IntegraFlo™
MANAGING RISK: MYCOTOXINS

WHAT ARE MYCOTOXINS?
Mycotoxins are naturally occurring byproducts of certain mold growth that can remain present in feeds even after mold is no longer present. Mycotoxins are known to hazardously contaminate crops and in turn contaminate animal feeds, leading to adverse effects on animal health and production.[1] Health challenges can range from acute illnesses and reduced feed intake all the way to chronic illness and death.

WHAT CONDITIONS CAUSE MYCOTOXINS?
Several varying factors contribute to growth of mycotoxin producing mold making them hard to predict and prevent. Mold growth can vary depending on levels of moisture, temperatures, storage conditions, plant stress and even geographic location. No region of the world escapes the problem of mycotoxins and it's estimated that there are about 300 harmful mycotoxins worldwide. [2]

Amplifying the issue even more, grains from different geographic locations are transported and mixed at new locations, spreading different types of mycotoxins and causing potentially higher contamination rates. [1]

WHY ARE MYCOTOXINS DIFFICULT TO DETECT?
Post-harvest storage conditions can promote optimal mold growth due to variations in humidity and presence of other factors such as "hot-spots." [3] In these particular locations, fungi grow intensively resulting in significantly higher mycotoxin loads compared to other areas.[3] Meaning, not all grains are uniformly contaminated, and samples taken from different areas may have varying results. Additionally, conducting multiple sampling tests can be expensive.

Beyond that, masked mycotoxins can occur. Toxins bind to certain molecules making them undetectable with conventional testing methods. Sample results may show up as having no (or low) contamination rates whereas, in reality, there is a mycotoxin risk present. [4]

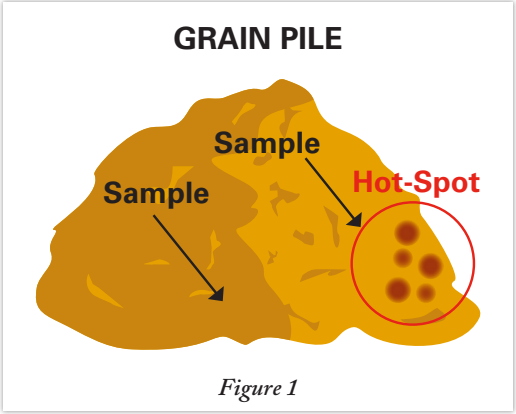


Figure 1

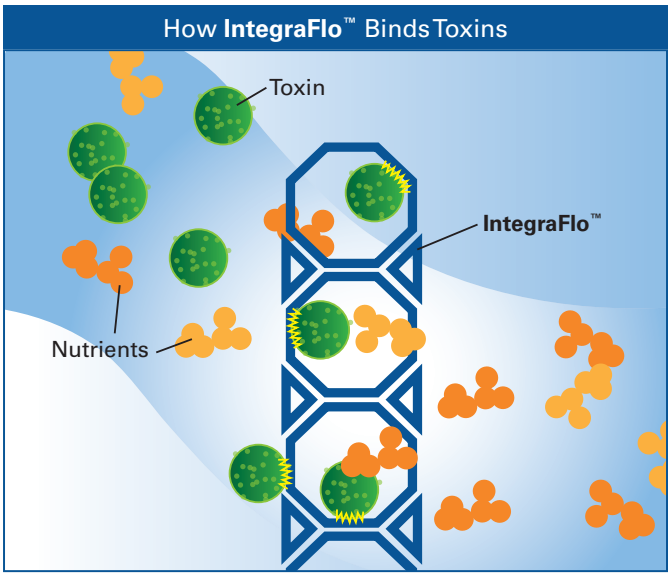
HOW POTENT ARE MYCOTOXINS?
Mycotoxins have varying degrees of potency depending on the type of mycotoxin, species of animal and level of exposure. Acute and chronic symptoms can develop rapidly and escalate over time. (See Table 1)

Known Mycotoxins	Symptoms
Aflatoxin	Acute liver damage, tumors, cancer, hemorrhaging, reduced milk or egg production, birth defects and reduced immunity. Swine are the most sensitive, but dairies are also significantly affected as aflatoxin can contaminate milk in dairy cows.
Zearalenone	Estrogen-like properties causing reduced reproductive performance, infertility and abortions.
Vomitoxin (DON)	Reduced feed intake, feed refusal, reduced body weight and vomiting in swine, reduced milk production in dairy cattle and reduced immune function.
Fumonisin	Liver and kidney toxicity, reduced weight gain. Causes pulmonary edema in swine. Also very toxic to equine.
Ochratoxin A	Kidney dysfunction, effects on fetal development, suppressed immunity.
T-2	Weight loss, poor feed utilization, lack of appetite, vomiting, bloody diarrhea, abortion, and (in severe cases) death. Poultry are the most sensitive. Causes severe oral lesions in poultry.

Table 1: *Chart adapted from references 1, 4, 5, & 6*

MANAGING RISK: HOW INTEGRAFLO™ CAN HELP

Many strategies for dealing with mycotoxins are either not practical or cost prohibitive. One strategy that has been economically utilized is the use of mycotoxin-binding products added to the diet.



SUPERIOR BINDING EFFICIENCY: INTEGRAFLO™

IntegraFlo™ is a uniquely structured, high-quality toxin binder designed with a blend of special silicates and proprietary technologies that give it superior binding efficiency without impairing nutrient utilization.

Due to its unique molecular sieve, **IntegraFlo™** effectively eliminates a broad range of mycotoxins yet allows nutrients such as phosphorus, vitamins, amino acids and trace minerals to be utilized by livestock.

PREVENTIVE PROTOCOL: INTEGRAFLO™

IntegraFlo™ is economically priced and more effective than similar competitive products. The standard rate of 4 lbs/ton protects your livestock for about $4 US/ton.

INTEGRAFLO™ PREVENTIVE PROTOCOL	
SPECIES:	**STANDARD RATE:**
Swine	4 lbs/ton
Equine	2 oz/head/day
Poultry	2 - 4 lbs/ton
Ruminants	2 oz/head/day

Table 2: See tag for additional feeding rates. Higher feeding rates may be utilized for specific mycotoxin challenges. Contact your Ralco nutritionist for more information.

References:

1. Rodrigues, I. (2008, August 22). Mycotoxins: A simple explanation for a complex topic (I). Retrieved from https://en.engormix.com/mycotoxins/articles/a-simple-explanation-mycotoxins-t34295.htm
2. O.O.M. Iheshiulor, B.O. Esonu, O.K. Chuwuka, A.A. Omede, I.C. Okoli and I.P. Ogbuewu, 2011. Effects of Mycotoxins in Animal Nutrition: A Review. Asian Journal of Animal Sciences, 5: 19-33.
3. Andersson, M. G., Reiter, E. V., Lindqvist, P. A., Razzazi-Fazeli, E., & Häggblom, P. (2011). Comparison of manual and automatic sampling for monitoring ochratoxin A in barley grain. Food additives & contaminants. Part A, Chemistry, analysis, control, exposure & risk assessment, 28(8), 1066-75.
4. Berthiller, F., Schuhmacher, R., Adam, G., & Krska, R. (2009). Formation, determination and significance of masked and other conjugated mycotoxins. Analytical and Bioanalytical Chemistry, 395(5), 1243-1252.
5. Pitt, J. I. (2000). Toxigenic fungi and mycotoxins. British Medical Bulletin, 56(1), 184-192.
6. Smith, T., & Girish, C. (2012). Prevention and control of animal feed contamination by mycotoxins and reduction of their adverse effects in livestock. Animal Feed Contamination, 326-351.