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SPECIFIC STRUCTURE OF THE NORMAL RAT GASTRIC FUNDUS WALL

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As a result of a comprehensive study, it was determined that the wall of the fundus of the stomach of rats according to the basic principles of structural organization corresponds to humans and can be used as an experimental model to study the effects of exogenous factors. By means of morphometric research the basic metric indicators of a wall of fundal department of a rats' stomach and histotopographic features of own glands are established.

Key words: fundus of the stomach, wall, own glands, morphometry.

The paper has been written within the research scientific work "Patterns of morphogenesis of organs, tissues and neurovascular formations in normal condition, pathology and under the influence of exogenous factors", carried out at the Ukrainian Medical Stomatological Academy of the MOH of Ukraine (State registration No. 0118U004457).

In Ukraine, diseases of the digestive system rank third among all diseases of the internal organs [4, 11]. Currently, changes in the nature of food consumption do not meet the nutritional, energy and water needs of the human body. This can increase the number of diseases of the digestive system [8, 14].

Data on the influence of the nature of food [9], beverages [12, 15], diseases [2, 6], stress and harmful working conditions on the stomach are becoming more and more common in the literature.

Publications report that about 50% of the adult population of Ukraine suffers from diseases of the gastrointestinal tract, caused by the use of food additives [10], which is accompanied by behavioral disorders [13]. Specific structure and nutrition habits make the rats the most appropriate experimental model for studying the effect of harmful factors on humans; therefore, awareness of features of the structural organization of the normal rat gastric wall is relevant to date.

The purpose of the work was at the establishing the structural features of the normal rat gastric fundus wall.

Material and Methods. 10 outbred mature male albino rats were involved into the study. After animals euthanasia, fragments of the gastric fundus wall were fixed in 10% neutral formalin for three days.

Subsequently, pieces of the gastric fundus wall, fixed in formalin, were embedded into paraffin according to conventional technique [1].

Sections of 5-10 μm thick were made by the sledge micritome and put onto the slides using the stencil technique.

After staining with hematoxylin and eosin the sections were put into polystyrene and studied in the light microscope.

Microimaging and morphometric study of the specimens was carried out using the microscope equipped with the DCM 900 digital microphoto attachment and the software adapted for these studies. Morphometric data were statistically processed using the *Excel* software [5].

Animal housing and experiments on them have been carried out in compliance with the requirements of international principles of the "European Convention for the Protection of Vertebrate Animals Used for Experimental and Other Scientific Purposes" and general ethical principles of experiments on animals [7].

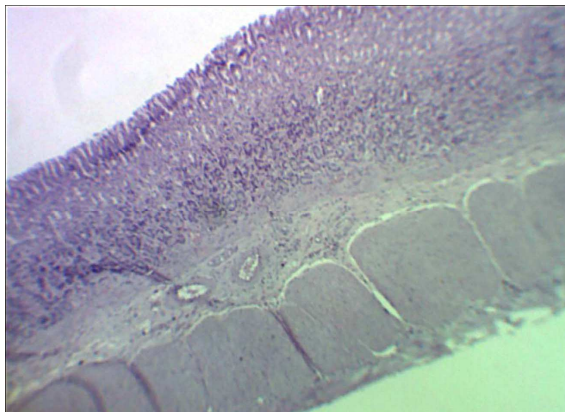


Fig. 1. Gastric fundus wall of rat of the control group. Microimage. H&E stain. 100 \times magnification.

Results of the study and their Discussion.

The gastric wall of rats of the control group had a regular structure and consisted of a mucous membrane with submucous layer, muscular and serous layers (Fig. 1).

The mucous membrane of the gastric fundus of rats of the control group was covered with a single layer columnar epithelium formed by superficial mucocytes. The lamina propria consisted of loose unformed connective tissue in which the vessels of the blood microvascular system were located. The muscular plate of the mucous membrane separated the latter from the submucous layer and was formed by smooth muscle tissue

that formed folds taking part in the formation of the surface topography of the stomach. Large vessels and nerve conductors were found in the submucous layer. Morphometric study has established the basic metric values of the gastric fundus wall of rats of control group (Table 1).

Table 1

Morphometric description of the gastric fundus wall of rats of control group (μm)

Parameters	Total thickness of the wall	Thickness of the mucous membrane	Thickness of the submucous layer	Thickness of the muscular layer	Thickness of the serous layer
Control group	1259,0 \pm 15,47	673,28 \pm 6,18	127,78 \pm 8,19	454,24 \pm 3,13	9,51 \pm 0,67

Superficial mucocytes were cylindrical; mucus granules were localized in the apical part; in the basal part the nucleus and endoplasmic reticulum was visualized (Fig. 2a).

The lamina propria was detected beneath the epithelium, containing the proper gastric glands. They were simple, weakly branched, tubular, and consisted of the isthmus, neck and head (Fig. 1). Proper glands of the gastric fundus contained cervical, basal and parietal exocrinocytes, stem cells and endocrinocytes. Cervical exocrinocytes were found only in the neck of the glands and were similar in structure to superficial mucocytes, had an irregularly shaped nucleus, secretory granules were localized in the apical parts of cells. Stem cells were also detected only in the neck by the cervical exocrinocytes and were a source of regeneration of both the superficial epithelium of the gastric fundus and the cells of the proper glands. Their nuclei had a basal localization (Fig. 1a).

The basal exocrinocytes made up the vast majority of the main part of the gland. Their cytoplasm was stained basophilic, the nucleus was detected in the basal part of the cells, the apical part contained secretory granules (Fig. 2b). Parietal exocrinocytes were detected from the outside of the main cells, were adjacent to their basal ends and were localized mainly in the upper half of their proper glands and scattered ones were found at the bottom. Their cytoplasm was stained oxyphilic (Fig. 2b).

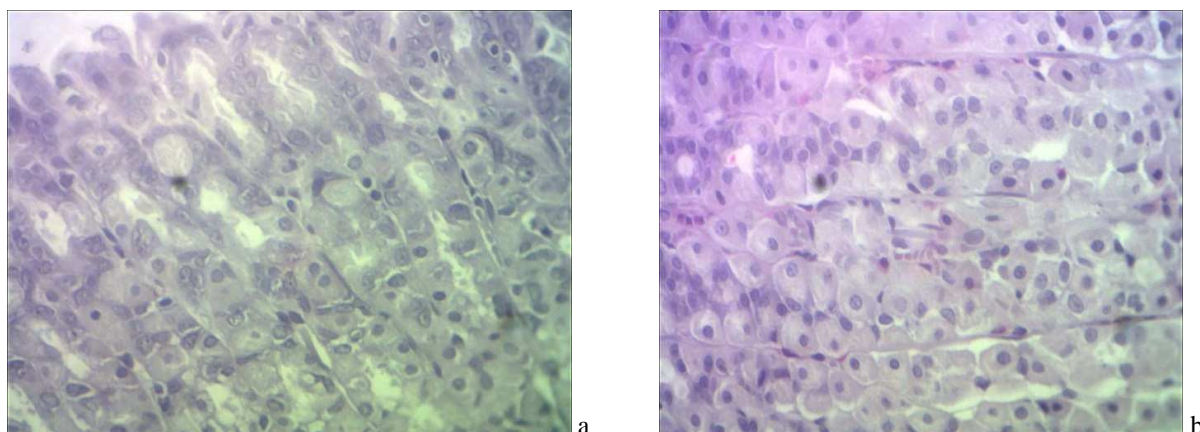


Fig. 2. Necks (a) and bodies (b) of the fundal glands of rat of the control group. Microimage. H&E stain. 400 \times magnification.

Endocrinocytes of the proper gastric glands were detected in the deep parts. The sections, stained with hematoxylin-eosin, had an optically light eosinophilic cytoplasm, apical parts were not conjoined with the lumen, granules were accumulated in the basal parts (Fig. 3a).

Vessels of the blood microvascular system, namely, arterioles and venules, were detected in the lamina propria; capillaries were localized in the connective tissue between the glands (Fig. 3a).

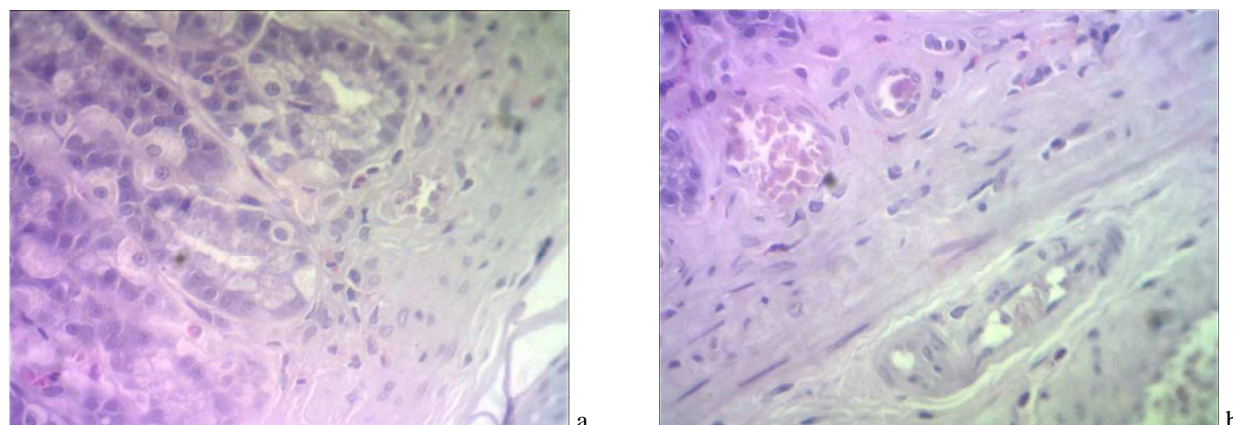


Fig. 3. The bottom of the fundal gastric glands (a) and microvasculature of the lamina propria (b) of rats of the control group. Microimage. H&E stain. 400 \times magnification.

The muscular plate of the mucous membrane was formed by several rows of smooth myocytes. Arteries and veins were visualized in the loose connective tissue of the submucous layer (Fig. 3b).

The local protective barrier in the mucous membrane of the gastric fundus of rats of the control group was represented by intraepithelial lymphocytes (Fig. 4a). Lymphocytes, macrophages and plasma cells were detected perivascularly in the lamina propria (Fig. 4b).

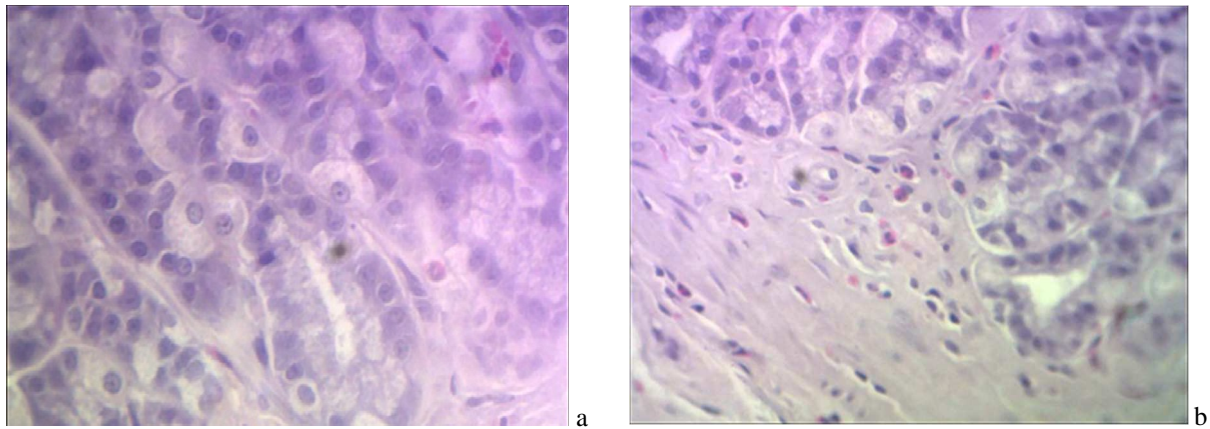


Fig. 4. Intraepithelial lymphocytes at the bottom of the gastric fundal glands (a) and leukocytes in the lamina propria (b) of the gastric wall of rat of the control group. Microimage. H&E stain. 400 × magnification.

At the neck of the gland in the group of intact animals, the outer diameter was $34.17 \pm 1.13 \mu\text{m}$; the diameter of the lumen was $10.63 \pm 0.74 \mu\text{m}$; the height of the epitheliocytes was $12.14 \pm 0.40 \mu\text{m}$.

At the body of the glands, the outer diameter was $32.81 \pm 1.26 \mu\text{m}$; the diameter of the lumen was $7.47 \pm 0.39 \mu\text{m}$; the height of the epitheliocytes was $11.09 \pm 0.55 \mu\text{m}$.

At the bottom of the gland the outer diameter was $43.68 \pm 1.43 \mu\text{m}$; the diameter of the lumen was $7.72 \pm 0.29 \mu\text{m}$; the height of the epitheliocytes was $14.47 \pm 0.47 \mu\text{m}$.

Thus, the results of histological examination suggest that the wall of the fundus of the rats' stomach according to the basic principles of structural organization corresponds to human and can be used as an experimental model to study the effects of exogenous factors.

The determined metrics data showed that the largest indicator of the outer diameter and height of the epitheliocytes of the rats' gastric glands of the control group was in the bottom, the average diameter of the lumen - in the body of the glands. The established values of the average wall thickness are consistent with the data of other researchers [2, 3].

Conclusions

As a result of a comprehensive study, it was determined that the wall of the fundus of the stomach of rats according to the basic principles of structural organization corresponds to humans and can be used as an experimental model to study the effects of exogenous factors. By means of morphometric research the basic metric indicators of a wall of fundal department of a rats' stomach and histotopographic features of own glands are established.

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Реферати

СТРУКТУРНІ ОСОБЛИВОСТІ СТІНКИ ФУНДАЛЬНОГО ВІДДІЛУ ШЛУНКУ ЩУРІВ У НОРМІ

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У результаті проведеного комплексного дослідження визначено, що стінка фундальної частини шлунку щурів за основними принципами структурної організації відповідає людині і може бути використана в якості експериментальної моделі для вивчення дії екзогенних чинників. За допомогою морфометричного дослідження встановлені основні метричні показники стінки фундального відділу шлунку щурів та гістотопографічні особливості власних залоз.

Ключові слова: фундальна частина шлунку, стінка, власні залози, морфометрія.

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СТРУКТУРНЫЕ ОСОБЕННОСТИ СТЕНКИ ФУНДАЛЬНЫЙ ОТДЕЛ ЖЕЛУДКА КРЫС В НОРМЕ

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В результате проведенного комплексного исследования определено, что стенка фундальной части желудка крыс основными принципами структурной организации соответствует человеку и может быть использована в качестве экспериментальной модели для изучения действия экзогенных факторов. С помощью морфометрического исследования установлены основные метрические показатели стенки фундального отдела желудка крыс и гистотопографические особенности собственных желез.

Ключевые слова: фундальная часть желудка, стенка, собственные железы, морфометрия.

Рецензент Старченко І.І.