarium* toxins, *Penicillium* toxins, or the toxins of other molds. Routine inclusion of a simple binder may not be very cost effective. Instead you should be considering an L-form technology based product that has proven to work in the face of the many very different mycotoxins in dairy rations. Similarly, your overall herd health relies on actions that you might take to insure that the cow's immune system is functioning well and is in balance. You can find lots of immune stimulants in the market but why not look for one that balances immune response. That simply

continued on p. 2

Some Good Advice continued from p. 1

means reducing the inflammatory response (part of the immune system) in the cow's intestinal tract while boosting the cellular and antibody response capacities. Your reproductive service technician can suggest a product for you that will combine immune regulation and mycotoxin control. Doesn't that make more sense than multiple products with limited capacity?

Yes, the milk price is likely not covering costs and you may need to do a thorough job of reviewing possible ways to change that. But, take the advice given in those three articles and be strategic in your decision making. When the milk market begins to turn, you will want to have a healthy and reproductively efficient herd ready to capitalize on that growing market. Don't let mycotoxins add further injury to your operation. ❖

¹Driehuis, F., Spanier, M.C. Schotten, J.M. and te Giffel, M.C. (2008). Occurrence of mycotoxins in feedstuffs of dairy cows and estimation of total dietary intakes. J. Dairy Sci. 91:4261-4271

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Stimulating Conversation! continued from p. 1, sidebar

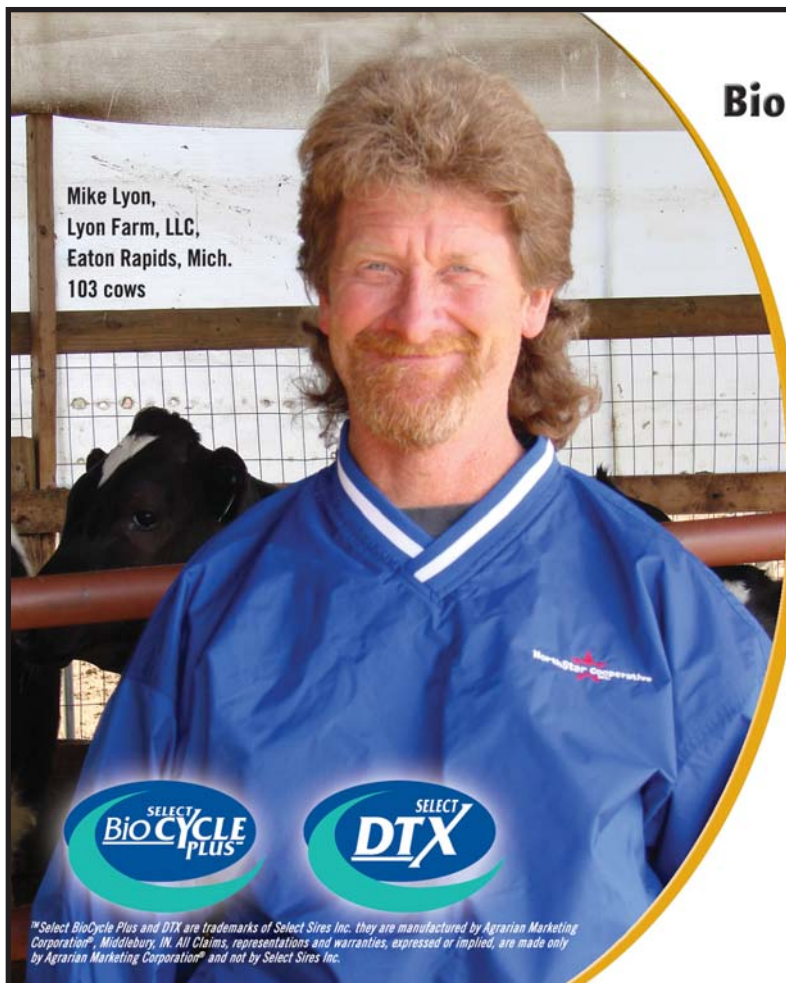
are lymphocytes that either assist in locating and identifying those pathogens so that the antibody response can occur, or are, in and of themselves, able to 'kill' some invaders. Another component of the system works more generically. Other cells (macrophage, neutrophils, etc.) don't need to identify a pathogen specifically; they only need to recognize it as foreign and they go to work. Such cells may, for example, engulf a foreign particle and destroy it.

Your cows are exposed constantly to foreign challenges, and the majority of these come via the feed and water. They are ingested and their presentation to the cow's immune system occurs within the gastro-intestinal (GI) tract. The GI tract is arguably the predominant immune 'organ' of the animal. And some of that immune activity can be very passive. The mucous of the GI tract, the epithelial cells lining that tract, etc. are physical barriers to the penetration of the animal by an invader. For those functions, we'd like to have the cow 'stimulated' to produce the best quality mucous layer and optimize the turnover rate for epithelium to ensure full integrity of those resources. But there is another part of that system. Consider the presence of *E. coli*, a gram negative bacterium that can act at least as an opportunistic pathogen, in the gut. It produces its own mucoid protective layer called lipopolysaccharide or LPS. Cells in the host animal recognize LPS and send out an alarm which causes a number of other immune messenger chemicals to be released and a large influx of certain immune system cells to be recruited to that area. At the same time, the liver begins to synthesize a series of proteins to help thwart the potential problems that could be caused by those *E. coli*. All this is part of

the inflammatory response. It is a necessary component for health, but at the same time, it is also a very costly one. Many investigators have shown that a large amount of the nutrition provided to the cow will be diverted into production of these proteins and in the overall inflammatory response. That means that during that response, a portion of the molecules you are counting on to produce both volume and quality of milk are being diverted. Your production suffers. If the inflammatory response continues or occurs at multiple sites, the problems get worse. Those epithelial cells in the intestine are sloughed at a more rapid rate and their replacements fail to arrive in a timely fashion. Lesions occur. Those epithelial cells are also the ones the cow is relying on to assist in digestion and take the largest role in absorption of nutrients. So, while some part of the protein and energy resources of the cow are being diverted to mount the inflammatory response, there may also be a reduction in actual nutrient absorption. We want the cow to be able to have some inflammatory capacity, but we don't want that to be overdone. In other words, that is one part of the immune system we'd rather not 'stimulate'.

The point here is fairly simple. In managing your herd health, you should be seeking adjuncts to your feeding program that help regulate or balance immunity. You might well want to avoid those that suggest their role is just as a 'stimulant' of immune function. In a subsequent issue, we'll explore how fungal toxins in feed upset that ability to regulate immunity and throw that all important system out of balance. ❖

¹P. Reugg, et al. (2009). On-farm culturing for better milk quality. Proceedings of the 9th Western Dairy Management Conference, Reno, NV, March 11-13, p.149-159.



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