Ruminant Nutrition: Mycotoxins – Prevalence, Impact, and Control Strategies in Ruminant Diets

883 Major mycotoxins in ruminant diets. D. E. Diaz*, *Novus International Inc., St. Charles, MO.*

Mycotoxins are undesirable, but mostly unavoidable, mold produced feed contaminants. The level of mycotoxins in foods and feed can fluctuate widely and vary significantly from year to year. These fluctuations depend on many factors, including adverse conditions that favor fungal invasion and growth either in the field or during storage. Apart from their threat to public health, mycotoxins are also associated with significant economic losses for both crops and animals. Although several hundred mycotoxins have been described in the scientific literature, less than 10 have been extensively studied since the discovery of aflatoxin in the early 1960s. Mycotoxins can increase disease incidence and reduce production efficiency in livestock. They can cause dermal toxicity, reproductive effects, carcinogenicity, neurotoxicity, teratogenicity, nephotoxicity and hepatoxicity. Additionally, mycotoxins may affect immune function and cause lipid peroxidation. In spite of current research advances, applied aspects of mycotoxicology are either limiting or difficult to extrapolate into the real world. This review will attempt to discuss some of the most common problems related to presence of mycotoxin in ruminant diets.

Key words: mycotoxins, ruminant

884 Impact of mycotoxins on the immune system. T. K. Smith*, *University of Guelph, Guelph, ON, Canada.*

Ruminant animals are generally considered to be more resistant to feed borne mycotoxins than monogastric animals because of the potential for rumen microorganisms to inactivate mycotoxins before they enter the blood stream. One symptom of mycotoxicoses that is sometimes observed in ruminants and monogastrics is immunosuppression. Lingering health problems in the herd, animals that do not respond to medications and failure of vaccination programs can be seen. Positive identification of mycotoxins as the causative factor is difficult because many conventional analytical techniques underestimate the degree of mycotoxin contamination of feedstuffs. This is further complicated by the fact that symptoms and lesions noted are not the classical lesions characteristic of mycotoxicoses. They are lesions caused by infections resulting from a mycotoxin-induced compromised immune system. The severity of immunosuppression can be further influenced by management systems. Environmental stresses arising from some management practices will also impart a degree of immunosuppression which may, therefore, appear to exaggerate mycotoxin-induced immunosuppression. The feeding of aflatoxin contaminated feeds to ruminants has been shown to lower disease resistance and to compromise vaccine-induced immunity. Several mechanisms of bovine immunosuppression by aflatoxin have been demonstrated in vitro including mitogen-induced stimulation of peripheral lymphocytes and inhibition of bovine lymphocyte blastogenesis. Recent studies in dairy cows demonstrated that feed naturally contaminated with *Fusarium* mycotoxins (mainly deoxynivalenol) can also affect immune function. Decreased serum IgA concentrations, depressed neutrophil phagocytosis and stimulated primary antibody response to ovalbumin immunization were seen. It can be concluded that ruminant animals can be subject to immunosuppression and decreased disease resistance when exposed to feed borne mycotoxins.

Key words: ruminants, mycotoxins, immunity

885 Prevalence of mycotoxins in feedstuffs. D. Taysom*, *Dairyland Laboratories Inc., Arcadia, WI.*

Each year molds and mycotoxins have a major economic impact on the feed industry and despite advances in analysis of the toxic metabolites produced by molds, they still prove to be difficult to measure and quantify. There are hundreds of unique mycotoxins in the environment; however, there are good analytical methods for approximately 15 – 25 toxins and depending on the sample matrix, most labs are proficient at testing 5 to 8 toxins. A variety of methods; ELISA, TLC, HPLC, HPLC/MS, HPLC/MS/MS are available with verifiable low detection limits on grains and meal product. However products that have undergone fermentation (corn silage) or are mixtures, (grain mixes, TMRs) are limited in number of methods available and must utilize higher detection limits. While complete "panels" of mycotoxin analysis are often recommended when trouble shooting mycotoxin contamination, there is a lack of evidence that this approach is more successful in determining the presence of mycotoxins when compared with analyzing for toxins commonly referred to as "markers." New research indicates that having samples identified for mycotoxin producing molds may also be an effective diagnostic tool. The most common approach for monitoring the prevalence of mycotoxins across a broad geographic region is to summarize data from laboratories performing mycotoxin analysis. While this is useful information, one should consider that most samples submitted for laboratory analysis are suspect in nature and laboratory summaries are not random sampling of products for mycotoxin contamination. There would be a great benefit to the feed industry for a mycotoxin monitoring program that included random sampling of products, accounted for seasonal differences and was implemented consistently over several years.

Key words: mycotoxins, prevalence, laboratory summary

886 Evaluation of feed additives for reducing mycotoxins. I. P. Oswald*, *INRA, ToxAlim Reseach Center, 31027 Toulouse Cedex 03, France.*

Mycotoxins are secondary metabolites elaborated by filamentous fungi and the contamination of food and feed with mycotoxins is a worldwide problem. These toxins have significant human and animal health, economic and international trade implications. The major mycotoxins of concern are aflatoxins, trichothecenes, ochratoxin, ergot alkaloids, zearalenone and fumonisins, most of which are highly toxic and some are carcinogenic in humans. With global warming, the threat from fungal invasion of crops is likely to increase. Every effort must be made to reduce the occurrence of mycotoxins. This is a complex task that require an integrated understanding of crop biology, agronomy, fungal ecology, harvesting methods, storage conditions, food or feed processing and detoxification strategies. The use of feed additives to alleviate nutrient deficiencies, increase product pigmentation, improve pellet quality and adsorb toxicants and toxins is a well established practice in the animal feed industry. A diverse variety of substances have also been investigated as potential mycotoxin-detoxyfying agents. Depending on their mode of action, these feed additives may act by reducing the bioavailability of the mycotoxins or by degrading them or transforming them into less toxic metabolites. We can define at least 2 main categories: (1) One of the strategies for reducing the exposure to mycotoxins is to decrease their bioavailability by including various

mycotoxin adsorbing agents in the compound feed, which leads to a reduction of mycotoxin uptake as well as distribution to the blood and target organs. (2) Another strategy is the degradation of mycotoxins into non-toxic metabolites by using biotransforming agents such as bacteria/fungi or enzymes. Substances that do not directly interact with mycotoxins, i.e., antioxidant agents, immunostimulatory agents, are not considered sensu stricto as mycotoxin-detoxifying agents. However, such compounds may be very efficient for reducing the toxicity of mycotoxins.

Key words: feed additive, mycotoxin, ruminants