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THE EFFECT OF BEVERAGES ON MORPHOLOGICAL INDICATORS OF THE STOMACH

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ABSTRACT: The main function of the stomach is to digest food. Inside it are cells *that produce digestive enzymes, called proteases, which convert complex food molecules into simple nutrients that can be assimilated by the cells of our organs and tissues. In addition, the stomach produces molecules called intrinsic factors. These proteins are important because when these nutrients pass through the intestines, they absorb vitamin B12, which is necessary for the production of red blood cells. Absorption of some nutrients also occurs in the stomach lining. Water, amino acids, caffeine, alcohol can pass through the stomach walls.*

***Purpose of the work**: To study the macro and microscopic microtopographic properties of the stomach wall in experimental animals under normal conditions and after taking the medicinal drinking mineral water "Joyzar", as well as to supplement the results and data.*

***Keywords**: stomach, mucous membrane, mineral water, morphology.*

INTRODUCTION

Morphological, immunological and lymphological aspects of the use of drinking mineral waters have not been sufficiently studied. Therefore, there is no information about morphological changes in the walls of the stomach when using mineral waters. For many centuries, treatment with mineral waters has been considered one of the main methods of treating, first of all, the digestive system, circulatory system, etc. Currently, mineral waters of various chemical compositions (oral administration, baths, various combinations of effects) are widely used in medical institutions for the treatment and rehabilitation of patients. A significant percentage of

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these patients are gastroenterological patients, many of whom need to receive mineral waters that have a healing effect on the digestive organs, immune and lymphatic systems. Mineral waters are used, in particular, for diseases of the stomach, intestines and liver. At the same time, the influence of hydrological factors on the morphology of the stomach walls, their cellular composition, the structure of the mucous membrane and its structures (glands, cells, connective tissue, hemocirculatory and lymphatic channels, etc.) has not been determined. A deep study of the laws of morphogenesis of the stomach walls when using mineral waters, knowledge of the changes occurring in the immune organs, is of great importance for human health. This, undoubtedly, will contribute to the effective treatment and prevention of stomach and intestinal lesions in resorts, sanatoriums and in everyday life, taking into account the achievements of therapeutic zones and endoecological rehabilitation.

MATERIAL AND METHODS OF RESEARCH

For the experimental scientific research, 50 male white non-breed rats, aged 3-4 months, weighing 180 g - 200 g, raised in standard vivarium conditions, were selected. Laboratory animals were divided into 3 groups according to the analysis of the research results:

A total of 10 white non-breed rats were selected in the control group I. Depending on their age, 5 rats of 3 months and 5 rats of 4 months were selected.

A total of 20 white non-breed rats were selected in the experimental group II. Depending on their age, 10 rats of 3 months and 10 rats of 4 months were selected. This group of rats was given 0.5 ml of ordinary distilled drinking water every morning for 30 days, that is, one month. . The number of deaths was 1.

A total of 20 white non-breed rats were selected in the experimental group III. 10 rats of 3 months and 10 rats of 4 months were selected according to age. This group of rats was given 0.5 ml of “Joyzar” healing mineral water every morning for 30 days, that is, one month.

The research methods included organometric, histological, histomorphometric and statistical methods. Morphological examination method. To achieve the goal, we also used the Van-Gieson and Hematoxylin-eosin staining methods.

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The preparation of histological preparations consisted of 4 stages and was carried out using traditional methods. A microtome was used to prepare the preparations, the prepared sections were stained with hematoxylin-eosin and Van-Gieson methods. For this, the sections were immersed in hematoxylin solution for 3-5 minutes, then washed with water. After the nuclei were stained purple (observed under a microscope), they were stained in eosin solution for 0.5-1.5 minutes, washed in distilled water and dehydrated with increasing concentrations of alcohols (from 70° to 100°). To remove alcohol from the section and fix it, they were placed in three parts of O-xylene and placed in Canada balsam.

We found it permissible to list all 4 stages of the preparation of histological preparations:

The first stage is the extraction of biological objects. Anesthesia was used to kill laboratory animals. Then the animal was quickly opened, the necessary organs and tissues were removed, small pieces (6-7 mm3) were cut from it with a sharp instrument and placed in a fixative. The volume of the fixative was 20-40 times greater than the volume of the specified object. Fixation prevents the development of post-mortem changes in tissues, stops biochemical processes in them. The effect of any fixative is based on complex physicochemical processes, primarily protein coagulation. We used complex reagents containing one (formalin, alcohol, acetone) and two or more components (chloroform, glacial acetic acid; Zenker's liquid - mercuric chloride, potassium dichromate, sodium sulfate, formalin, distilled water).

The second stage is washing, dehydration and mounting of biological objects. Fixed biological objects were prepared in a suitable way to obtain thin sections: to make it sufficiently dense, after fixation, the sections were washed under running water for 12-24 hours to get rid of excess fixative. This stage was skipped for sections in Carnoy's fluid. After washing, they were loosened and mounted with increasing alcohols, for which alcohols of 50°, 60°, 70°, 80°, 90°, 96° and 100° were used in succession. Then the sections were clarified, for which absolute alcohol (100°) and O-xylene were first mixed in a 1:1 ratio, placed in this mixture, and then in 2/3 of pure O-xylene. After cleaning, the tissue is fixed in a thermostat (a mixture of equal parts of

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o-xylene and paraffin) at a temperature of 37 ° C, then 2/3 of pure paraffin is melted at 56 ° C. The sections soaked in paraffin are glued to wooden blocks. Biological objects prepared in this way can be stored in the open air for a long time.

The third stage is the preparation of histological blocks. A microtome was used to prepare the blocks. The obtained paraffin sections were glued to a glass slide smeared with a mixture of protein and glycerin (in a 1: 1 ratio) and dried in a thermostat at 37 ° C.

The fourth stage is staining and sectioning. The blocks were stained and the organ structure was clearly seen under a trinocular microscope of the HL-19 model with software designed for observing biological microobjects, based on the unequal chemical composition of tissue structures. All of them can be divided according to their origin: plant (hematoxylin), animal (carmine), synthetic (eosin); according to chemical properties: acidic, basic, neutral.

As is known, the ability of structures to be stained with basic dyes is called basophilia. The basophilic structure in a cell is the nucleus containing nucleic acids. Basophilic dyes include hematoxylin, carmine, thionine. Structures stained with acidic dyes are called oxyphilic, for example, the cytoplasm of cells. Acid dyes are acid derivatives or their salts (eosin, acid fuchsin). Neutral dyes (trypan blue, neutral red). In addition, there are specific dyes. For example, elastic fibers are stained red-brown with orcein, resorcinol-fuchsin is dark blue, and aldehyde-fuchsin is dark purple. Fats and fat-soluble substances in cells are stained orange with Sudan III, and osmium stains fats black. To identify the elements of the nervous system under a microscope, the silver nitrate impregnation method is used.

Before preparing the block, it is removed from paraffin (dewaxing). For this, the preparations are sequentially passed through three parts of O-xylene, alcohols of decreasing strength (from 100 ° to 70 °), and then they are placed in distilled water. The preparations prepared in this way are stained with hematoxylin and eosin. For this, the preparations are placed in a hematoxylin solution for 3-5 minutes, then in tap water for washing and differentiation. After the nuclei acquire a purple color (controlled under a microscope), they are stained in an eosin solution for 0.5-1.5 minutes, washed

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in distilled water and dried in alcohols of increasing strength (from 70 ° to 100 °). In addition, to stop the action of alcohol solutions and to clarify the blocks, they are sequentially placed in 2/3 parts of O-xylene and embedded in Canada balsam.

The next task was to cut 4-6 μm thick paraffin blocks on an MS-2 microtome, and the sections were stained with hematoxylin and eosin.

The sections were examined morphometrically, and the size of the stomach walls was measured using an ocular micrometer, for which we used a trinocular microscope made in China. DN-107t/ Model NLSD-307b (Roman, China).

RESULTS AND DISCUSSION

The stomach of the white-bred rats lies mainly under the liver. The greater curvature of the stomach emerges from under its sharp cardiac edge. It is located on the left side and slightly caudal to the lesser arch, the fundus of the stomach is located dorsally and slightly cranially to the pyloric part. Thus, the stomach of the white-bred rat is located almost transversely [between the sagittal and transverse planes].

When studying the topographic-anatomical and skeletoscopy data of the stomach of the white-bred rat, the following indicators were identified. In laboratory white-bred rats, the upper or upper posterior wall of the stomach touches the jejunum and ileum loops on the right, and the left adrenal gland and left kidney on the left. The stomach covers the upper 2/3 of the lower surface of the adrenal gland of the left kidney and is located close to the upper, i.e. anterior, end of the left kidney. The left side of the stomach is rounded, it is located mainly under the diaphragm, and on the left side it is located in contact with the spleen. The right side of the stomach narrows and from its last part it is attached to the beginning of the duodenum. If the duodenum, which is located on the outer side of it, is close to the right side of the stomach, the rest of the stomach lies under the visceral surface of the liver. The above situation indicates that it has reached the right border of the hilum of the liver.

The lesser curvature of the stomach wall is located transversely in its anterior part, and after the organ is full, it is observed that it bends and increases in size. The lesser curvature of the stomach is the place of attachment of the esophagus to the stomach, and it is attached to a topographically and anatomically specific area, that is,

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to the middle part of the lesser curvature of the stomach. The greater curvature of the stomach is located on the back of the organ, often located transversely.

There are several bundles from the abdominal organs of white-bred rats to the stomach, which are as follows: Stomach-splenic bundle: from the spleen to the greater curvature of the stomach; diaphragmatic-gastric bundle: from the diaphragm to the left half of the greater curvature of the stomach; hepatostomach bundle: from the liver to the lesser curvature of the stomach; gastro-colonic bundle: starting from the greater curvature of the stomach and continuing to the transverse colon.

The stomach of 4-month-old laboratory white-bred rats is fully formed. When macroscopically examining 4-month-old rats in the experiment, the following data were obtained:

The body weight of 4-month-old laboratory animals varied between 180-200 g, with an average of 243.6±5.3 g. The total length of the stomach of white outbred rats in the control group was 32-34 mm, with an average of 33.62±0.18 mm. The width of the organ varied between 13-15 mm, with an average of 13.81±0.18 mm. The thickness of the organ under study varied between 12-15 mm, with an average of 13.69±0.32 mm. The length of the greater curvature was around 37-38 mm, with an average of -37.43±0.10 mm. The length of the lesser curvature was 14 - 15 mm, with an average of -14.65±0.10 mm.

Histological analysis of the structural components of the stomach wall of healthy white outbred rats revealed the following data:

The height of the gastric mucosa in the area of the transition of the esophagus to the stomach [cardiac part] of white outbred rats at the age of 4 months ranged from 432.8 μm to 523.3 μm, with an average of 472.9±8.32 μm; in the depths of the organ, the height of the mucosa varied from 442.1 μm to 529.3 μm, with an average of 509.4±8.02 μm. In the body of the stomach, the height of this layer ranged from 448.1 to 546.8 μm, with an average of 511.8±9.08 μm; The height of the mucosa in the pyloric

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region ranged from 381.4 μm to 476.5 μm, with average value of 427.4±8.75 [Figure 3.1].

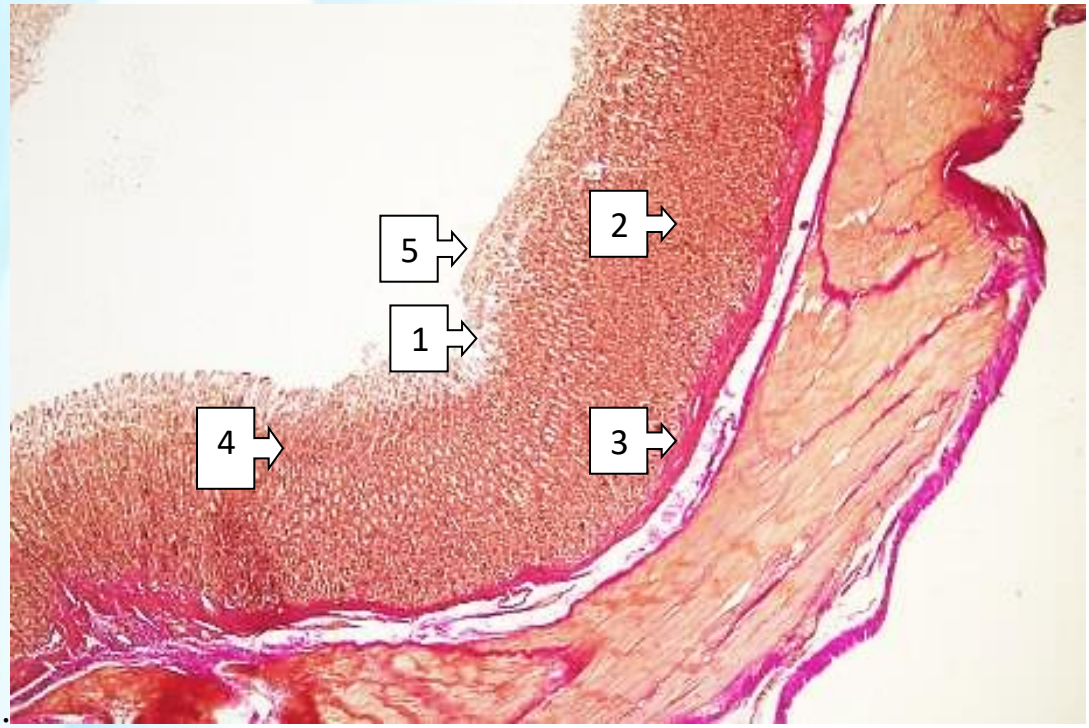

Figure 3.1. The structure of the cardiac part of the stomach of 4-month-old control white rats. 1 – mucosa, 2 – submucosa, 3 – muscular layer, 4 – bundle of collagen fibers, 5 – inter-folding fossa. Stain Van – Gizon. Size. 10X40.

The mucous membrane of the stomach wall of the white non-breed rats in the control group is covered with a multilayer epithelium, in which the epithelial layer consists of three rows: - basal cells; - round cells and oval cells. The presence of the above cells is characterized by the fact that they are not very large, tightly packed together and the nucleus is located in the center of the cell. The structure of the cells located in the middle and upper rows is oval in shape, and it is possible to see the eccentric location of the larger cell nuclei. In the apical part of these cells there are granules with a secretory nature. The height of the fold of the cardiac part of the stomach wall is from 425.3 μm to 505.8 μm, with an average of 456.5 ± 7.41 μm. In the tuberous area, this indicator is from 430.3-518.1 μm, with an average of 473.0 ± 8.08 μm. The height of the fold of the body of the stomach wall varied from 438.4 to 538.5 μm, averaging 492.5 ± 9.2 μm. In the area of the transition to the duodenum [pyloric part], this indicator was 372.3 - 468.9 μm, averaging 418.3 ± 8.89 μm. The height of the intermucosal folds of the mucous membrane, which is one of the components of the stomach wall, in the cardiac part was 384.3 - 462.1 μm, averaging

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411.5 ± 7.16 μm. In the tube area, it varied from 388.4 - 471.8 μm, averaging 422.1 ± 7.67 μm. When the body part of the stomach wall was studied, this measurement was 392.6-491.4 μm, with an average of 448.7±9.1 μm. In the pyloric part of the organ, the height of the recess between the folds under study was 331.2-421.8 μm, with an average of 365.9±8.34 μm. The thickness of the submucosal base located under the mucous membrane of the stomach wall in the cardiac region of the organ varied from 38.6-47.3 μm, with an average of 42.7±0.8 μm. In the fundus of the organ, the thickness of the submucosal base varied from 39.4-45.8 μm, with an average of 43.2±0.59 μm. The thickness of the submucosal layer in the body of the stomach wall is 40.3-48.1 μm, with an average of 43.6±0.72 μm. The thickness of this layer in the pyloric part of the organ varies from 41.2-52.1 μm, with an average of 46.3±1.01 μm [3.1.- table].

The total muscular layer of the stomach wall includes two - internal and external muscular layers. It can be seen that the structure of the internal layer consists of bundles of myocytes in the longitudinal direction. The outer layer consists of muscle fibers in a circular orientation. The inner longitudinal layer in the organ wall consists of bundles of myocytes of an elongated oval shape, transverse, with a larger longitudinal volume. The bundle of myocytes located in the pyloric part of the stomach wall consists of oval-shaped cells. The thickness of the total muscle layer of the wall of the organ under study was 205.8-261.3 μm in the cardiac part of the organ, with an average of 236.4±5.11 μm. The thickness of the muscle layer of the fundus of the stomach was 181.3-221.8 μm, with an average of 204.4±3.73 μm. The thickness of the muscle layer of the body of the stomach wall was 218.9-232.5 μm, with an average of 227.5±1.25 μm. In the section of the transition to the duodenum, this indicator varies from 371.4-442.3 μm, with an average of 410.1±6.52 μm. The height of the glandular tissue of the gastric wall in the cardiac part was 38.9-46.8 μm, with an average of 42.5±0.73 μm. This indicator varied from 37.4-42.2 μm in the area of the base of the organ, with an average of 40.4±0.44 μm. The height of the glandular tissue of the body part was in the range of 36.1-44.2 μm, with an average of 40.6±0.74 μm. In the pyloric part, it varied from 40.8 to 47.9 μm, with an average of 44.4±0.65 μm.

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The glands in the gastric wall are mainly composed of head, parietal and mucus-producing cells, and it can be seen that the base and body part of the gland are composed of head and parietal cells, and the anterior part is composed of parietal and mucus-producing cells. Chief cells are spherical in shape, with their nucleus located in the center of the cell. Parietal cells are larger than chief cells and are often oval in shape. In addition, parietal cells have 1 or 2 nuclei in their center. Mucus-producing cells are slightly elongated and have an oval or triangular nucleus in the center of the cell.

The glands in the gastric wall are mainly composed of head, parietal and mucus-producing cells, and the bottom and body of the gland are composed of head and parietal cells, and the anterior part is composed of parietal and mucus-producing cells.

Currently, diseases of the gastrointestinal tract occupy one of the leading places among common diseases [erosive gastritis and erosive-ulcerative gastritis] [M. A. Osadchuk et al., 2002], therefore, in recent years, the histological structure of the gastric mucosa of humans and mammals has been widely studied.

In order to correctly understand the nature of gastric ulcer, it is necessary to have a clear idea of the specific mechanisms of its formation, as well as the general pathological structural and functional reorganization of the gastric mucosa. The state of the gastric mucosa in the dynamics of ulcers has not been studied sufficiently. At the same time, an integral assessment of changes occurring in the gastric mucosa is important, which can be carried out using new methodological approaches [T. K Gaskina et al., 2009].

Despite the availability of data on the effect of water on the digestive system of the stomach, the gastric mucosa is considered sensitive to all external factors, but they have not been sufficiently identified and studied in postnatal ontogenesis. All of the above undoubtedly makes it difficult to correctly interpret the functional significance of the components of the gastric wall in normal and pathological terms.

Analysis of the study results showed that when comparing the components of the gastric wall of the control group of white outbred rats with those of the 2 groups of

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experimental white rats, the following changes in morphometric parameters were detected. It can be seen that the height of the mucous membrane of the cardiac part of the stomach decreased by 0.95%, the height of the fold by 0.94%, the inter-fold space by 4.11%, the submucosal base by 2.8%, the total thickness of the muscular layer by 0.17%, the glandular tissue by 5.5%, and the total thickness of the stomach wall by 0.74%. In the depths of the organ, these indicators changed as follows: the height of the mucous membrane by 2.37%, the height of the fold by 0.89%, the inter-fold space by 5.92%, the submucosal base by 5.78%, the total thickness of the muscular layer by 1.07%, the glandular tissue by 3.9%, and the total thickness of the stomach wall by 1.46%. The total mucosal height of the gastric body was observed to decrease by 2.11%, the height of the fold by 2.51%, the inter-fold space by 7.65%, the submucosal base by 2.29%, the total muscular layer thickness by 0.6%, the glandular tissue by 6.1%, and the total thickness of the gastric wall by 1.52%. At the junction of the organ with the duodenum, the mucosal height was found to decrease by 1.77%, the height of the fold by 2.68%, the inter-fold space by 3.24%, the submucosal base by 3.02%, the glandular tissue by 3.5%, and the total thickness of the gastric wall by 1.21%.

CONCLUSION

In conclusion, when comparing the animals of this group of the study with the animals of the control group 1, the minimum changes in the histological and histomorphometric indicators of the gastric mucosal tissue elements of the white outbred rats of the study group 2 were recorded in the bodies of 3-month-old rats of the experimental group, and the maximum changes were recorded in the bodies of 4-month-old rats of the experimental group. The use of Jo'yzar mineral water allowed to significantly reduce the negative effects on all studied parameters.

During the study, statistically significant differences were found in all studied organometric and morphometric indicators compared to the indicators of the control group of animals of the 2nd and 3rd study groups.

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