Allergies: a disease produced of hypersensitivity from fungal antigens and represent immune response as a result to fungal spores inhalation or direct contact to some fungi such as *Aspergillus fumigatus*.

Mycetism: a toxicosis status produced by digesting smut spores, toxic fruiting bodies or fungal sclerotia.

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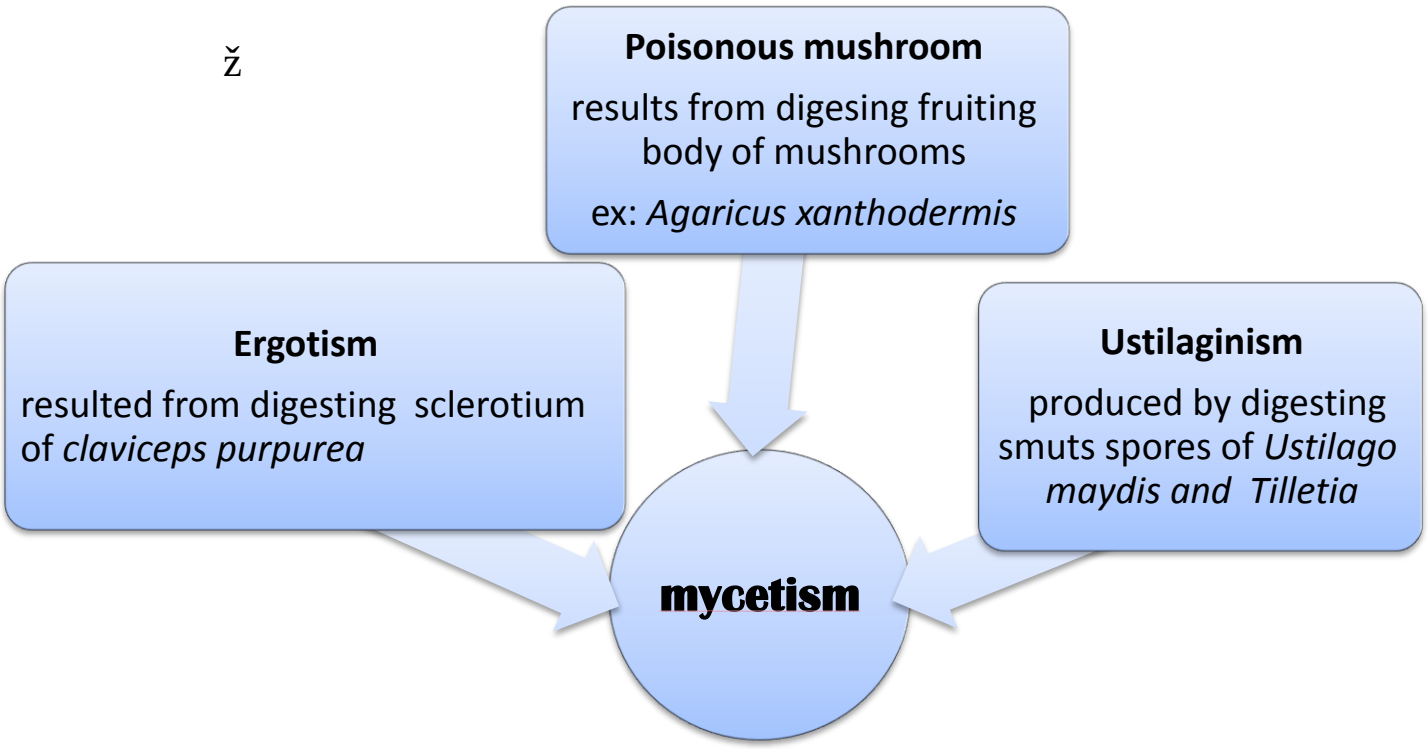

Mycotoxicosis : a toxicosis produced from digesting food containing toxic secondary metabolites (mycotoxins) of fungi .

Mycotoxins : are secondary metabolites of fungi that are recognized as toxic to other life forms.

secondary metabolite: A compound that is not necessary for growth or maintenance of cellular functions but is synthesized, generally, for the

protection of a cell or micro-organism, during the stationary phase of the growth cycle. Many are used in foods, pharmaceuticals, and other industrial applications.)

Historical

Modern mycotoxicology was not developed until the discovery of aflatoxins in the early 1960s as the causative agent in the peanut meal causing the "Turkey X" disease that killed more than 10,000 turkeys fed with the contaminated meal. 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. In the last 40 years, many new mycotoxins have been identified and characterized

Characteristics of Mycotoxins

1-Odorless

2-Tasteless

3-Resistant to degradation

4-Production is variable

5-Produced on surfaces of spores

6-Remain active on dead spores

7-May contaminate food products

8-Cause short- & long-term effects

9-Multiple exposure routes

10-Produced by numerous species

Characteristics of mycotoxin induced disease

a. not transmitted among animals

b. Pharmaceutical treatment does not alter the course of disease

c. Mycotoxicosis most often presents as a uncertain, sub-acute or chronic condition.

Major groups of Mycotoxin

1-Aflatoxin

Aflatoxin : a mycotoxin has been linked to various cancers in agricultural and food processing. Aflatoxins are a type of mycotoxin produced by *Aspergillus* species of fungi, such as *A. flavus* and *A. parasiticus*. Can be recognized by yellow-green or gray-green, respectively, on corn kernels, in the field or in storage .

Aflatoxin Symptoms: Liver damage, Liver cancer, Pulmonary Edema, Hemorrhage and death

Treatment:

It believe that eating vegetables like carrots and celery can reduce effect of Aflatoxin mycotoxin.

Aflatoxin Types

There are three main types of aflatoxin mycotoxins:

Aflatoxins B: This group includes aflatoxin B1 and B2. Aflatoxin B1 is the most common aflatoxin, as well as the most toxic and carcinogenic

Aflatoxins G: This group includes aflatoxin G1 and aflatoxin G2

Aflatoxins M: This group includes aflatoxins M1 and M2. These aflatoxins are metabolic products which are found in the urine and milk produced by animals which have been given feed with aflatoxins in it.

2-Ochratoxin

Ochratoxin is a mycotoxin that comes in three secondary metabolite forms, A, B, and C. All are produced by *Penicillium* and *Aspergillus* species. The three forms differ in that Ochratoxin B (OTB) is a nonchlorinated form of Ochratoxin A (OTA) and that Ochratoxin C (OTC) is an ethyl ester form Ochatoxin A.

Ochratoxin A has been found to appear in edible tissues of animals that received contaminated feed shortly before slaughter. Furthermore, it has also been detected in sausages, ham and bacon. It is a further danger to human health in that after ingestion it can be passed into the blood sera and milk.

Symptoms

Symptoms may be acute, sub acute or chronic depending on the severity of the exposure. OTA has been labeled as a carcinogen and a nephrotoxin, and has been linked to tumors in the human urinary tract, although research in humans is limited by confounding factors.

Treatments

- Potassium restriction as necessary
- Phosphate binders - for management of hyperphosphatemia in chronic renal failure
- Calcium supplements - for hypocalcaemia
- Calcitriol and other Vitamin D supplements - for hypocalcaemia and hyperparathyroidism associated with chronic renal failure
- Sodium bicarbonate - for acid-base disturbance

3-Trichothecens

Trichothecens comprise a group of toxins that share a common chemical structure, though produced by a variety of fungi particularly *Fusarium* and related genera. Purple red moulds, occasionally detected in corn, wheat and soybeans, signal the presence of tricothecens.

The trichothecens include deoxynivalenol (DON), also known as vomitoxin because of its strong vomiting effect. At levels over 1 ppm, severe weight loss and vomiting occur. Effects on reproduction are unknown, but it is best to avoid feeding breeding animals infected grain.

T-2 is a very potent tricothecen, found in barley and wheat, which can seriously impair fertility in swine.

Symptoms

Initial symptoms include nausea, vomiting, and burned skin. Dermal exposure results in significant blistering and formation of vesicles, bullae, petechiae, and ecchymoses. Ocular exposure may cause burns and corneal opacification. Respiratory exposure induces cough, pleuritic chest pain, dyspnea, and hemoptysis. Severe gastrointestinal symptoms such as hematemesis and abdominal pain may occur after inadvertently swallowing small amounts of aerosolized dispersed trichothecene mycotoxin. Bloody diarrhea and severe dehydration have also been described following mycotoxin exposures in Southeast Asia.

Treatment

Treatment includes skin decontamination with soap and water. Contaminated clothes should be discarded to prevent secondary contamination. Patients may also require general supportive care, appropriate fluid resuscitation, routine treatment for burns, and monitoring for signs of gastrointestinal hemorrhage.

4-Zearalenone

Zearalenone is produced by several *Fusarium* molds under cool, wet conditions. It grows on grain before harvest, but can worsen in storage. Insect damage increases the susceptibility of crops. Infected corn may be identified by dark purple discoloration and affected wheat by pink tips.

Zearalenone is probably the mycotoxin most detrimental to swine with serious effects on the breeding stock.

Symptoms

Toxicity results in the reddening and swelling of the vulva, increased size of mammary tissue, straining with subsequent rectal and vaginal prolapsed, as well as pseudopregnancy and false heat. Fertility problems surface at 100 to 200 ppb.

Treatment

ACTIVATED CHARCOAL

Activated charcoal binds most toxic agents and can decrease their systemic absorption if administered soon after ingestion. In general, metals and acids are poorly bound .

Administer charcoal as a slurry (240 mL water/30 g charcoal). Usual dose: 25 to 100 g in adults/adolescents, 25 to 50 g in children (1 to 1 years), and 1 g/kg in infants less than 1 year old.

DILUTION -

Immediate dilution with milk or water may be of benefit in caustic or irritant chemical ingestions. Dilution immediately dilute with 4 to 8 ounces.

Other Selected Mycotoxins

Other Mycotoxins Produced by ***Aspergillus***:

Sterigmatocystin (ST) is a naturally occurring hepatotoxic and carcinogenic mycotoxin produced by fungi in the genera *Aspergillus, Bipolaris,* and *Chaetomium* as well as *P. luteum.*

Structurally related to AFB1, ST is known to be a precursor of AFB1.

ST is a mutagen and genotoxin and has been found in cereal grains (barley, rice, and corn), coffee beans, and cheese.

A. terreus and several other fungi (e.g., *A. flavus* and *A. fumigatus*) have been found to produce the tremorgenic toxins, territrems, **aflatrem, and fumitremorgin.**

A. terreus, A. fumigatus, and Trichoderma viride also produce **gliotoxin,** In addition, *A. flavus, A. wentii,* and *A. oryzae*, are capable of producing **nitropropionic acid (NPA),** a mycotoxin causing apnea, convulsions**,** congestion in lungs and liver.

Other Mycotoxins Produced by ***Penicillium***

Penicillia produce many mycotoxins with diverse toxic effects. Cyclochlorotine, luteoskyrin (LS), and rugulosin (RS) have long been considered to be possibly involved in the yellow rice disease during the Second World War. They are hepatotoxins. Several other mycotoxins, including patulin (PT) penicillic acid (PA) citrinin (CT), cyclopiazonic acid (CPA, citreoviridin, and xanthomegnin, which are PT and PA are .produced primarily by several species of Penicillia produced by many species in the genera *Aspergillus* and *Penicillium*. *Byssochlamys nivea* also produces PT

Alternaria Toxins

Infects the plant in the field, such as wheat, sorghum, and barley. Also fruits and vegetables that can cause spoilage in refrigeration. Toxins include: alternariol, alternariol monomethyl ether, altenuene, tenuazonic acid, and altertoxins.

Little is know of these toxins; but, toxic effects are seen in rats, chicks, ducklings, and turkeys.