

Effects of Industrial Toxicants on the Structure of the Retal Intestinal Wall of the Rat

Ilyasov A. S.

Doctor of Biological Sciences, Professor of the Department of Anatomy of the Bukhara State Medical Institute.

Sharifova Sh. K.

Doctor laboratory assistant Republican scientific center of emergency medical aid Bukhara branch

Abstract: The study of the functional state of the body upon the intake of toxicants and the prevention of their migration from waste into the environment, as well as the complete elimination or limitation of their effect on living organisms is one of the most important directions in solving modern medical and environmental problems. Studies have established that the internal and external sphincters of the rectum form a complex combined formation. The obtained results reveal more deeply the mechanism of occurrence of various disorders of the sphincter apparatus of the intestine. The nature of the relationship of muscle structures and connective tissue with the sphincters is different and must be taken into account when eliminating organic disorders of the rectal sphincters.

Keywords: toxicants, heavy metals, migration, cumulation, rectum, anal canal, rats.

Global problems are faced by humanity living in conditions of soil, water, atmospheric air and food pollution with toxicants - salts of heavy metals, pesticides, etc. one of the most important directions in solving modern medical and environmental problems. The main sources of pesticides entering nature are: enterprises of the chemical, oil refining, metallurgical, fuel and other industrial sectors. A toxicant is a substance that is toxic and stable under environmental conditions, which can accumulate in human and animal organisms to dangerous concentration levels. toxins are absorbed by living organisms and moving along food chains, increasing their concentrations many times over, have a harmful effect on living organisms and humans [1].

In recent decades, it is increasingly recognized that success in the field of protecting and promoting health of the population largely depends on social and economic factors, as well as the conditions and state of the environment in which the current and future generations of people live [2].

Any body of water or water source is associated with its surrounding external environment. It is influenced by the conditions for the formation of surface or underground water runoff, various natural phenomena, industry, industrial and municipal construction, transport, economic and domestic human activities. The consequence of these influences is the introduction into the aquatic environment of new, unusual substances - pollutants that worsen the quality of water. Pollutants entering the aquatic environment are classified in different ways, depending on approaches, criteria and objectives. So, chemical, physical and biological pollution is usually emitted. Chemical pollution is a change in the natural chemical properties of water due to an increase in the content of harmful impurities in it, both inorganic (mineral salts, acids, alkalis, clay particles) and organic nature [3,4] (oil and oil products, organic residues, surface active substances, pesticides).

The most common pollutants of the water surface are oil products, phenols, easily oxidizable organic substances, metal compounds, ammonium and nitrate nitrogen, as well as specific pollutants - lignin, xanthates, formaldehyde, etc., the main source of which is wastewater from various types of industries, enterprises agriculture and communal services, surface water runoff [5].

Toxicants have an effect on the formation of sphincters of the rat rectum, the severity of these changes depends on age and their type. By the 6th month, under the action of copper sulfate, the structure of the internal sphincter changes more. At 12 months, when exposed to potassium thiocyanate, more pronounced morphological changes occur than when exposed to copper sulfate. By the 12th month, under the action of potassium thiocyanate, there was a greater decrease in the thickness of the external sphincter by 58.0% in the anterior part compared with the control group. The formation of sphincters under the action of potassium thiocyanate is delayed in comparison with the control group

The muscular membrane of the external sphincter consists of two rows of longitudinally arranged bundles of circular myocytes of a rounded shape. They lie obliquely, and the angle of their deviation from the longitudinal axis of the anal canal is greater than in the internal sphincter (Fig. 1).

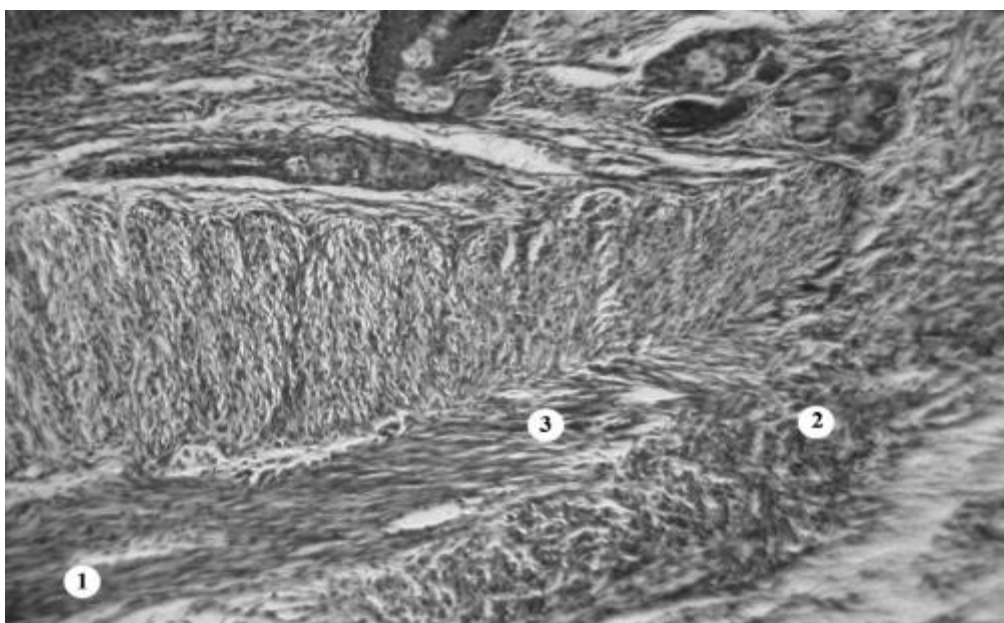


Fig. 1. Distribution of the longitudinal muscle layer in the space between the sphincters in 22 day old rats. 1. The space between the sphincters. 2. External sphincter. 3. Longitudinal muscle layer. Staining with hematoxylin and eosin. About. 20x approx. 7.

In our opinion, these bundles of myocytes unite the sphincter into a holistic anatomical formation, thereby, possibly, ensuring the synchronization of the work of the internal and external sphincters.

On the 11th day, the rate of increase in the thickness of the external sphincter was 54.0% in the posterior part. In 12-month-old rats, the increase in the thickness of the external sphincter increases by 55.0% in the anterior part. In the sphincters of the rectum by day 6, the rate of increase in the diameter of the lumen in venules and arterioles is 16.0%. By the 6th month, under the action of sulfate, the diameter of the lumen is greater in the venules by 30.0% in the sphincters of the rectum of copper in comparison with the control group.

By the 6th month of the experiment, under the action of potassium thiocyanate, the diameter of the lumen in the venules increased by 34.0% compared with the control group. In the experimental groups, as a result of the action of xenobiotics, the density of the bundles of connective tissue in the structures of the anal canal wall increases, as a result of which the density of the location of the nuclei of myocytes in the sphincters of the rectum increases, this can lead to a violation of their contractility [6].

During the lactation period, the increase in the thickness of the muscular membrane of the external sphincter is more pronounced in the distal part. By the age of 12 months, the muscular membrane of the external sphincter becomes thicker in the proximal part (Fig. 2).

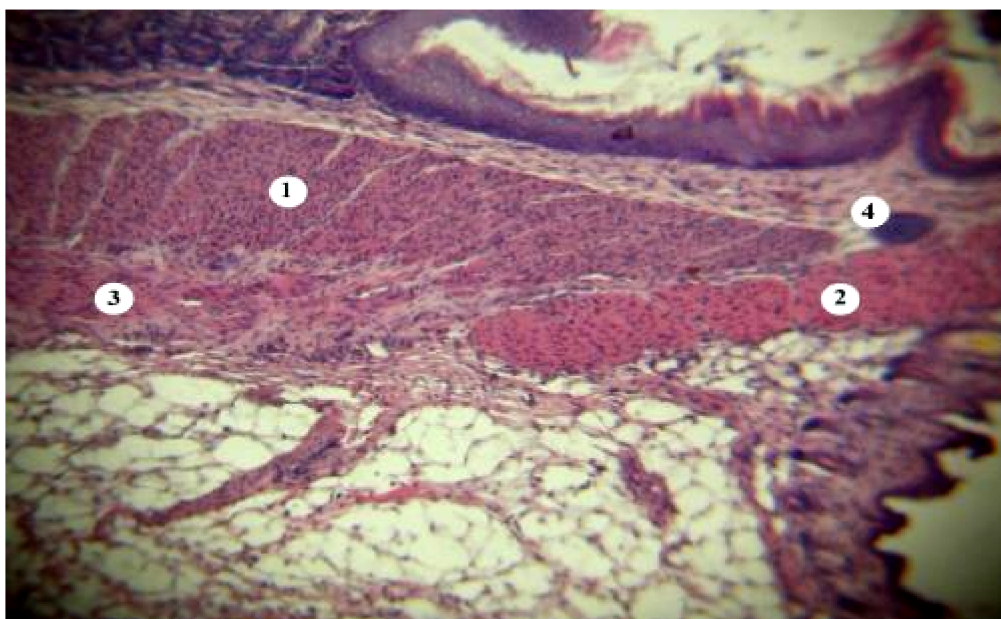


Fig. 1. Parts of the anal canal of the rectum of rats 6 months of age 1. Internal sphincter. 2. External sphincter. 3. Longitudinal muscle layer. 4. Inter-sphincter zone.

Staining with hematoxylin and eosin. Ob. 10hock. 7.

The effect of xenobiotics has an effect on the formation of sphincters of the rat rectum, the severity of these changes depends on the age and their type. By the 6th month, under the action of copper sulfate, the structure of the internal sphincter changes more. At 12 months, when exposed to potassium thiocyanate, more pronounced morphological changes occur than when exposed to copper sulfate. By the 12th month, under the action of potassium thiocyanate, there was a greater decrease in the thickness of the external sphincter by 58.0% in the anterior part compared with the control group. The process of sphincter formation under the action of potassium thiocyanate lags behind in comparison with the control group.

In the experimental groups, as a result of the action of xenobiotics, the density of the location of bundles of connective tissue in the structures of the anal canal wall increases, as a result of which the density of the location of the nuclei of myocytes in the sphincters of the rectum increases, this can lead to a violation of their contractility. The process of formation of the muscular membrane of the sphincters of the rat rectum is delayed; this is expressed when exposed to potassium thiocyanate. In the intersphincter zone, differences in the structure of the epithelium and fibrous structures of the connective tissue were revealed. This is due to the fact that it is located on the border between the anal canal and the external environment [7].

At 12 months, under the action of copper sulfate, a decrease in the thickness of the longitudinal muscle layer in the space between the sphincters by 40.0% compared with the control group is revealed. By the 24th month under the action of potassium thiocyanate, the thickness of the longitudinal muscle layer is 42.0% less than in the control group.

In the anal canal of the rat rectum, exposure to copper sulfate and potassium thiocyanate leads to their cumulation in the rat organism. The content of residual amounts of copper and thiocyanate predominates in the esophagus and rectum. However, it should be noted that in the sphincter zones of the digestive tract more residual amounts of copper are detected, so in the gastrointestinal duodenal passage it is 3.5 times higher and in the sphincters of the rectum it is 2.0 times higher than the content of rhodonite [8] ...

Changes in the wall of the anal canal of the rectum depend on the type of xenobiotic, the duration of its exposure and age. Xenobiotics affect both their formation and their function. The results obtained reveal more deeply the mechanism of occurrence of various disorders of the sphincter apparatus of the rectum in areas with an increased content of xenobiotics, in particular copper sulfate and potassium thiocyanate [9].

It has been established that the anal canal is subdivided into the pre-sphincter section, the transition zone, the internal sphincter, the external sphincter, the space between the sphincters and the intersphincter zone. When examining the internal and external sphincters of the rectum, it was revealed that they form a complex combined formation. The obtained results reveal more deeply the mechanism of occurrence of various disorders of the rectal sphincter apparatus.

It was revealed that there are connective tissue layers in the pre-sphincter region. Inflammatory processes can spread along them. The nature of the relationship of the fibrous structures of the connective tissue with the sphincters is different and must be taken into account when eliminating organic disorders of the rectal sphincters.

Thus, at present, part of humanity is in one way or another exposed to the action of various chemicals. The desire to better understand the links between the properties of chemicals and their effects on both humans and ecosystems has led to the emergence of a new interdisciplinary branch of environmental science - chemical, biological and medical ecotoxicology.

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