

# FUNDAMENTALS OF PATHOLOGOANATOMIC DIAGNOSTICS IN POISONING

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**Annotation.** The article covers the general principles of the clinical course, the dynamics of the processes of anatomical manifestation in internal organs and tissues, pathological diagnosis of poisoning, information on the analysis and generalization of the results of autopsy of corpses, as well as the causes of poisoning of farm animals. Autopsy data are presented for the most common poisonings of animals with substances such as certain chemical elements and their compounds, gaseous substances and plant poisons. Information is provided on intravital pathological processes, mechanisms of death and the severity of cadaveric phenomena when assessing the results of the autopsy.

**Key words:** poisonings, clinic, dynamics, toxicosis, local and general changes, intoxication, mycotoxicoses, poisonous plants and substances, chemical compounds.

Before starting this topic, it is necessary to clarify the meanings of the concepts of poisoning, intoxication and toxicosis. Poisoning is a disease that develops as a result of toxic substances entering the animal's body from the outside. Intoxication - develops in the body due to toxic products secreted by pathogens of infectious and invasive diseases. Toxicosis occurs due to metabolic disorders or changes in endocrine glands that produce hormones, for example, thyrotoxicosis.

**Diagnosis of poisoning is very difficult, complicated and responsible.** Most of the toxic substances are inhibitors of enzymes, which cause disorders of oxidation-reduction processes and nervous control, and cause clinical-anatomical similarities of the disease in various poisonings. In some cases, it is not enough to determine what substance the animal was poisoned with, but it is also very important to determine how the poison entered the animal's body and the conditions that gave rise to the poisoning.

Animals are often poisoned due to carelessness (coldness) in the storage of poisonous medicinal substances or non-compliance with the rules for their use, irresponsibility of responsible persons, feeding animals with poisoned seeds, medical errors or deliberate malicious intent. In such cases, poisonings are the reason for a court case. Therefore, when poisoning is suspected, all aspects of the condition, the clinical-anatomical appearance of the disease, chemical-toxicological examination of the obtained pathological samples, botanical analysis of food, and in uncertain and responsible cases - a biological test should be conducted.

It is possible to make a diagnosis of poisoning and draw a court opinion only based on the generalization of the results of these tests conducted in Hartomon. Unfortunately, in many cases, veterinary practitioners diagnose food poisoning without sufficient evidence.

In case of poisoning, the clinical manifestations of the disease and pathomorphological changes in the organs develop under the local and general effects of the poison and are directly related to the body's functional disorders and reflex response. Toxic substances of mineral origin cause denaturation, coagulation and hydrolysis of tissue proteins, death of cell elements,



hyperemia, swelling and inflammatory processes in tissues and organs in direct contact with it. Such local changes usually develop in the internal organs where the poison has entered, accumulated (caught) and expelled from the body.

The general resorptive effect of toxic substances is complex and multifaceted, and has not been studied in depth and comprehensively. Although most toxic substances are similar to chemical compounds in the body by their chemical structure or chemical effects, they instead participate in biochemical reactions in tissues and organs, and at the same time lead to disruption of physiological functions. Most of the toxic substances join chemical compounds with enzymes and hinder their activity. As a result of this, other changes occur in the body, such as metabolism, transmission of information through nerve fibers, and other changes.

A very simple example of such a competition of toxic compounds for body functions is the formation of carboxyhemoglobin in the blood of carbon monoxide poisoning. In comparison to the formation of carboxyhemoglobin, the combination of oxygen with hemoglobin is 10 times faster. However, the dissociation of carboxyhemoglobin, that is, the process of separation of carbon dioxide from oxygen, is three thousand times slower than that of oxyhemoglobin. Therefore, even when there is a relatively small amount of carbon dioxide in the inhaled air, carboxyhemoglobin slowly accumulates in the blood, which, in turn, leads to a violation of the function of oxygen transport and the development of asphyxia.

Cations of mercury, lead and copper and compounds of arsenic interact with sulfhydryl groups of enzymes in the body, disrupt oxidation-reduction processes, interfere with the system of information transmission through nerve fibers and reflex reactions of the body.

Organophosphorus compounds stop the activity of cholinesterase for a long time, disrupt the process of hydrolyzing acetylcholine, and cause severe damage to the nervous and cardiovascular systems.

Most poisonous substances belonging to the plant world (alkaloids, glycosides and toxalbumins) have the property of having different (selective) effects on different parts of the nervous system. They cause a violation of the function of organs necessary for life, cause paralysis of the respiratory or cardiovascular center of the brain.

For example, the alkaloid (atropine) of the plants belladonna and bangidevona inhibits the activity of the cholinergic system of autonomic nerves and disrupts the transmission of impulses (information) from parasympathetic nerve fibers. Alternatively, cicutoxin mainly acts on the vasomotor center of the vagus nerve.

In case of poisoning, the reflex reaction of the body, manifested by clinical symptoms such as increased salivation and body sweating, vomiting, diarrhea, is directly related to the tickling (excitation) of the sensitive ends of nerve fibers. At the same time, the origin of the body's reflex reaction can be central, that is, due to anoxemia and metabolic disorders in the brain.

**Determining the details of the poisoning situation.** In case of poisoning, as soon as possible, it is necessary to collect anamnesis data on old impressions. For this purpose, the statements of the heads of farms, all herdsmen and shepherds, witnesses of the situation are collected. When collecting anamnesis data, it is necessary to pay very important attention to the following:

- dynamics of illness and death;
- clinical manifestations of the disease;



- dependence of poisoning on changes in the diet and replacement of pasture or irrigation system;

- that activities such as seed treatment, poisoning of rodents, chemical treatment of gardens, farms and animals have been carried out on the farm.

**Information such as the location of the poisoning**, the inspection of livestock buildings and mangers, the composition of litter and vomited feed, as well as the determination of flora in the pastures, as well as the storage and use of toxic chemicals on the farm, are also of great diagnostic value. In short, all details and locations related to poisoning must be thoroughly and comprehensively investigated.

Without a careful study of the details of poisoning cases, it will not be possible to clarify the way in which the poison entered the animal's body and to determine the type of poisoning, that is, the negligence of service personnel, carelessness in the storage of toxic chemicals, medical error, malicious intent or the result of an accident.

**Study of the clinical presentation, dynamics and death of poisonings.** In veterinary practice, acute poisonings, which develop due to a single ingestion of a toxic or lethal dose of poison into the body, are often observed. Sudden disease of healthy animals, disease of many animals at the same time, homogeneity of clinical manifestations of the disease in animals and high number of deaths are characteristic manifestations of acute poisoning. In acute poisoning, morbidity and mortality are rapid and rapid. The disease is usually observed among animals provided with the same feed, reared in the same pasture, or preventive measures against invasive diseases were carried out at the same time.

In acute poisonings, as a rule, disturbances in the functions of the digestive organs (salivation, vomiting, diarrhea, sometimes mixed with blood, atony of the intestines and pre-gastric sections in ruminants), changes in the central nervous system (anxiety, excitement, depression, depression, muscle tremors, convulsions, vasoconstriction and paresis), as well as clinical signs such as rapid breathing and wheezing. In this case, rapid replacement of one clinical sign with another is observed; restlessness and excitement are often replaced by depression, general lethargy, atony, paresis and paralysis.

Chronic poisoning of animals is less common and in most cases occurs due to plant poisons (alkaloids, glycosides, saponins, toxalbumins, essential oils, etc.). The clinical manifestations of chronic poisoning are usually related to disturbances in the body's compensatory system due to the toxic effect or accumulation of the poison in tissues and organs. In such cases, animals suffering from other diseases or exposed to stress (moving from one place to another, vaccination, etc.) first get sick and die.

In chronic poisoning, illness and death of animals lasts for a long time, so such cases are not detected for a long time, for example, poisoning with gossypol, solanine, aflatoxin, etc.

The clinical manifestations of poisoning are different and directly depend on the nature of the interaction between the general, local and selective effects of the poison, as well as the activity of the body's reflex response. However, there are also manifestations that are common to most types of poisoning; usually, after a short period of excitement and anxiety, severe depression begins, the body temperature does not rise, and before death (in the terminal stage of the disease), the body temperature even drops below the norm.

However, in some nutritional poisonings, specific, characteristic clinical symptoms of one or another level of the disease are manifested, which have great diagnostic significance. For example, in case of poisoning with the bangidevona plant, pupils are dilated, the adaptive



properties of the eyes and the ability to see are lost, as well as the drying of the mucous membranes of the oral cavity, atony of the intestines and constipation develop; Erythemas and focal inflammations in the white (non-pigmented) parts of the skin, vesicular eczemas with severe itching are characteristic clinical signs of buckwheat poisoning; In case of poisoning of horses with one-year cultured corn plant, clinical signs in the form of suffocation with a whistling sound due to injury and paralysis of the excitatory nerve are observed.

In most cases, the death of poisoned animals occurs as a result of asphyxiation, and in rare cases - due to cardiac arrest.

**Evaluating the results of the crack inspection.** When poisoning is suspected in the death of animals, necropsy is a must. First of all, based on the data of the slit examination, it is possible to exclude the possibility of the presence of non-infectious, infectious and invasive diseases. Secondly, on the basis of pathologoanatomical and morphological changes in tissues and organs, it is possible to suspect poisoning due to food contaminated with mineral poisons, poisonous plants or poisonous fungi. Third, in the process of dissection, it is sometimes possible to find out that the animal's stomach contains seeds of cereal crops treated with chemicals, undigested leaves, stems or roots of poisonous plants, and rodenticides or residues. All of the above-mentioned aspects are of great diagnostic value, therefore, a deep and comprehensive pathologoanatomical dissection of the body is very important.

Due to the fact that pathomorphological changes in the organs in poisoning are not characteristic in most cases, their development depends on the amount of the poison and the mechanism of the pathogenic effect, the duration of the disease and the state of the reactions of the animal organism. Based on the results of autopsy, it is possible to give an opinion about which group the poison belongs to. For example, poisoning with mineral substances causes the development of local and general changes. Clearly expressed and specific local changes are observed in the digestive system, liver and kidneys.

Catarrhal ulcerative stomatitis and gingivitis develop in animals, especially horses, in acute poisoning with arsenic, fluorine, mercury, copper and lead compounds. However, the most severe changes are observed in the stomach due to the retention of the food mass due to the contraction (spasm) of the sphincter at the entrance to the duodenum. The above-mentioned toxic substances cause catarrhal-hemorrhagic and ulcerative-necrotic gastritis, which is expressed by thickening of the stomach, especially its bottom and pyloric part, mucous layer and folds. In ruminants, the scrotum and scrotum are also injured, and hemorrhagic infiltrates and focal necrosis develop in them.

It is also necessary to pay attention to the pathologoanatomical changes observed in the intestines. In this case, the mass inside the duodenum and small intestine often resembles boiled rice porridge and is coffee-colored or bloody. In their mucous layers, sputum and catarrhal-hemorrhagic inflammations, sometimes focal necrosis are observed. Changes in the liver and kidneys are manifested by dystrophic processes.

In poisoning with mercury compounds, in addition to hemorrhagic gastroenteritis, necrotic nephrosis and diphtheria colitis also develop, and large numbers of hemorrhages are observed in the body of large horned animals, as well as in the liver, kidneys, serous layers, subcutaneous and intermuscular connective tissue cells. The development of nephrosis in the kidneys is characterized by an increase in the concentration of mercury cations in the convoluted tubules during the absorption of urine by the epithelial tissue.



When animals are poisoned with gaseous toxic substances (mercury vapors, sulfur dioxide, etc.), pathologoanatomical changes develop in the form of inflammation of the respiratory tract, lung congestion, and bronchopneumonia.

In addition, some toxic substances used in the treatment of animals against ectoparasites (organic phosphorus compounds, copper sulfide ointment, etc.) are absorbed through the skin, although local changes are not observed, but the possibility of animal poisoning cannot be ignored.

The appearance and severity of general changes in poisoning may vary depending on the mechanism of action of the poison and the duration of the disease. When death occurs very quickly, only changes in the circulatory system are observed - persistent hyperemia, hemorrhages, swelling of the lungs and brain. When the disease lasts more than one night, dystrophic changes also develop in the parenchymatous organs, mainly in the liver and kidneys, and jaundice appears when the number of broken erythrocytes increases too much. However, unlike infectious diseases, systemic hyperplasia of lymph nodes is not observed in poisonings, and the size of the spleen does not increase.

In the case of acute poisoning with plant poisons, only changes related to the mechanism of death and organ dysfunction (swelling of the gastrointestinal tract with gases, obstruction of the large intestine, filling of the pre-gastric compartments in ruminants, etc.) are observed during the pathologo-anatomical examination. Dystrophic changes in the liver and kidneys, catarrhal or catarrhal-hemorrhagic inflammations develop in the stomach and intestines only in case of chronic poisoning or in case of feeding with plants containing essential oils.

Due to the large-scale use of organophosphorus and organochlorine compounds in agriculture, cases of poisoning of animals with these substances are not uncommon. In acute poisoning with such toxic chemicals, pathomorphological changes are not characteristic, but are manifested only by persistent hyperemia of internal organs, slight swelling of the lungs, catarrhal inflammation in the stomach and intestines. However, in chronic poisoning, in addition to disorders of the circulatory system, protein and fatty dystrophies develop in the liver and kidneys.

Thus, as can be seen from the above data, pathomorphological changes in organs and tissues in poisoning, with some exceptions, do not have specific characteristics. Based on the changes found in the autopsy, the cause of poisoning can only be suspected as mineral substances, poisonous plants, food contaminated with poisonous fungi, organophosphorus or organochlorine compounds.

In this case, it is possible to determine the type of poison by careful chemical-toxicological examinations of pathological samples (internal organs, masses in the stomach and intestines, vomited food, etc.) and by in-depth analysis of the composition and quality of food. Therefore, it is necessary to send samples of pathological material, feed, water and vomit mass from dead animals with clinical-anatomical signs of poisoning for laboratory examination. It is necessary to follow the rules for taking and packing samples sent to the laboratory for testing.

In some food poisonings (botulism, mycotoxicoses, etc.), biotesting in laboratory animals is of important diagnostic value. In necessary cases, it is possible to determine the poor quality of feed even by a small group of animals on the farm itself.





Based on the summation of the results of all the above examinations, the local veterinarian gives a final conclusion on poisoning. If there are discrepancies between the data of poisoning cases and clinical-anatomical examinations, as well as the results of chemical-toxicological analysis of pathological materials, food and water samples, their reasons are given in the written final conclusion.

Factors such as imperfect detection methods for some toxic substances, errors in taking samples for tests, too fast decomposition of the poison or leaving the body, often cause negative results during laboratory tests. In addition, the initial suspicion of poisoning may not be confirmed by further detailed clinical-anatomical and laboratory examinations. In such cases, based on the additional information obtained, an appropriate conclusion is written.

In some cases, the death of animals occurs due to the combination of non-fatal poisonings with other diseases or their aggravation with autoinfections. In veterinary practice, it is possible to cite cases of deaths of animals poisoned with gossypol after rabies vaccination, or cases of paratyphoid and dysentery accompanied by mycotoxicosis. In such cases, both diseases are indicated in the pathologoanatomical diagnosis.

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