

Toxicology Third stage Lec 11 Mycotoxins Dr.Siham A.Wadee

**Mycotoxin is a convenient generic term describing the toxic secondary metabolites produced by fungi.**

**“Myco” means fungal (mold) and “toxin” represents poison. They encompass a considerable variety of low molecular weight compounds .with diverse chemical structures and biological activities.**

**Some mycotoxins could also be toxic to plants or other microorganisms; but these compounds are not classified as antibiotics of fungal origin.**

**considering the effects of mycotoxins on animals, it is important to distinguish between “mycotoxicosis” and “mycosis.**

**Mycotoxicosis is used to describe the action of mycotoxin(s) and is frequently mediated through a number of organs, notably the liver, kidney, lungs, and the nervous, endocrine, and immune systems.**

**Due to their diverse chemical structures, mycotoxins may exhibit a number of biological effects, including both acute and chronic toxic effects as well as carcinogenic, mutagenic, genotoxic, and immunotoxic effects.**

**Mycotoxins are toxic substances produced by some fungi. The following mycotoxins may be found in foods:-**

**1-Aflatoxin—produced by *Aspergillus flavus* seen on corn and under a microscope at right.**

**Because aflatoxins are a series of highly potent carcinogens produced by commonly occurring *Aspergillus flavus* and *A. parasiticus*, research has focused new attention on mycotoxins.**

**It is apparent, most of the mycotoxin producing fungi belong to three genera: *Aspergillus*, *Fusarium*, and *Penicillium*. However, not all species in these genera are toxicogenic.**

**2-Ergot –produced by *Claviceps purpurea*.**

### **3-Intestinal irritants –produced by poisonous mushrooms.**

#### **1.Fungal growth**

- a. Field fungi : fungi that attack plants that grow in the field (occurring (prior to harvest) grow under special conditions. (Fusarium**
- b. Storage fungi : Storage fungi usually invade grain or seed during storage and are generally not present in large quantities before harvest in the field. The most common storage fungi are species of Aspergillus and Penicillium. Contamination occurs through spores contaminating the grain as it is going into storage from the harvest. The development of fungi is influenced by the:-**

**Moisture content of the stored grain**

**Temperature**

**Condition of the grain going into storage**

**Length of time the is grain stored and**

**Amount of insect and mite activity in the grain.**

#### **3.Treatment of mycotoxin-induced disease:-**

- a. For most mycotoxins, there is no specific treatment or antidote**
- b. Supplement with vitamins & selenium may be helpful, and provision of adequate high-quality protein.**

#### **4.Prevention of mycotoxin-induced disease:-**

- a. Avoiding**
- b. Diluting**
- c. Cleaning**
- d. Testing**
- e. Drying**
- f. Adding (organic acids will prevent mold growth).**

## **A- Aflatoxin:-**

### **1. Sources**

**Aspergillus flavus & A.paraciticus**

**Corn, peanuts**

### **2-Factor favoring production of aflatoxins .**

**a. Temperature : 25-30 °C**

**b. Grain moisture**

### **3. Chemical characteristics:-**

**Exhibit intense blue or green fluorescence under UV**

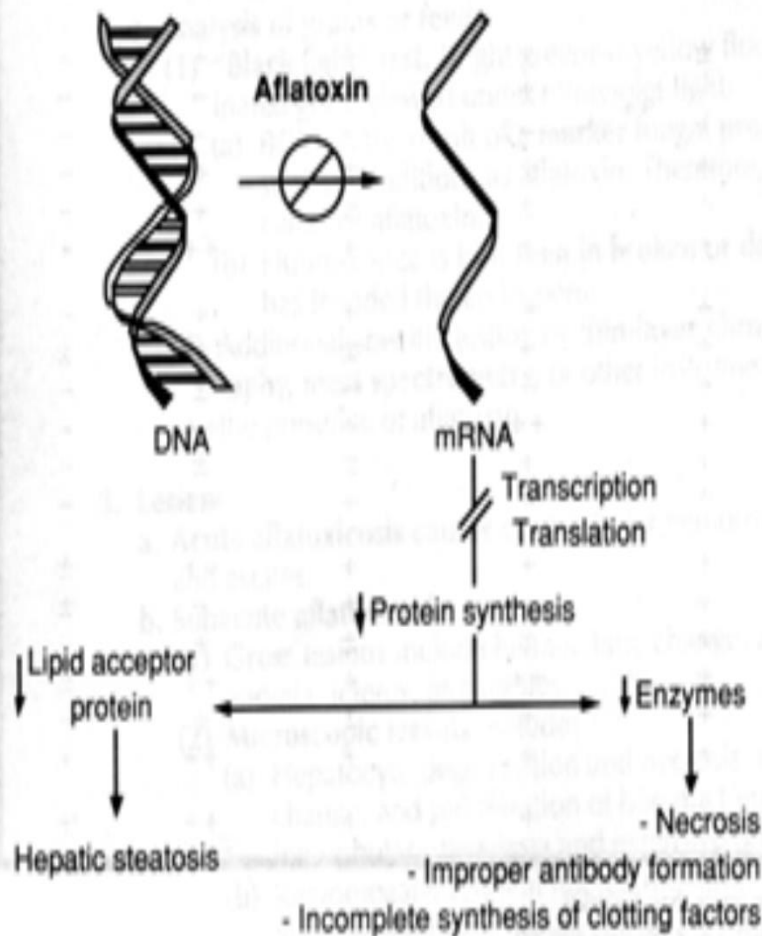
**aflatoxins B1, B2, G1 and G2 :**

**aflatoxin M1 is a metabolites of AFB1 found in animal urine, milk :also or tissues.**

### **5.Mechanism of toxicologic damage:**

**Also called steatosis, fatty liver can be a temporary or long-term condition, which is not harmful itself, but may indicate some other type of problem. Left untreated, it can contribute to other illnesses. It is usually reversible once the cause of the problem is diagnosed and corrected. The liver is the organ responsible for changing fats eaten in the diet to types of fat that can be stored and used by the body. Triglycerides are one of the forms of fat stored by the body and used for energy and new cell formation. The break down of fats in the liver can be disrupted by alcoholism, malnutrition, pregnancy, or poisoning. In fatty liver, large droplets of fat, containing mostly triglycerides, collect within cells of the liver. The condition is generally not painful and may go unnoticed for a long period of time. In severe cases, the liver can increase to over three times its normal size and may be painful**

and tender.



**FIGURE 29-3.** Pathogenesis of aflatoxicosis. Aflatoxin binds to guanine in deoxyribonucleic acid (*DNA*), inhibiting the signal for the formation of messenger ribonucleic acid (*RNA*). Interruption of protein synthesis leads to deficiencies of structural proteins, enzymes, and lipid acceptor protein. The long-term effects of impaired protein synthesis include hepatic steatosis and a variety of metabolic and function derangements.

a. Loss of enzyme

b. Lack of formation of lipid acceptor protein in liver

c. Decreased cellulose digestion, volatile fatty acid formation & ( proteolysis (breakdown of proteins

d. Necrosis.

Toxicity

a. Young animals are more susceptible than adult

b. Nutrition deficiency increase susceptibility.

Diagnosis

**Clinical sign : decreased growth rate, reduced feed efficiency, mild anemia, and increased susceptibility to infectious disease.**

**Treatment & Prevention:-**

**a. Detoxification : Hydrated sodium calcium aluminosilicate (HSCAS) can absorb aflatoxins**

**b. Supportive : Vitamin .E & selenium**

**c. Prevention**

**Mold inhibitor .**

**Treatment of grain with anhydrous ammonia for 10-14 days.**

**2-Ergot**

**A.Source: Claviceps purpurea :barley, wheat & oat.**

**B.Factor favoring :Warm & humid.**

**Mechanism of toxic:-**

**A.a potent initiators of contraction in smooth muscle.**

**B. mimic the action of dopamine.**

**Clinical sign:-**

**a. necrosis of the feet, ears and tail.**

**b. increased temperature., pulse & respiration rate.**

**c. lactation does not occur.**

**d. hyper-excitability & tremors.**

**e. heat intolerance in cattle.**

**Treatment. a. animals should be provided with a warm, clean, stress-free environment.**

**b. Control secondary bacterial infection.**