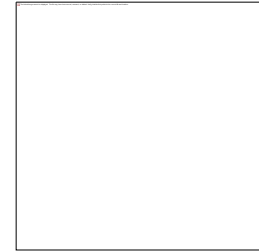


Stored Grain

Ochratoxin, Citrinin, and Penicillic Acid (PA): Nephrotoxins



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Ochratoxins (A, B, C) are primarily produced by *Aspergillus alutaceus* var. *alutaceus* (syn. *A. ochraceus*), *Penicillium verrucosum* (Dierckx) and *P. viridicatum* (Westling). Several other *Aspergillus* and *Penicillium* species have been reported to produce one or more of the ochratoxins. Ochratoxin A is the most common and most studied, and has been found in wheat grain in all milled fractions, and has been identified in bread and pasta products. The *Penicillium* species are the most important in temperate climates and *A. alutaceus* var. *alutaceus* in tropical climates. All of these fungi grow under storage conditions when in equilibrium with 80 to 85% moisture (~16 to 18% for starchy cereal grains) and when temperatures are as low as 50°F. Ochratoxin A contamination by *Penicillium* spp. is common where grain is lodged and wet weather delays harvest in temperate climates. In the field, intoxication from ochratoxin poisoning has primarily been reported for poultry and swine.

Ochratoxin A and citrinin mycotoxicoses primarily involve kidney, liver and immune system damage. Clinical signs vary with the species affected. Poultry have signs of listlessness, weakness, decreased feed consumption, increased water consumption, wet litter, increased bone fractures and decreased productivity. High levels of ochratoxin and citrinin cause visceral gout in chickens. Decreased feathering may occur. Clinical signs of ochratoxin and citrinin poisoning (porcine nephropathy) in pigs are increased water consumption and increased urination of dilute urine containing protein. Pigs are lethargic and may have elevated body temperature. Ochratoxins can cause tonsillitis in pigs, and immunosuppression is common in pigs. Ochratoxin mycotoxicoses in adult cattle, other adult ruminants and horses is not well characterized. Young non-ruminants are more susceptible to ochratoxins and citrinin.

Humans are sensitive to ochratoxins. The Balkan endemic nephropathy syndrome is associated with the consumption of ochratoxin-contaminated foods. Human exposure to ochratoxins and citrinin can be from ingestion of contaminated grain or by inhalation of contaminated grain dust. Pork and chicken meat can contain residues of Ochratoxin A. Processed meats, such as sausages and cured hams, will have equivalent levels of those found in the fresh meat.

Maximum limits for Ochratoxin A contamination have been established in a number of countries with member countries of the European Unions setting guidance values of 250 ppb in animal feeds composed of cereal grains, 100 ppb in complete poultry feeds, 50

ppb in complete swine feeds and 5 ppb for raw grains and 3 ppb for products from cereal grains intended for direct human consumption.

Toxicosis due to citrinin and ochratoxin A occurs most often in Denmark and other Scandinavian countries and has been associated with *P. viridicatum* in barley. At slaughter, the kidneys of affected animals are enlarged and pale, with an uneven cortical surface and cortical fibrosis. Lesions may also be evident in the liver.

Categories: Stored Grain, Fungi, Ochratoxin, Citrinin, Penicillic Acid (PA), Nephrotoxins

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