

Effect of mycotoxins on animals



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Mycotoxins are secondary metabolites produced by fungi. Secondary metabolites are chemicals produced by fungus that is not essential for growth of the animal. A mycotoxin is a fungal metabolite that causes an undesirable effect in exposed animals. While all mycotoxins originate from a fungus, not all toxic compounds produced by fungi are not characterized as mycotoxins. These unwanted effects are a result of the animal being in the state of mycotoxicoses, exposure often most likely from consumption. Damage can be caused to bodily systems vital for overall health function. The immunity of the animal is susceptible to decrease rapidly under mycotoxicosis. Also, the reproduction will experience a decline in production due to the intake mycotoxins.

Molds is fungi that develops into multicellular colonies. Molds are aerobic, which means they can only grow with the presence of oxygen. Molds can grow on silage, or wet feeds. Once molds begin to grow mycotoxins can be produced pre harvest, during storage, during transport, processing or feeding. Mold growth and mycotoxin production is related to inadequate storage methods, weather extremes, low quality of feedstuffs and faulty feeding conditions. Molds can grow in a pH range between four and eight. Also, molds can grow within a temperature range from fifty to up to one hundred and four degrees' Fahrenheit.

Mycotoxins can be detrimental in a variety ways depending on the type of mycotoxin becomes present. Mycotoxins are known to have variants that are carcinogens. A carcinogen is a substance capable of causing cancer in living tissues. Symptoms in animals can have a wide range of elements from decreased feed consumption, and even decreased metabolism of feed. Also

weight loss is often seen in cases, weight loss, diarrhea, and vomiting. When breeding animals for their meat producers often see the problem of abortion and still births in animals who have consumed mycotoxins.

Tissue necrosis and tumors are both symptoms that may arise within an animal who has consumed a certain type of mycotoxin. Tissue necrosis is known to be a characteristic or feature used when the highest grade of tumors is diagnosed. Tissue necrosis is a process of breakdown of ordered structure and function following traumatic damage, that is often irreversible. Necrosis occurs when nutritional demands of a growing tumor surpass the nutrient supply from the vasculature. Cell necrosis is recognized by changes in the nucleus that are microscopic. Changes can include the nucleus swelling, which will cause condensation of the nuclear chromatin.

Mycotoxins effect on horses

Mycotoxins effects on horses can be broken down into two generalized categories. Horses can either suffer from mycoses or even mycotoxicoses. Mycosis is when the growth of fungi becomes apparent on the animals' body. Mycotoxicoses is more of when mycotoxins have been exposed to the horses diet or feed, respiratory system, or even dermal exposure can result in mycotoxicoses. Therefor mycotoxicosis deals more with once the mycotoxin has effectively entered a bodily system of the horse. Often symptoms of mycotoxicosis that will not be visible are reduced glycogen synthesis and impaired lipid transport.

The most common for of mycoses in horses is known as guttural pouch mycosis. The fungus *Aspergillus* is the most common found fungus to be the

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catalyst for this fungal infection. The guttural pouch of the horse is one of a kind, this body part can only be found in horses and few other species. Horses in fact have two of these pouches and are extensions of the eustachian tube. Each guttural pouch is divided into two separate compartments. Plaques formed from the fungus form inside the guttural pouch, often along the internal carotid, external carotid, and maxillary arteries. Progressively the fungus has the potential to erode through the walls of these major blood vessels. Hemorrhage can result if proper care is not administered, however these hemorrhages may be fatal depending on the severity of the infection. If left untreated the infection will intensify until ultimately a fatal bleed occurs.

There are many types of mycotoxins that have shown to impact horses in a negative way, and studies elude to this same information. Aflatoxin are known to be problematic to horses, these mycotoxins usually target the liver. Much like the aflatoxins, mycotoxin ochratoxin may be produced by aspergillus. Fumonisin is a mycotoxin produced by fusarium moniliforme that is known to have similar characteristics as most mycotoxins, and if improperly treated can result in fatality. Ergot is a mycotoxin produced by Neotyphodium, infection of this fungus can lead to an expected result of a decrease in performance and dystocia (difficulty giving birth).

Ergot is oldest mycotoxin to date, this mycotoxin derives from the fungus Claviceps (Claviceps purpurea). This fungus is known to grow on the ears or rye and other cereal grasses. Ergot alkaloids are a unique sub set of secondary metabolites and have been identified by three groups as: ergopeptines, clavines, and amides of lysergic acid Ergot is composed of alkaloids

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that may disrupt stimulation of smooth muscle cells. Upon consumption of this mycotoxin on feedstuffs horses will undergo ergotism. Ergotism is a term used for ergo-alkaline toxicity, these toxins are known to affect the endocrine, vascular, and nervous systems. The amount necessary to cause major impacts in horses is rather minimal. For symptoms to be triggered the build up of these mycotoxins only has to reach between fifty to one hundred parts per billion. Symptoms often vary from but are not limited to: abortion late in gestation, a decrease in lactation yields, and overall body function complications for foals. Ergot usually is a byproduct of malpractices of feed storage or even during harvesting.

Fusarium is a mold that is been researched and is known to grow on corn, wheat, and grasses. Deoxynivalenol or DON is the mycotoxin that is most likely to be produced from the mold Fusarium. Deoxynivalenol is a vomitoxin, therefore once this mycotoxin has either been inhaled or consumed by the horse multiple unwanted symptoms will arise. This mycotoxin upon entering the body is associated with acute diarrhea, ataxia, vomiting, and if untreated can lead to a sudden death. However due to the monogastric intestines of the animal horses have a high tolerance for deoxynivalenol and are usually less suscept. Yet high amounts of deoxynivalenol when consumed in higher quantities horses are known to reduce feed intake. Generally once feed intake has decreased work or performance declines just as well.

The pivotal aspect of mycotoxins comes about when the possibility of different mycotoxins originating from the same fungus. Fusarium moniliforme for example produces the mycotoxins known as FB1, FB2, and FB3. All three of these mycotoxins in particular are prone to become present

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in corn crops. Within in horses FB1 is one of the more devastating mycotoxins because of the known relations between consumption of this mycotoxin and its relevance to the development of the neurological disease leukoencephalomalacia. The danger of leukoencephalomalacia lies within its ability of transmission to an entire herd. The symptoms of this disease can range from ataxia, neurological dysfunction, and even lethargy.

Leukoencephalomalacia is such a detrimental disease due to there being no treatment or cure. Therefore producers of these animals should be weary of the risk factors associated with administering even a small amount to the animals' diet.

Mycotoxins effect on cattle

Most mycotoxins are excreted by cattle by milk, feces, and urine. Mycotoxins in general are also adept to be chemically stable and can survive most food processing. The major mycotoxins that have shown to trouble cattle are: aflatoxins, ochratoxins, fumonisins, trichothecenes and zearalenone. The molds that these mycotoxins derive from are *Aspergillus*, *Fusarium* and *Penicillium*, these all can produce detrimental mycotoxins. Upon observation of an reproduction decline throughout the entire herd, mycotoxins may often be the primary agent.

Deoxynivalenol or vomitoxin are produced by *Fusarium graminearum*. These mycotoxins will come about more frequently in a wet and cold environment. Vomitoxin in particular has shown over time to be most prevalent in wheat crops. Mycotoxins' have shown to disrupt protein synthesis, and cell proliferation, and in extreme or untreated cases cell death is prevalent

occurrence. Aflatoxin is another mycotoxin that is produced by the fungus *Aspergillus flavus* and *Aspergillus parasiticus*. This mycotoxin does have negative effects in cattle but, even humans as well may experience symptoms upon consumption. Aflatoxins have been well documented to be found primarily on corn crops. Once a bull or heifer have consumed corn with the mycotoxin aflatoxin present the animal will experience cellular changes, cell deregulation, and if left untreated the mycotoxin will run its course and cause fatality.

Fumonisin is one cause of mycotoxins that is produced by various naturally occurring fungi. Fumonisin has a higher chance of reproduction in a hot, dry climate once the corn has started to sprout. However a wet and cool climate may lead to the growth of these toxins during the pollination stage of growth. Consumption of these mycotoxins in cattle is known to be associated with immunosuppression, oxidative stress, and leaky gut syndrome. Leaky gut syndrome is an ideology of loose connections within the cattle's gut. The intestine of the animal is compared to that of tears within a coffee filter, which allows the release of important nutrients needed for absorption and metabolism. The important nutrients that are affected by leaky gut syndromes are the digestible proteins. However the body has an adverse response to this imbalance and immune cells attack the autoimmune invaders, which will often result in inflammation that can be painful to the animal.

Ruminant animals are generally considered to be less susceptible to mycotoxicoses than monogastric animals. The theory of how ruminant animals can avoid in feed mycotoxins is through the power of the rumen.

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The rumen flora which is composed of bacteria, fungi, and protozoa is what inactivates mycotoxins that may enter the animals' system. The process in which ruminants break down ingested feed is through microbial fermentation. The most prevalent protozoans found in the rumen originate from the genera of: Epimastix, Entodina, Diplodina, and Holotrich ciliates. On average between two hundred and five hundred thousand protozoa can be found in the rumen of these animals.

Bacteria compose about half of the living organism that cohabitate inside the rumen. Anywhere between twenty to fifty million bacteria are likely to be found in the rumen of cattle. Even with the majority percentage of the living organism present in rumen are bacteria, bacteria do more than half the work that is required for microbial fermentation. Rumen bacteria are identified four distinct classifications. Bacteria in the rumen can be identified as either fiber digesters, starch and sugar digesters, hydrogen using bacteria, and lactate using bacteria. Bacteria and Protozoa digest roughly between seventy and eighty percent of digestible matter within the rumen.

Mycotoxins effect on poultry

Mycotoxins are fungal metabolite which upon ingestion, inhalation, or absorption through the skin of the chicken can cause disease to the animal and possibly can become fatal. Mycotoxins are toxic compounds that are naturally produced by certain types of molds. Young chickens are more sensitive to the presence of mycotoxins in their intestinal, or respiratory tract. There is a wide range of effects that have been studied in chickens, however immunosuppression. Immunosuppression is when the strength of

an animals' immune system is lowered, which in fact makes the animal more susceptible to infection or illnesses. There is a restricted level of mycotoxins allowable in animals within the United States. However even low levels of mycotoxins present in feed over long periods of time can impair the immune system, leading to immunocompromised animals.

Ochratoxins are a gathering of fundamentally related metabolites that are derived by growths having a place within the general *Aspergillus* and *Penicillium*, and Ochratoxin (OTA) is the most pervasive mycotoxin of this gathering. Indications of OTA lethality in poultry incorporate shortcoming, weakness, diminished feed utilization, decreased development rate and egg generation, poor feathering, and extreme mortality at high dietary focuses (Hamilton et al., 1982; Gibson et al., 1989; Huff et al., 1988b).

Pathophysiological changes incorporate diminished pee focus and glomerular filtration rate, debilitation of proximal rounded capacity, and degeneration and ultrastructural adjustments in renal uprightness (Huff and Hamilton, 1975; Glahn et al., 1988, 1989). Increments in the general loads of liver, spleen, pancreas, proventriculus, gizzard, and testicles have additionally been accounted for in poultry encouraged OTA (Gibson et al., 1989; Huff et al., 1988b).

Ochratoxin A comprises of an isocoumarin moiety connected through the 7-carboxy gathering to the amino corrosive L- β -phenylalanine. At a cell level, OTA meddles with DNA, RNA, and protein combination by repressing the catalyst phenylalanine-tRNA synthetase (Marquardt and Frohlich, 1992).

Ochratoxin An additionally influences renal starch digestion through a decrease of the renal mRNA coding for phosphoenolpyruvate carboxykinase,

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a key catalyst in gluconeogenesis (Leeson et al., 1995). The impacts of OTA on DNA, RNA, and protein combination are believed to be because of the phenylalanine moiety of the poison rivaling phenylalanine in the chemical catalyzed response (Marquardt and Frohlich, 1992). Ochratoxin additionally causes hypercarotenemia in grills (Huff and Hamilton, 1975) that is more extreme than that brought about by Aflatoxins. (Osborne et al., 1982; Schaeffer et al., 1987).

Mycotoxins effect on swine

Swine in particular are extremely sensitive to mycotoxin exposure. Young pigs and breeding sows and boars are more suscep to mycotoxins than more mature swine would be. However both the phase of life the animal is important, along with the phase of production the animal is in, and the level of mycotoxin concentration present in the feed. Likewise as there are many varieties of mycotoxins, there is within that a variety of mycotoxins that can potentially cause significant health and performance problems. These mycotoxins include: Aflatoxin, Ochratoxin, Deoxynivalenol, Zearalenone, Fumonisin. Furthermore, the fungi *Aspergillus* produces the mycotoxin most detrimental to pigs, which is claviceps.

Mycotoxins can effect swine by either way of mycosis or mycotoxicoses.

Mycosis is defined as any disease that is triggered by the development of fungi on the swines' tissue. The fungi invades the tissue of the animal, which can result in disease. Mycotoxicoses is another way mycotoxins can negatively effect swine however, through a different route of entry.

Mycotoxin exposure within digestive or respiratory system, even physical

contact with the secondary metabolites is enough to inhibit an immune response.

Prevention of mycotoxins

Mycotoxins as expressed throughout the piece of work are harmful to animals and have negative effects of many sorts. Preharvest treatment is important and can be completed with the use of Afla-Guard and *Aspergillus flavus* AF36, show promise of reducing Aflatoxins in grain through competitive exclusion. Post harvest it best to lower or limit moisture content of plant seeds, after harvesting and during storage. Commodities should be stored at lower temperatures as much as possible. Pest control in stored bulk grains with approved insecticides will limit insect infestations.

Also, the growth of fungi can be ceased by re drying the products, which are mycotoxins. If the fungi has abundantly covered feedstuffs is not uncommon to destroy the contaminated products by way of burning. With the inclusion of additives such as sodium bentonite that serve as binders. Efficient irrigation can reduce mycotoxins formations in the field before the crop is harvested. Organic acids can be used as preservatives for high moisture feeds.

Conclusion

Mycotoxins are secondary metabolites created by fung. While all mycotoxins begin from an fungi, not every poisonous compound are portrayed as mycotoxins. These undesirable impacts are a consequence of the creature being in the condition of mycotoxicoses, presentation frequently no doubt

from utilization. Likewise, the propagation will encounter a decrease underway because of the admission mycotoxins.

Molds form into multicellular provinces. Molds are vigorous, which implies they can just develop with the nearness of oxygen. Molds can develop on silage, or wet feeds. When molds start to develop mycotoxins can be delivered pre collect, amid capacity, amid transport, handling or bolstering. Shape development and mycotoxin generation is identified with insufficient capacity strategies, climate boundaries, low nature of feedstuffs and broken encouraging conditions. Molds can develop in a pH extend somewhere in the range of four and eight. Additionally, molds can develop inside a temperature go from fifty to up to one hundred and four degrees' Fahrenheit.

Mycotoxins can be inconvenient in an assortment ways relying upon the sort of mycotoxin winds up present. Mycotoxins are known to have variations that are cancer-causing agents. A cancer-causing agent is a substance fit for causing malignancy in living tissues. Side effects in creatures can have a wide scope of components from diminished feed utilization, and even diminished digestion of feed. Additionally weight reduction is frequently found in cases, weight reduction, loose bowels, and retching. When rearing creatures for their meat makers frequently observe the issue of premature birth and still births in creatures who have devoured mycotoxins.

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