Featured expert of the month...

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Introduction

The FAO, Food and Agriculture Organization of the United Nations, has estimated that as much as 25% of the world's grain supply is affected by mycotoxins (CAST, 1989). The presence of mycotoxins in animal feedstuffs is of great concern worldwide due to the impact on the human population's food supply. In 1995, the FAO/WHO conducted a survey that revealed aflatoxin testing in feed and food by nearly one hundred countries worldwide (FAO 1995). This illustrates the prevalence of mycotoxins in the food chain for both man and animals. There are approximately 1,600 fungal species producing some 3,200 secondary metabolites (Turner and Aldridge, 1983).

This high number of mycotoxins is one of the reasons why diagnosing a mycotoxin exposure is difficult. In most cases, we are dealing with animal exposure to more than one toxin at any given point in time. This synergism between toxins and / or metabolites, makes it somewhat difficult to accurately diagnose the problem. It is more often than not, the sub-clinical effects of long-term exposure to low levels of mycotoxins in the diet that tend to reduce productive and reproductive performance. Diagnosing mycotoxicosis in the field can often times be quite difficult. This is due to the fact that the clinical observations (symptoms) seen in many cases by producers, nutritionists, and veterinarians can be attributed to other conditions and / or disease challenges. Some of the observations noted in the field can be related to feed quality and feed management issues as well as overall management shortcomings.

Diagnosing a Mycotoxin Problem

Mycotoxins are immunosuppressive enough in many cases that the animal becomes susceptible to a variety of bacterial challenges (such as E. coli, Salmonella, etc.). In these cases, there is a tendency to focus veterinary therapy on the bacterial infection, which leaves the mycotoxin challenge left untreated and thereby manifests itself further by compromising animal production, reproduction, and overall animal or herd health. If left untreated, the situation may turn chronic in nature and become irreversible. There are cases where the animal never recovers due to permanent damage to affected organs in the body and / or the immune system.

Mycotoxins are actually compounds produced by molds known as metabolites. These metabolites may in fact, produce other compounds of their own which in turn are known as metabolites as well. Trying to diagnose a mycotoxin challenge at the dairy is a problem magnified by the fact that there is the complication of metabolites forming compounds that are unidentifiable, coupled with a lack of precise sampling and testing methods (Schilfer, 1990). Sometimes the best bet for determining a case of mycotoxicosis, depends on experience on the part of the veterinarian, nutritionist, and dairy producer (Whitlow and Hagler, 1999). Experience is a necessity when trouble-shooting possible mycotoxin affected herds.

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In most cases where mycotoxin problems are identified, the animal symptoms are the determining factor. Problems associated with feed integrity are situations such as visible mold present accompanied by a moldy or mildew-like smell. Feed of this nature generally feels warm to the touch or shows signs of heating in pockets. This is true of finished feed, total mixed rations, and individual feed ingredients (including fermented feedstuffs). One of the challenges associated with identifying problems associated with feed is the fact that in some instances the feed may look, smell, and feed totally normal, but actually be deadly in nature.

Depending upon which mycotoxins are present, we see them exert their negative effects on:
- Immune System
- Endocrine System
- DNA
- Reproductive Performance
- Digestive Tract
- Liver
- Kidney
- Nervous System

The symptoms we see associated with dairy cattle are as follows:
- Reduced feed intakes and / or feed refusal.
- Lack of response to veterinary therapy
- Unthrifty nature, may appear to be undernourished
- Hair coats may have a rough, dull appearance
- Production may be lower than normal (even when on a well-balanced and well-fortified diet)
- Variety of reproductive disorders (abortions, silent heats, low conception rates, irregular cycles, etc.)
- Intermittent diarrhea or constipation (stools may vary in color and consistency, blood may be present as well)
- Immunosuppression (may see a higher than normal incidence of opportunistic diseases)
- Higher than normal incidence of fresh cow metabolic disorders

When we examine the above list of animal symptoms, it is easy to see why experience in diagnosing is necessary.

Digestive Tract Integrity and Immunity

Digestive tract integrity plays a major role in maintaining overall herd health and production. A healthy digestive tract contributes not only to nutrient absorption and utilization, but to a healthy immune system as well. Think of the gut as a functioning immune system all by itself.

While little research has been conducted on the effects of mycotoxins on the immune system in dairy cattle, plenty of research has been conducted on other species of animals utilizing a wide variety of mycotoxins. Our overall knowledge of mycotoxins affecting the immune system allows us to conclude and assume the following changes in the immune system (Cast 1989):
- Thymic aplasia – a defect in the thymus or lack of development
- Inhinition of phagocytocis – the inability to engulf and destroy foreign microorganisms
- Delayed cutaneous hypersensitivity – altered skin reaction associated with an immune system response
- Lymphocyte proliferation – multiplication of white blood cells
- Leukocyte migration – movement of white blood cells

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Dealing with the Problem

Maintaining gut integrity and optimizing digestive tract health becomes increasingly important in the face of a mycotoxin challenge. Once the gastrointestinal tract has been compromised by mycotoxins, we can assume the dairy cow becomes more susceptible to pathogens, especially the gram-negative organisms. Let's assume for a moment, we have had a strong challenge from a combination of toxins from the tricothecene family. In this case we may see damage to the mucosal surface of the gut including hemorrhaging. In this particular situation, not only has digestion and nutrient absorption been compromised, but so has the immune system. This does not account for the possible deleterious effects of any molds and yeasts present in the diet.

Nutritional therapy should be employed with a focus on offsetting all of the problems associated with mycotoxicosis. The first step would be to add a gluco-mannan based toxin-binder to the diet to bind the mycotoxins. Knowing we have a compromised digestive tract and possible pathogen challenges, it is a good idea to utilize a mannan-oligosaccharide/direct-fed microbial combination product in conjunction with the toxin-binder. Over the years I have found this therapy to be the single most important diet addition in terms of offsetting the problem. Addressing the challenge on the immune system is a must in an effort to maintain overall animal and / or herd health. Utilizing selenium yeast and higher than normal doses of vitamin E will help bring about a positive change in immune function. All doses of toxin-binders, mannanoligosaccharides, selenium yeast, and vitamin E are dependent on the severity of the problem.

Clinical symptoms in herds undergoing a bout with mycotoxicosis will vary in severity based upon: (1) the toxin or combination of toxins ingested, (2) the dosage of toxin ingested, (3) length of exposure to the toxins, (4) immune status of affected animals at the time of ingestion, and (5) management and environmental factors associated with the herd (i.e., heat stress, stray voltage, bunk management, etc.).

When dealing with a mycotoxicosis outbreak focus nutritional therapy and diet changes with the following in mind:
- Immune Status
- Digestive Tract Integrity
- Reproductive Performance
- Rumen Function

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