Stored Grain

Trichothecene Mycotoxins, T-2, HT-2, Diacetoxyscirpenol (DAS)

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Fusarium spp.that produce DAS, T-2, nivalenol, and other trichothecenes are listed in Table 1. These fungi commonly attack grains and can grow at temperatures from slightly above freezing to about 86°F (30°C). T-2 and HT-2 toxins are produced over a temperature range of 46° to 77°F (8° to 25°C), with the maximum production at temperatures below 59°F (15°C). This group of mycotoxins, produced by *Fusarium poae* and *F. sporotrichoides,* were associated with Alimentary Toxic Aleukia (ATA), a disease that killed thousands of people in the USSR in 1913, and in the Ukraine from 1940 to 1947.

All domestic animals are susceptible to poisoning by dietary intake of T-2, HT-2, and DAS in the range of a few ppm. In poultry, feed contaminated with 1 to 3.5 ppm of T-2, and 0.7 ppm of HT-2 (a closely related toxicant) may produce lesions at the edges of the beaks, abnormal feathering in chicks, a drastic and sudden drop in egg production, eggs with thin shells, reduced weight gain, hemorrhages in various tissues, increased susceptibility to infections and increased mortality. The same levels fed to turkeys resulted in reduced growth, oral erosions and lowered immunity to infection.

T-2 and DAS in cattle feed results in unthriftiness, decreased feed consumption, slow growth, reduced milk production, diarrhea, abdominal pain, anemia, decreased white blood counts, abortions, bleeding and bruising, decreased immune function and infertility. Field outbreaks of hemorrhagic bowel syndrome and death of some animals is typically associated with the more toxic trichothecenes, such as T-2 toxin, in herds of cattle and swine.

Pigs are particularly susceptible to the trichothecene mycotoxins. T-2 toxin and/or DAS in amounts sufficient to cause toxicoses in pigs have been found in unharvested corn, silage, soybeans, and in finished feeds using corn and soybeans as ingredients. Feed refusal is generally the first sign that the feedstuffs contain trichothecene mycotoxins. The second sign is decreased weight gain. This can be accompanied with bouts of diarrhea and lethargy. Abdominal pain and teeth grinding can also occur. Hemorrhages including bleeding from the intestinal tract can occur. The trichothecenes target all cells with rapid division. These are the cells that line the gut, precursor cells that form the red and white blood cells, and precursor cells that produce spermatozoa in the testicle. Abortions have been associated with trichothecene poisoning of sows. Infertility , uterine and ovarian lesions commonly result from consumption of feed contaminated with 1 to 2

ppm of T-2 toxin. Pigs, placed on feeds that do not contain mycotoxins, recover but residual effects may be observed.

Occupational health hazards exist in handing trichothecene-contaminated grains and feed. The trichothecene mycotoxins can cause severe skin and eye irritation. Personnel should wear protective clothing and a respirator or an effective breathing mask when handling contaminated grain. Trichothecene contaminated grains and feed is often diverted to ethanol production.

Table 1. Major Mycotoxins and Toxin-Producing Fungi from Corn, Cereal, Soybeans, Peanuts, and Other Pro
and Some of their Effects on Animals.

Toxin or Syndrome	***Fungal source***	***Feeds or foods affected***	***Possible effects on animals***
Aspergillus *Toxins- (primarily) Aflatoxins B_1, B_2, G_1, and G_2 (B_{2a}, G_{2a}, M_1, and M_2 are metabolites and seldom present in grain; M_1 and M_2 are important contaminants in milk)*	Aspergillus flavus and A. parasiticus	*Cereal Grains, peanuts, soybeans, and other foods*	*Hepatotoxin; carcinogenic; reduced gr rate; hemorrhagic enteritis; suppressio natural immunity to infection; decrease production of meat, milk and eggs, pulmonary mycotoxicosis*
Ochraoxins (nephrotoxins)	Aspergillus alutaceaus var. alutaceus (ochraceus) *and* Penicillium viridicatum	*Cereal grains*	*Toxic to kidneys and liver; abortion; po feed conversion, reduced growth rate, general unthriftiness; reduced immunit infection*
Sterigmatocystin	Aspergillus nidulellus, A. glaucus, A. sydowii A. versicolor and Bipolaris sorokiniiana	*Cereal grains*	*Toxemia; carcinogenic, hepatotoxic*
Termorgenic toxin	Aspergillus flavus, Aspergillus terrus, Penicillium cyclopium, *and* P. palitans	*Cereal grains, soybeans, peanuts, and other food feeds, etc.*	*Tremors and convulsions, death*
Penicillum Toxins (primarily) Luteoshyrin	Penicillium islandicum	*Rice*	*Hepatotoxic, tremors and convulsions*
Patulin	Penicillium urticae, P. expansum, P. clavirome, *and Aspergillus clavatus*	*Cereal grains, apple products*	*Hemorrhages of lung and brain; edema toxic to kidneys; possibly carcinogenic*
Rubratoxin	Penicillium rubrum		*Liver damage, nephrotoxic and hemor*
Citrinin	Penicillium citrinum		*Kidney damage*
Penicillic Acid	Penicillium viridicatum and several other Penicillium sp.	*Cereal grains*	*Similar to ochratoxin*
Ergot Toxins Ergopeptines	Claviceps purpurea	*Cereal Grains*	*Vasoconstriction, loss of extremities (e tail, fee, etc.), skin necrosis, agalactia*
Ergovaline	Neotyphodium (Acremonium) and Epichloe sp.	*Fescue*	*Reduced weight gain, abortion, poor survivability of offspring, fescue foot*

Fusarium Toxins

Zearalenone (Estrogenic syndrome) Zearalenol	Fusarium graminearum, F. colmorum, F.equiseti	*Cereal grains, soybeans*	*Hyperestrogenism, infertility, stunting, and even death*
Emetic or feed refusal Factor, (Vomitoxin) Deoxynivalenol or DON	Fusarium graminearum *(sexual state),* Gibberella zeae*),* F. culmorum	*Cereal Grains*	*Food refusal by swine, cats, dogs; reduction in weight gain*

Other trichothecenes (T-2, HT-2, Monoacetoxyscripenol or MAS, Diactoxyscripenol or DAS)	Fusarium graminearum, F. equiseti, F. poae, F. acuminatum, F. sambucinum and F. sporotrichoides	*Cereal grains, soybeans, potato*	*Severe inflammation of gastrointestinal tract and possible hemorrhage; edema; vomiting And diarrhea; infertility; degeneration of bone marrow; death; reduced weight gain; slow grow sterility, abortion*
Fumonishin B^1, B^2	F. verticillioides, F. proliferatum	*Corn*	*Leukoencephalomalacia "moldy corn disease" in horses, pulmonary edema swine, neural tube defects and esopha cancer in humans*

Categories: Stored Grain, Fungi, Trichothecene, Mycotoxins, T-2, HT-2, Diacetoxyscirpenol (DAS)

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