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Mycotoxins III

Aflatoxins

Aflatoxins are produced by certain species of the fungus Aspergillus, such as Aspergillus flavus, A. parasiticus and A. nomius. Different aflatoxins are designated by letter and then a subscript number, for example, aflatoxin B_7, B_2, G_1 and G_2. A. flavus produces B_1 and B_2 in corn and cottonseed, whereas A. parasiticus produces all four in peanuts. Most mycotoxin production occurs while the crop is in the field or in post harvest storage.

Formation

Aflatoxin B_1 is the most commonly found aflatoxin arising from natural contamination. Conditions favouring aflatoxin production include drought and insect infestation; the insects damage the grain making fungal infection much easier. Interestingly, the ethanol produced in DDGS production does not destroy aflatoxins but rather it concentrates them in the DDGS.

Metabolism

Aflatoxin B_1 is broken down in the liver to produce at least seven metabolites – one is an 8, 9 epoxide which binds to DNA, RNA and proteins. Part of the DNA becomes resistant to repair and is likely to initiate signs of toxicity and liver cancer. Impaired protein synthesis and an inability to release fat causes the early lesions of fatty change, necrosis and growth depression.

Diets deficient in protein are likely to enhance the effects of aflatoxin.

Toxicity

Many factors influence toxicity and these include dose, dietary interactions, animal type or species, exposure time and age of animal.

Prolonged exposure to mycotoxins adversely affects growth and immune function. For example, research has shown that a diet containing 2.5ppm aflatoxin B_1 fed to 17.5kg barrows for just over a month decreased body weight, rate of gain and feed consumption and adversely affected several blood parameters. Liver lesions are produced in similar aged pigs fed 140ppb over 12 weeks (longer exposure time). 280ppb fed to weanlings significantly decreased growth.

Clinical effects

Acute or subacute aflatoxicoses cause depression, anorexia, anaemia, jaundice and haemorrhagic diarrhoea.