# Newsletter

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## > POULTRY! A Painful Crash Course In Mycotoxin Poisoning!! Don't Know What This Is?

*Birds that are exposed to mycotoxins suffer from many painful symptoms ultimately affecting performance. Inflammation is noticed and exposed often around the beak and mouth, typically caused by the mycotoxin T-2 toxin. These symptoms can progress to blistering and skin necrosis often followed by sloughing of the epidermal layer. Nasal areas and oral cavities are painfully inflamed affecting the bird's ability to eat, leading to increased mortalities and reduced feed intake. We now know that mycotoxins are very harmful to both animals and humans and cost the industry millions of dollars annually. Many people perceive that "man-made" chemicals pose a greater threat than naturally derived substances. Interestingly, the most toxic compounds known are natural (Cheeke, 1995). Recently, a Yemen researcher found that poultries are ideal routes for food mycotoxins (Yemen Observer Newspaper). Assuring us that no region in the world escapes the problems associated with mycotoxins and that mycotoxicosis continues to attract greater attention especially as we become more aware of the severity that mycotoxins pose to both animal and human health.*

*Mycotoxins can be found in major cereal grains such as maize, soya, sorghum, barely, wheat, rice meal, cottonseed meal, and groundnuts. Most mycotoxins can sustain and remain intact during processing and are therefore considered to be stable compounds. Throughout the years within the poultry industry our knowledge of raising healthy animals has gone a long way. But along this beaten path there have been many hoops and countless jumps we had to make in order to remain successful within this growing and competitive industry. You cannot smell nor see mycotoxins and in retrospect can pose an effect on performance. Therefore making us wait for clinical symptoms so that our profits will not be stolen or rather taken away from us. If you wait until clinical signs are visible from mycotoxins then it is rather obvious, you no doubt waited too long!*

***Ruben Beltran***


Mycofix® Plus product line

**Along with management and biosecurity programs, health and disease are of utmost priority inmaintaining a healthy animal. Throughout the phases of poultry production many factors can influence or rather impact on animal's well being. Some of which include the animal's environment, genetics, feed additives, vaccination programs, nutrition and the overall sanitary conditions in which our animals are raised on.**

# Have our Birds Become More Vulnerable to Disease due to Mycotoxins?

In 1955 the word mycotoxicosis was first used to describe diseases, which were caused by fungal toxins. Worldwide, approximately 25% of crops are affected by mycotoxins annually (Cast, 1989). The estimated 25% contamination of the world's annual crops would potentially extrapolate to billions of dollars (Trial *et al.*, 1995). Mycotoxins have been known to make animals more susceptible to disease leading to illness or sometimes even death. Grains that have been exposed to severe environmental conditions such as temperature and humidity are only a part of why mycotoxins occur. Other factors that lead to the development of mycotoxins can be the time of harvest as well as storage conditions of the grain. Some of the strategies that are used to prevent mycotoxin contamination include the following: careful screening of incoming ingredients, proper storage of feedstuffs, cleaning storage bins and feed milling equipment. Even following strict guidelines and management practices producers often find themselves owning grain or feed that has been contaminated with mycotoxins.

## Getting Realistic about Mycotoxins

The effects of mycotoxins in animals depend on: age, physiological state, nutrition, and the level of toxicity that can often make mycotoxicosis difficult to diagnose. The definition of mycotoxicosis is "Diseases caused by exposure to mycotoxin-contaminated feedstuffs or foods". Mycotoxins exert their effects through three primary mechanisms:

1. **A reduction in amount of nutrients available for use by the animal (Kao and Robinson, 1972)**
2. **Effects on the endocrine and exocrine systems (Klang *et al.*, 1978)**
3. **Suppression of the immune system (Sharma, 1993)**

Mostly not only one mycotoxin occurs but a variety of different ones. Especially the *Fusarium sp.* produces a big group of mycotoxins. Therefore oftentimes mycotoxins produced by this type of fungus occur simultaneously (DON, T-2, ZON, etc.). These agents can act synergistically under field conditions resulting in major losses of production especially when coupled with stressors associated with commercial poultry rearing situations and their exposure to potential harmful organisms (ex. *Salmonella spp., E. coli*). Therefore it can be stated that there are no safe levels of mycotoxins present (Hamilton, 1984). Of the major species of poultry that are used for meat type / egg production, these animals tend to be fairly resistant to fumonisin, deoxynivalenol, and zearalenone. However if one of these mycotoxins is detected it can be a marker that mold activity has occurred in the ration leading to the development of other mycotoxins.
Prevalent mycotoxins in poultry are produced by *Fusarium, Aspergillus,* and *Penicillium species*. Aflatoxins, T-2 toxin, DON (deoxynivalenol), and DAS (diacetoxyscirpenol), are considered to be the main causes for the visible declines in production. In general these groups of mycotoxins can negatively affect and lead to the following outcomes:

- **Feed intake**
- **Bruising**
- **Increased incidence of diarrhea and blooding feces**
- **High incidence of diseases associated with poor immune function**
- **Pale liver syndrome** *(see picture 3)*
- **Beak/vent lesions (tissue edema** *see picture 1,2 and 4 - 6***)**
- **Altered immune mechanism resulting in vaccine failures**
- **Poor or impaired feathering**
- **Sudden drop in egg production**
- **Weak or thin egg shells**
- **Decreased quality of egg components**

*Picture 1 and 2: T-2 toxin- oral lesions located in mandibular mucosa.*

## What Other Problems do Mycotoxins Cause?

There are many other production problems that can be associated with the contamination of mycotoxins. Table one and two represent the toxic effects in both, broilers and layers alike.

## Economic Consequences of Mycotoxins in Poultry Production

Animal and poultry nutrition represents a challenging mixture of not only animal requirements and production goals but also involves heavily on economics. Feed is widely recognized as being the most important component in the cost of producing chicken. A common rule of thumb is that feed represents approximately half the cost of producing an eviscerated whole chicken (Aho, 2004).
The financial impact in which mycotoxins cause economic losses in poultry and livestock production can be calculated by quantifying performance. Some parameters, which can be used to measure production losses, can be mortality, feed conversion ratio, egg production, egg quality, and percent hatchability.
The effect of oral lesions in breeders can result in reduction of feed consumption due to irritation around areas of the beak and can ultimately cause a reduction in laying which is often a result from exposure of 1-4 ppm of tricothecene (T-2 toxin) contaminated feed (Diaz, Cortez, and Roldan; 2005) *(see picture 1 and 2)*.

*Picture 3: Pale liver due to aflatoxin*

A practical example of an economic loss due to mycotoxins on a parent broiler breeding enterprise would be: integrators that suffered from a decline in egg production and a reduction in percent hatchability. A typical scenario from this result would be that these integrators would then have to purchase broiler chicks or eggs from an outside source to compensate for the losses from their in-house breeder flocks. A 10% drop in egg production, coupled with a 5% reduction in hatchability for 20 days in a flock of 25,000 40-week-old broiler breeders will reduce production by 19% (ASA).

*Picture 4, 5 and 6: DAS- Oral lesions located in the laryngeal mound and tongue.*

Projected value of the loss of 45,625-day-old broilers at $8,193 taken into consideration the current production values which include a purchase price of 15 cents per unit (ASA).

*** All Pictures are compliments of Don Poole, Degussa Corporation USA.*

## Toxic effects of dietary trichothecene mycotoxins in broiler chickens

| Mycotoxins | Dietary level (mg/kg) | Time of Exposure | Effects | Reference |
|---|---|---|---|---|
| T-2 toxin | 4 | 1 week | Oral lesions | Wyatt et. al., (1972) |
| | 4 | 3 weeks | Neural disturbances, Decreased growth rate | Wyatt et. al., (1972, 1973a) |
| | 4 | 3 weeks | Reduced weight gain, hepatic hematomas | Wyatt et. al., (1973b) |
| | 4 | 3 weeks | Abnormal feathering | Wyatt et. al., (1975) |
| | 0.4 | 7 weeks | Oral lesions | Chi et. al., (1977b) |
| | 1-4 | 3 weeks | Oral lesions: decreased feed intake & weight | Chi et al., (1977b) |
| | 8-16 | 11 days | Decreased weight gain; oral lesions | Joffe and Yagen, (1978) |
| | 4-16 | 3 weeks | Oral necrosis; reduced feed consumption | Hoerr et al., (1982b) |
| | 50-300 | 3 weeks | Reduced hematocrit, lymphoid atrophy, anemia; | Hoerr et al., (1990) |
| | 8 | 3 weeks | Oral lesions, decreased body weight | Kubena et al., (1990) |
| DAS | 5 | 3 weeks | Oral lesions, decreased feed intake and weight | Chi & Mirocha, (1978) |
| | 4-16 | 3 weeks | Oral necrosis; growth retardation | Hoerr et. al., (1982b) |
| | 1-2 | 3 weeks | Oral lesions, growth retardation | Ademoyero & Hamilton, (1991b) |
| | 4-8 | 3 weeks | Decreased body weight | Ademoyero & Hamilton, (1991a) |
| DON | 1.87 | 4 weeks | No adverse effects | Hulan and Proudfoot, (1982) |
| | 16 | 3 weeks | Reduced body weight gain and feed efffciency | Kubena et al., (1988, 1989a) |

## Toxic effects of dietary trichothecene mycotoxins in laying hens

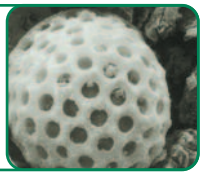
| | | | | |
|---|---|---|---|---|
| T-2 toxin | 16 | 4 weeks | Decreased feed intake and egg production; oral lesions | Speers et al. (1973) |
| | 8 | 8 weeks | Decreased feed consumption, egg production, shell thickness; decreased hatchability; oral, crop, and gizzard lesions | Chi et al., (1977c) |
| | 4-8 | 4 weeks | Egg production slightly decreased (not statistically significant) | Speers et al., (1977) |
| | 16 | 4 weeks | Reduced feed intake, body weight, egg production | Speers et al., (1977) |
| | 12 | 18 days | Decreased feed intake and egg production; decreased egg weight; oral lesions | Wyatt et al., (1978) |
| | 1-10 | 4 weeks | Decreased egg production and hatchability | Tobias et al., (1992) |
| | 2 | 24 days | Oral lesions; decreased feed intake and egg production | Diaz et al., (1994) |
| DAS | 0.5 | 4 weeks | Decreased hatchability of fertile eggs | Allen et al., (1982) |
| | 2 | 24 days | Oral lesions; decreased feed intake and egg production; Increased incidence of soft-shelled eggs | Diaz et al., (1994) |
| DON | 0.35-0.7 | 70 days | Decreased egg and shell weight, shell thickness | Hamilton et al., (1981) |
| | 1-5 | 24 weeks | No adverse effects on health or productivity | Hamilton et al., (1985) |
| | 20 | 12 days | No adverse effects | Prelusky et al., (1985) |
| | 2.5-4.9 | 70 days | Increased incidence of chick developmental abnormalities | Bergsjo et al., (1993) |

*Modified from S. Leeson, G. Diaz, and J.D. Summers (Poultry Metabolic Disorders and Mycotoxins 1995)*

## Drawing a conclusion to strategically deal with mycotoxins through the use of Mycofix® Select based on 3 important strategies

**1. Synergistic blend of minerals**

Processed and activated for selective ADSORPTION of mycotoxins.

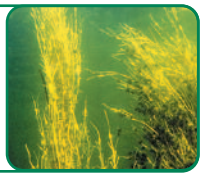


**2. Biotransformation**

ENZYMES capable of degrading the molecular structure of *Fusarium* toxins by breaking up particular functional groups. Converting from toxin to non-toxic form by ENZYMATIC DEGRADATION.

**3. Phycophytic constituents**

Provide IMMUNE SUPPORT and compensate the immune-suppressive effect of mycotoxins.



## In Conclusion

**The importance of good and sound nutrition is nothing new. Today nutrition is as important as ever in maintaining a healthy animal. Mycotoxins among other things will affect your bottom line whether it's an acute outbreak or subtle changes in production parameters. Today many companies, researchers, and universities are finding ways to improve our animals' environment and well being. Yet despite the hard work and efforts the questions still remain but can be somewhat understood and that is, "Have our birds become more vulnerable to disease due to mycotoxins and what do mycotoxins do to our overall profitability?"**

## > WHO TO CONTACT FOR QUESTIONS ON THIS ARTICLE:


**Name:** Ruben Beltran

**Position:** Product Manager

**Education:** 1993-1998 B.S. Poultry Science;
Texas A&M University, College Station Texas
1998-2001 M.S. Poultry Science;
Texas A&M University, College Station Texas
2002- Commercial Account Executive;
Custom Pesticide Services, San Antonio, Texas

**Masters Thesis:** Effects of Recombinant Turkey Interferon-Gamma on Development of Immunity to Coccidia in Neonatal-Turkeys

**1999-2001:** Graduate Research and Teaching Assistant / Lab Technician II;
Poultry Health Laboratory, Texas A&M University, College Station, Texas

**2003-Present:** Product Manager, BIOMIN IAN

**Address:** Biomin USA Inc, 1846 Lockhill-Selma Rd., Suite 101
San Antonio,TX 78213, USA
Phone: +1 210-342-9555; Fax +1 210-342-9575
**e-Mail: ruben.beltran@biomin.net**



**Mycoglobe Argentine 2006,** March 15th – 17th 2006, Villa Carlos Paz, Argentina

**Midwest Poultry Federation Convention 2006,** March 21-23, St. Paul, MS, USA

**BSAS Conference Animal Nutrition,** March 27th – 29th 2006York, United Kingdom

**International Conference on Avian Nutritional and Metabolic Disorders**
14th -17th April 2006, Nanjing, China

**AVESUI,** 25th – 27th April 2006, Florianópolis, Brazil

**Poultry Science Association (PSA) Annual Meeting 2006,**
July 16th -19th, 2006, Edmonton, Canada

**World Nutrition Forum,** September 7th-8th, Vienna, Austria

## > Literature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## > Impressum


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Industriestrasse 21, A-3130 Herzogenburg, Austria
Tel: +43 2782 803-0, Fax: +43 2782 803-40; e-Mail: office@biomin.net, www.biomin.net, Publisher: Erich Erber