How to Cite
Anvarovna, S. P., Isakovich, A. D., Khudoyberganovna, K. K., Askarovna, M. N., Maksutalievich, T. K., & Rasulovich, R. O. (2023). Morphofunctional characteristics of the parotid salivary glands of rabbits in postnatal ontogenesis. *International Journal of Health & Medical Sciences*, *6*(1), 38-43.
https://doi.org/10.21744/ijhms.v6n1.2092

Morphofunctional Characteristics of the Parotid Salivary Glands of Rabbits in Postnatal Ontogenesis

Sharipova Postumia Anvarovna
Professor of the Tashkent State Dental Institute, Uzbekistan

Abdukarimov Dilshod Isakovich
Assistant of the Tashkent State Dental Institute, Uzbekistan

Kenzhaeva Khilola Khudoyberganovna
Assistant of the Tashkent State Dental Institute, Uzbekistan

Mirzaakhmedova Nilufar Askarovna
Assistant of the Tashkent State Dental Institute, Uzbekistan

Turdaliev Komilzhon Maksutalievich
Assistant at Tashkent State Dental Institute, Uzbekistan

Rakhmanov Otabek Rasulovich
Assistant at Tashkent State Dental Institute, Uzbekistan

Abstract---*The rodent family unites a large number of animal species and is of interest to various areas scientific knowledge. Animal species from the rodent family are interesting because they occupy different ecological niches and are adapted to different conditions of existence. Many species of rodents feed exclusively on plant foods, but there are also omnivorous species whose dietary range includes insects, worms and other invertebrates, as well as bird eggs and small vertebrates. Examples include rats, guinea pigs, mice. As a result, the rodent family demonstrates biologically diverse group of species that are very different in appearance, with specific morpho functional adaptations. Generally morphological and functional features of the large salivary glands in representatives of the rodent family in not currently studied.*
Keywords---*acinus, connective tissue, morphogenesis, morphometry, ontogenesis, parotid gland, rodents, serocyte, sublingual gland, submandibular gland.*

Introduction

The salivary glands perform an important function in maintaining the normal chemical composition of tooth enamel, maintain the physiological level of regeneration of the epithelium of the oral cavity and the entire digestive tract, participate in the regulation of water-salt homeostasis of the body and perform an endocrine function (Babaeva & Shubnikova, 1979; Kim et al., 2022). In the classical experiments of I.P. Pavlov on the study of the secretory function of the salivary glands, it was shown that the amount of saliva secreted is determined by the chemical composition and physical properties of food and is regulated by special reflexes in response to various types of mechanical and chemical excitability. Salivary glands (glandulae salivares) - are subdivided into obstetric and intra-mural into large and small, so the parotid salivary glands, which open with their ducts into the oral cavity, also belong to the obstetric major salivary glands (Beahm et al., 2009; Choi et al., 2002).

Main part

The parotid duct passes into the oral cavity at the level of the fourth premolar in the region of the interbuccal space. The salivary glands include the major and minor salivary glands (Artemova, 1979; Maslova et al., 2018). The glands of the lips, cheeks, palatine and lingual glands are small, and the large salivary glands include three pairs of large glands: parotid, mandibular, sublingual (single-duct and multi-duct), 12 located deep from the oral mucosa. The parotid salivary gland, with its main mass, is located along the posterior edge of the lower jaw, within the upper 2/3 of the distance from the zygomatic arch to the angle of the lower jaw. The gland is covered by the parotid fascia and the subcutaneous muscle of the head. In adult animals, the gland is located at the level of the middle of the dorsal part of the zygomatic arch and the ventral edge of the lower jaw. In 39.1 - 60.5% of cases, above the masticatory muscle, in 4.5% of cases, the gland is short and its lower edge is located above the level of the ventral edge of the lower jaw. In 19.5% of cases, the lower edge of the gland lies at the level of the ventral edge of the mandible, and in 76% of cases, the gland descends to the middle of the distance between the vascular notch and the caudal edge of the angle of the mandible (Tastanova et al., 2020). These are the largest glands of all the salivary glands, covered with a connective tissue capsule, from which trabeculae extend, dividing it into lobules. The lobules include protein terminal sections, intercalary and striated ducts. These glands are complex branched alveolar glands, they produce a protein (serous) secret. The protein terminal sections are round or oval in shape and consist of 2 types of cells: I) glandular cells, called serocytes, and 2) myoepithelial. Between the terminal sections are thin layers of connective tissue that form the stroma of the gland. Intercalated intralobular excretory ducts - the smallest, start from the end sections, consist of an inner layer of cuboidal or flattened epithelial cells and myoepitheliocytes. In the parotid gland, these ducts are well developed and branch. These ducts drain into intralobular striated ducts. The striated intralobular excretory ducts are well developed and consist of one layer of prismatic epitheliocytes and a layer of myoepitheliocytes. The striated ducts flow into the interlobular excretory ducts. The interlobular excretory ducts are located in the interlobular connective tissue. At the origins, these ducts are lined with a two-layer, at the mouth - with a multilayer cubic epithelium. The interlobular excretory ducts empty into the common duct of the gland. The common duct of the gland at the origins is lined with stratified cuboidal epithelium, at the mouth - with stratified squamous non-keratinizing epithelium. The duct pierces the masticatory muscle and opens in the vestibule of the oral cavity at the level of the upper 2nd large molar (Zbären et al., 2003; Van Sickels, 2009).

Materials and Methods

The experiment was carried out on rabbits at the age of 1, 2 and 3 weeks. Animals were kept under standard conditions: 12-hour light period, temperature 20°C. The morphological and functional state of the major salivary glands of rats was assessed by morphological (hematoxylin and eosin) and morphometric methods. Pieces of the parotid glands for morphological and morphometric studies were fixed in a 10% formalin solution and embedded in a paraffin mixture. Sections 5 µm thick were stained with hematoxylin and eosin. The results of the morphometric study are presented as a sample mean and standard deviation (Volkov, 2016; Avtandilov, 1990; Battaglia et al., 2022). The research materials were subjected to statistical processing using the methods of parametric and non-parametric analysis. Accumulation, correction, systematization of initial information and visualization of the obtained results were carried out in Microsoft Office Excel 2016 spreadsheets. Statistical analysis was carried out using the IBM SPSS Statistics v.26 program (developer - IBM Corporation). Quantitative indicators were evaluated for compliance with the normal distribution, for this, the Shapiro-Wilk test (with the number of subjects less than 50) or the Kolmogorov-Smirnov criterion (with the number of subjects more than 50), as well as indicators of asymmetry and kurtosis, were used (Sznitman, 2013; Steinberg, 2007).

Results and Discussion

Morphometric studies included the definition of:

1. Total area of the parotid glands;
2. Number of slices;
3. Number of acini;
4. Area of acinus MKM (micrometer);

The results of the experiment are presented in the following table

Table 1
Morphometry of the parotid glands of rabbits

Morphometry of the parotid glands of rabbits	1 week		2 week		3 week	
	M	m	M	m	M	m
Total area of the parotid glands	146,80	9,78	192,40	14,23	255,30	6,27
Number of slices	53,20	2,46	78,80	5,46	120,70	4,37
Connective tissue septum	27,90	2,27	39,70	3,92	59,40	3,45
Acinus numbers	212,50	9,85	284,10	10,35	327,40	4,95
Area of acinus MKM (micrometer) ;	65,70	7,84	76,60	8,42	78,90	5,94

The early stages of postnatal morphogenesis of the parotid salivary gland in rabbits are characterized by a statistically significant increase in the diameter of the acini from 212.50±9.85 μm to 284.10±10.35 μm, causing a trend towards an increase in their area (picture 1).

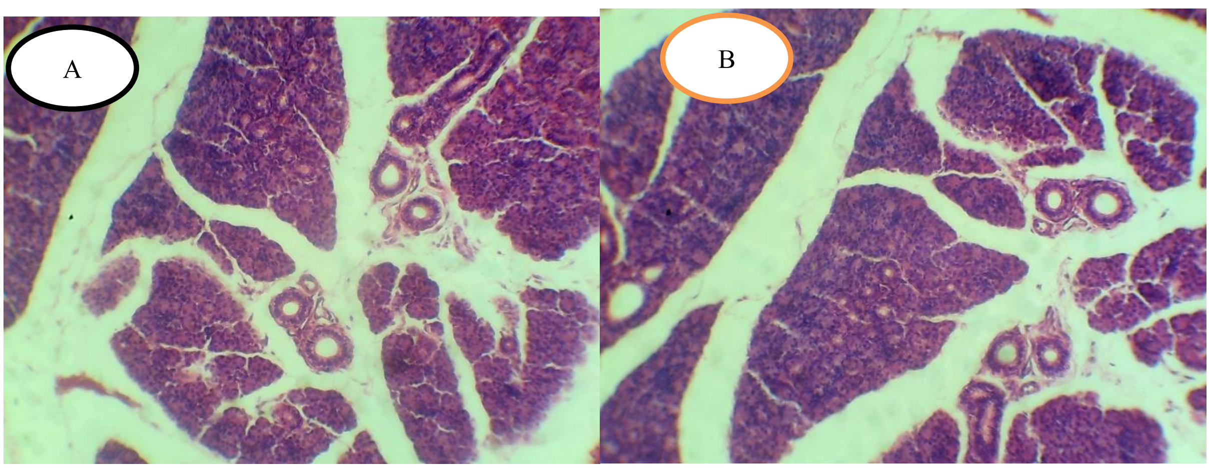

Figure 1. The structure of the parotid glands of rabbits for 1 (A)and 2(B) weeks

At the same time, the number of acini increases sequentially, and then by the 2nd week it stabilizes up to 3 weeks. In the later period of ontogenesis, from 2 to 3 weeks, there is an increase in the cross-sectional area and diameter of acini, probably due to an increase in the cross-sectional area of the cytoplasm of serocytes, and in the period of maturation (2-3 weeks) by an increase in their number on the cross-sectional area of the acinus (picture 2).

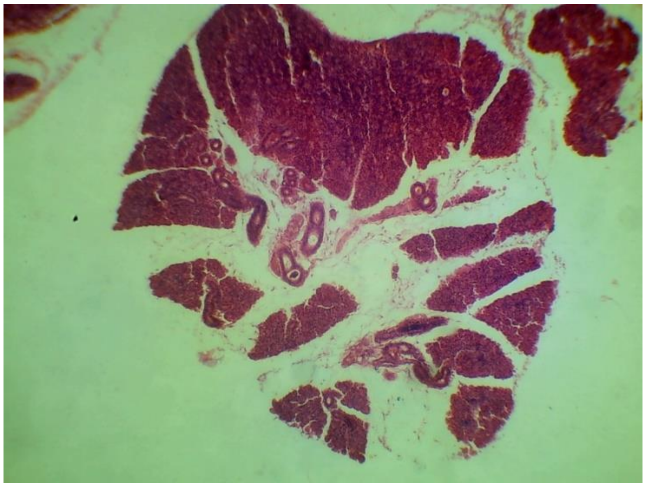

Figure 2. The structure of the parotid glands of rabbits for 3 weeks

The period from 1 to 3 weeks is characterized by a statistically significant increase in the cross-sectional area and diameter of the parotid glands, as well as an increase in their walls and diameter. The subsequent period (2-3 weeks) is characterized by both an increase in the cross-sectional area of the walls and lumens of the intercalary ducts, which is accompanied by a simultaneous increase in the area of nuclei and cytoplasm of epitheliocytes and their number in the cross-sectional area of the duct, similar to acini.Thus, normally, the morphogenesis of the parotid salivary gland in the period from 1 to 3 weeks is characterized by a 1.5-fold increase in the cross-sectional area of the terminal sections, which is based on an increase in both the number of serocytes per cross-sectional area of the acinus and the size of the cells themselves (Carey & Barner, 2019; Ashburner & Friston, 2001).

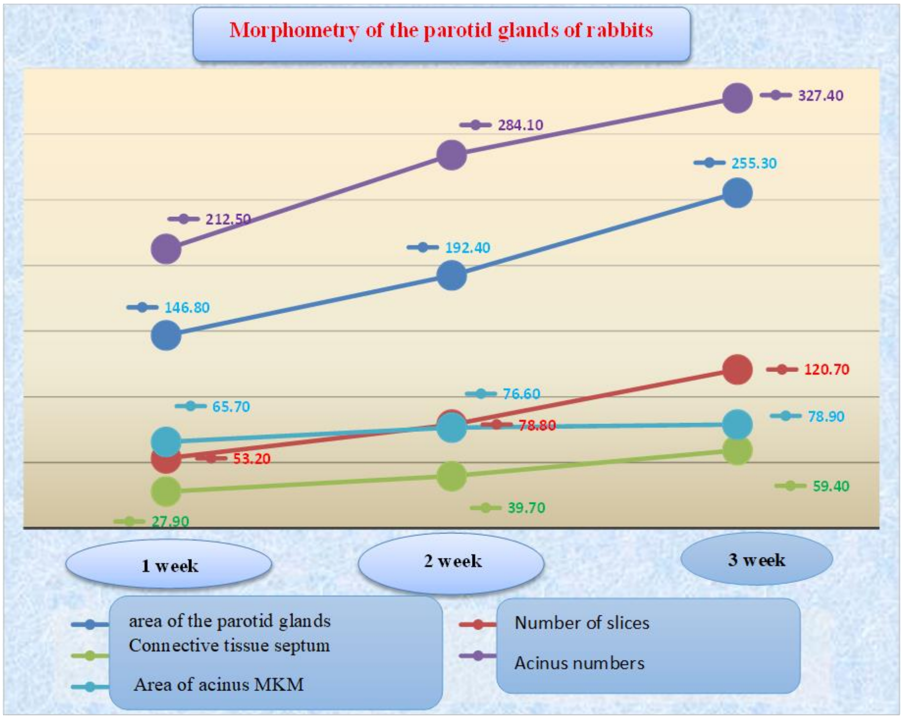

Figure 3. Morphometry of the parotid glands of rabbits

Changes in the morphometric parameters of the intralobular excretory ducts of the parotid salivary gland are characterized by two stages. A decrease in the cross-sectional area of the walls of the intercalary and striated ducts in early postnatal ontogenesis is replaced by their increase at later stages. These phenomena are accompanied by similar changes in the size of the nuclei and cytoplasm of epitheliocytes. The functional activity of epithelial cells of the intralobular excretory ducts increases most intensively in the late stages of postnatal ontogenesis (Iglič et al., 2004; Crosby, 1952).

Conclusion

The morphogenesis of the acini of the parotid salivary gland in rabbits is generally characterized by an increase in their size during 3 weeks of postnatal ontogenesis, and the intralobular ducts are characterized by two-stage dynamics. Early postnatal ontogeny is characterized by a decrease in the cross-sectional area of the duct walls and an increase in the gaps; at later stages, both indicators increase statistically significantly. Changes in the morphometric parameters of the intralobular excretory ducts of the parotid salivary gland are characterized by two stages. An increase in the cross-sectional area of the walls of the intercalary and striated ducts in early postnatal ontogenesis is replaced by their increase at later stages. These phenomena are accompanied by similar changes in the size of the nuclei and cytoplasm of epitheliocytes. The functional activity of epithelial cells of the intralobular excretory ducts increases most intensively at the late stages of postnatal ontogenesis.

References

Artemova, M. K. (1979). Lymphatic bed of the main bronchi in normal human subjects and in venous stasis. *Arkhiv Anatomii, Gistologii i Embriologii*, *77*(9), 40-43.

Ashburner, J., & Friston, K. J. (2001). Why voxel-based morphometry should be used. *Neuroimage*, *14*(6), 1238-1243. https://doi.org/10.1006/nimg.2001.0961

Avtandilov, G. G. (1990). Medical morphometry/GG Avtan dilov.—M.:«. *Medicine*.

Babaeva, A. G., & Shubnikova, E. A. (1979). Structure, function and adaptive growth of salivary glands. *M.: MSU*, 192.

Battaglia, A. G., Ali-Zade, C., Monti, L., Al Khawashki, H., Winkler, H., Del Sel, H., ... & Romanò, C. L. (2022). Metal Hypersensitivity or Missed Periprosthetic Joint Infection? A Critical Review. *Orthopedics*, *45*(2), e73-e78.

Beahm, D. D., Peleaz, L., Nuss, D. W., Schaitkin, B., Sedlmayr, J. C., Rivera-Serrano, C. M., ... & Walvekar, R. R. (2009). Surgical approaches to the submandibular gland: a review of literature. *International journal of surgery*, *7*(6), 503-509. https://doi.org/10.1016/j.ijsu.2009.09.006

Carey, S., & Barner, D. (2019). Ontogenetic origins of human integer representations. *Trends in cognitive sciences*, *23*(10), 823-835. https://doi.org/10.1016/j.tics.2019.07.004

Choi, J., Kim, I. K., & Oh, N. S. (2002). Multiple sialoliths in sublingual gland: report of a case. *International journal of oral and maxillofacial surgery*, *31*(5), 562-563. https://doi.org/10.1054/ijom.2002.0253

Crosby, W. H. (1952). The pathogenesis of spherocytes and leptocytes (target cells). *Blood*, *7*(2), 261-274. https://doi.org/10.1182/blood.V7.2.261.261

Denisov, A. B. (2011). Method of Assessment of the Dynamics of Salivary Function in Rats during the Experiment. *Bulletin of experimental biology and medicine*, *151*(5), 658-661.

Iglič, A., Veranič, P., Jezernik, K., Fošnarič, M., Kamin, B., Hägerstrand, H., & Kralj-Iglič, V. (2004). Spherocyte shape transformation and release of tubular nanovesicles in human erythrocytes. *Bioelectrochemistry*, *62*(2), 159-161. https://doi.org/10.1016/j.bioelechem.2003.07.002

Kim, L. A., Abdukarimov, D. I., Shagulyamova, K. L., Mirzaakhmedova, N. A., & Turdaliev, K. M. (2022) Morphometric Characteristics of the Parotid Glands in Immature Rats with Intestinal Dysbacteriosis.

Maslova, I. B., Lifanova, T. E., Golenkova, O. V., Mikheeva, E. S., & Lebedeva, N. V. (2018). The diversification as the trends of reforming additional proffessional education of social workers. *Research Journal of Pharmaceutical, Biological and Chemical Sciences*, *9*(2), 1117-1127.

Steinberg, M. S. (2007). Differential adhesion in morphogenesis: a modern view. *Current opinion in genetics & development*, *17*(4), 281-286. https://doi.org/10.1016/j.gde.2007.05.002

Sznitman, J. (2013). Respiratory microflows in the pulmonary acinus. *Journal of biomechanics*, *46*(2), 284-298. https://doi.org/10.1016/j.jbiomech.2012.10.028

Tastanova, G. E., Rakhmonov, O. R., & Khamdamov, Sh. I. (2020). MORPHOLOGICAL FEATURES OF FETAL AND TOPOGRAPHICAL ANATOMY OF THE HEART, INTRACARDIAC STRUCTURES AND LARGE BLOOD VESSELS OF THE MEDIASTINUM. A new day in medicine, (4), 698-700.

Van Sickels, J. E. (2009). Management of parotid gland and duct injuries. *Oral and Maxillofacial Surgery Clinics of North America*, *21*(2), 243-246. https://doi.org/10.1016/j.coms.2008.12.010

Volkov, V. P. (2016). Information-analytical approach to the morphogenesis of neuroleptic cardiomyopathy. Universum: medicine and pharmacology, (1-2 (24)).

Zbären, P., Schüpbach, J., Nuyens, M., Stauffer, E., Greiner, R., & Häusler, R. (2003). Carcinoma of the parotid gland. *The American journal of surgery*, *186*(1), 57-62. https://doi.org/10.1016/S0002-9610(03)00105-3