

## **MYCOTOXINS: HIDDEN AND OBVIOUS THREAT**

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**Introduction.** In the modern world, mycotoxicoses are becoming increasingly important. These are diseases caused by the ingestion of mycotoxins - metabolites formed during the life of a number of microscopic (mold) fungi. About 10 thousand species of mushrooms are known to be useful for humans. They are used for the production of cheese, bread, antibiotics, etc. But there are many fungi that harm humans and animals and huge economic damage, at present, there are about 50 genera of them. Particularly dangerous are parasitic and saprophytic mold fungi. More than 300 mycotoxins are currently known. Aflatoxins, ochratoxins, patulin, zearalenone and others belong to the most common highly toxic and very dangerous mycotoxins in food.

It should be noted that mycotoxins are more commonly found in plant foods. Their defeat by fungi occurs during the ripening and harvesting period under unfavorable meteorological conditions and improper storage. Agricultural products and feeds affected by fungi change their appearance, which helps to establish their poor quality. Such foods and feeds can cause serious diseases for people and animals due to the accumulation of mycotoxins.

**Aim.** To study the features of the effect of mycotoxins on the human body and analyze the mechanisms of development of mycotoxicosis.

**Materials and methods.** Analysis of scientific literature related to research on mycotoxins and mycotoxicoses in the field of medical microbiology, mycology and pathophysiology.

**Results and discussion.** Serious attention should be paid to the detection of mycotoxins in animal products, which can get into them as a result of feeding animals feed contaminated with mycotoxins, which partially accumulate in the tissues and organs of animals, and in egg-laying birds - also in eggs. From the body of lactating animals, mycotoxins are metabolized and excreted in milk. Such products pose the greatest danger to human health, because mycotoxins can be present without visible mold growth. However, there is no direct relationship between the damage to the food substrate by fungi and the formation of mycotoxins in it.

Very often, mycotoxins are absent in food contaminated with fungi. Mycotoxins are resistant to physical and chemical factors. Therefore, breaking them down in food is a difficult task. Conventional methods of technological and culinary processing only partially reduce the content of mycotoxins in the product. High temperature (over 200°), freezing, drying, exposure to ionizing and ultraviolet radiation were also ineffective.

Several types of mycotoxicosis are known: alimentary, respiratory and dermatomycotoxicosis. Pneumomycotoxicosis and dermatomycotoxicosis occur in humans when mycotoxins enter the body through the mucous membrane of the respiratory tract or damaged skin surface. These diseases ("grain fever", "combers'

fever") are observed in people working with raw materials that are affected to a large extent by toxin-forming fungi.

The most common alimentary mycotoxicosis in humans and animals are fusariotoxicosis: sporotrichiellotoxicosis, fusariograminearotoxicosis, fusarionivaletoxicosis. Sporotrichiellotoxicosis is a serious illness associated with the consumption of products from grain that has wintered under the snow or late harvest, containing toxins of the fungus *Fusarium sporotrichella*. It proceeds with symptoms of general toxicosis, then progressive leukopenia develops with necrotic or gangrenous sore throat, sepsis.

Fusariograminearotoxicosis ("drunken bread" syndrome) occurs as a result of the consumption of baked goods made from grains infected with the fungus *Fusarium gramineum*. The toxic substances produced by it belong to nitrogen-containing glucosides, cholines and alkaloids that act on the central nervous system. The disease manifests itself in the appearance of weakness, a feeling of heaviness in the limbs, stiffness in gait, the appearance of sharp headaches and dizziness, vomiting, abdominal pain, diarrhea. With prolonged use of products from such grain, anemia, mental disorders can develop, and sometimes death occurs.

Fusarionivaletoxicosis is a serious disease of humans and animals, observed when eating foods and feed made from wheat, barley and rice, affected by the "red mold" - species of *Fusarium fungi*. In humans, the disease is accompanied by nausea, vomiting, diarrhea, headaches, convulsions. Mycotoxins nivalenol, fusarenone X, nivalenol acetate were isolated from grain affected by these fungi. Mycotoxicosis also includes a severe disease of the cardiac form of beriberi, which is known in Japan, which is manifested by damage to the nervous and cardiovascular systems, and quite often ends with the death of the patient. It occurs as a result of eating "yellow-colored rice" infected with the fungus *Penicillium citreoviride*, which produces the toxin citreoviridine.

The long-known mycotoxicosis "ergotism", a severe disease that occurs when eating cereals affected by ergot horns, *Claviceps purpurea* and *Claviceps paspalum*, containing lysergic acid alkaloids and clavine derivatives with pronounced neurotoxic effects, can be attributed to the same group of diseases. In humans, the disease occurs in acute and chronic forms. In patients with the acute form, symptoms of acute gastroenteritis and lesions of the central nervous system (paresthesia, convulsions) are noted; in the chronic form, the disease begins with general weakness, loss of appetite, aches throughout the body, the appearance of paresthesias, especially in the arms and legs, vomiting, and gastrointestinal disorders.

There are three forms of ergotism: convulsive, gangrenous and mixed - convulsive gangrenous. With a convulsive form of ergotism, the main symptoms are tonic convulsions of certain muscle groups (more often flexors), paresthesia, pain along the nerves. Depressive-manic states and epileptic seizures ("evil writhing") are possible. The duration of the disease is from 3 to 6 weeks, relapses are sometimes observed. The gangrenous form occurs with prolonged intake of small doses of ergot alkaloids. After 10-20 days, against the background of general intoxication, necrotic changes appear on the peripheral parts of the limbs, which accompanied by severe

incessant pain. Sometimes, along the line of demarcation, spontaneous rejection of the dead part of the limb can occur - mutation.

When using food or feed containing metabolite toxins - aflatoxins produced by some strains of *Aspergillus flavus* and *Aspergillus parasiticus*, aflatoxicosis occurs. The toxicity of aflatoxins is extremely high. Acute group B aflatoxin intoxication is characterized by the rapid development of symptoms and high mortality; the clinical picture of acute poisoning is characterized by lethargy, impaired coordination of movements, convulsions, paresis, dysfunction of the gastrointestinal tract, hemorrhages, edema, weight loss and developmental delay.

In all cases of acute intoxication, the target organ is the liver, in which necrosis and proliferation of the epithelium of the bile ducts develop, and in chronic intoxication - cirrhosis, primary liver cancer. The widespread occurrence of aflatoxins in plant foods, the possible accumulation in animal products and the almost ubiquitous detection of their producers pose a threat to human health. A number of mycotoxicoses are known, which are mainly recorded in farm animals, but can also occur in humans. Stachybotriotoxicosis is a serious disease in horses. Occurs as a result of feeding roughage containing the toxin of the fungus *Stachybotrys altmans*. Cattle and poultry can also get sick. It is characterized by severe inflammatory and necrotic changes in the gastrointestinal tract, hemorrhagic diathesis, acute cardiovascular failure, leukopenia and agranulocytosis.

In humans, contact with contaminated feed or industrial raw materials can lead to dermatitis or pneumoconiosis. Dendrodochiotoxicosis occurs when consuming feed containing toxic substances secreted by the fungus *Dendrodochium toxicum*: it is characterized by severe damage to the cardiovascular system, lightning-fast course and death of the animal. Ochratoxicosis occurs when eating products containing a toxin produced by the fungus *Aspergillus ochraceus* – ochratoxin, which selectively affects the kidneys (nephritis of pigs) and has a hepatotoxic effect.

The diagnosis of mycotoxicosis is based on the identification of the relationship between intoxication and the consumption of foods affected by fungi, the indication of mycotoxins in food, as well as in biological fluids and tissues. Treatment is carried out according to the general principles adopted in clinical toxicology, is mainly symptomatic. First of all, it is necessary to stop the ingestion of products contaminated with mycotoxins into the body. For the purpose of detoxification, on the 1st day, gastric lavage, intestinal cleansing are carried out, then activated charcoal is administered orally or through a tube (30 g 2-3 times a day); forced diuresis is shown, and in severe cases - hemosorption. In the future, the treatment of mycotoxicosis is aimed at preventing liver damage and infectious complications. Prevention of mycotoxicosis in humans consists in the regulation and organization of control over the content of mycotoxins in food.

**Conclusions.** Mycotoxins have a carcinogenic, mutagenic effect, suppress the body's immunity, affect the kidneys, liver, nervous and circulatory systems, gastrointestinal tract, cause blood diseases, septic sore throat, dermatitis, convulsions, acute pain, severe intoxication, disrupt hormonal balance and reproductive functions. Therefore, the study of the pathogenesis of mycotoxicosis and the search for effective methods of treatment of this pathology is an urgent and timely problem.