

MORPHOMETRIC STUDY OF INTRALOBULAR DUCTS IN WISTAR RAT MANDIBULAR GLAND

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Abstract. Mandibular gland in rodents is composed of acini, intralobular ducts (intercalated, granular, striated) and interlobular duct, a single excretory duct that effuses into the oral cavity. Granular ducts appear only in rodents mandibular gland (mouse, rat, hamster, gerbil). In this study five male Wistar rats were considered. Mandibular glands were collected after euthanasia, in order to perform histological and morphometric investigations. Our study highlights that mandibular glands in Wistar rats show a large number of striated and granular ducts, which occupy almost half of the studied section area. The number of granular ducts (177.4/field) in mandibular gland of Wistar rats considered in the study are much higher than the number of striated ducts (64/field). The area occupied by the granular ducts is significantly larger than the one occupied by the striated ones.

Keywords: intralobular ducts, mandibular, morphometry, Wistar rat

INTRODUCTION

The rodents' salivary glands are characterized in detail from a histoarchitectonic point of view. Mandibular gland is composed of acini, intralobular ducts (intercalated, granular, striated) and interlobular duct, a single excretory duct that effuses into the oral cavity. Granular ducts appear only in rodents mandibular gland, producing polypeptides and presenting sexual dimorphism (granules are bigger in males than in females). In males, the cells of these ducts are columnar and contain large granules, whereas in females the epithelium of these ducts is short columnar, with less cytoplasmic granules than in males (Jayasinghe *et al.*, 1990; Turner and Hiroshi, 2002). At birth, mandibular glands are comparable both in males and females, and from sexual maturity (about 7 weeks in rat) a relatively pronounced sexual dimorphism occurs (Pritam *et al.*, 2013).

The aim of this study was the morphometric quantification of the loading degree in granular and striated ducts in order to assess the participation degree of the cells to the general secretion of the mandibular gland in Wistar rat.

MATERIAL AND METHOD

In this study, we used five male Wistar rats (280-295 g), from the University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca Biobase. The investigation was approved by the UASVM Bioethics Commission of Cluj-Napoca and was carried out in accordance with the legislation of the Ministry of Health. Rats were humanly euthanized by prolonged exposure to isoflurane inhalation anesthesia. After death, mandibular glands were harvested, fixed in 10% buffered formalin, dehydrated through graded alcohols, clarified in n-butanol and paraffin embedded. Sections, 5 μ m thick, were obtained and stained with hematoxylin-eosin and examined with an Olympus BX41 optical microscope equipped with a digital camera. To evaluate the ratio between granular and striated ducts in mandibular gland in Wistar rats we used AmScope program. The obtained data were analyzed with

GraphPad Prism 6 software. The percentage of the granular and striated ducts was calculated, the difference being occupied by acini, connective tissue, blood vessels, interlobular ducts.

RESULTS AND DISCUSSION

In Wistar rat, the mandibular gland has small serous acini and three categories of intralobular ducts (intercalated, granular and striated), occupying almost half of the studied section area.

Histologically, in mandibular gland of the five animals studied, granular ducts (177.4/field) were more numerous than the striated ones (64/field). Assessing the intralobular ducts on the whole section (1699509.677 μm^2), we found that they occupied the 36.24%. Moreover, the 29.73% of these ducts were granular while the 6.51% were striated, indicating that the granular ducts were 2.77 times more numerous than the striated ones.

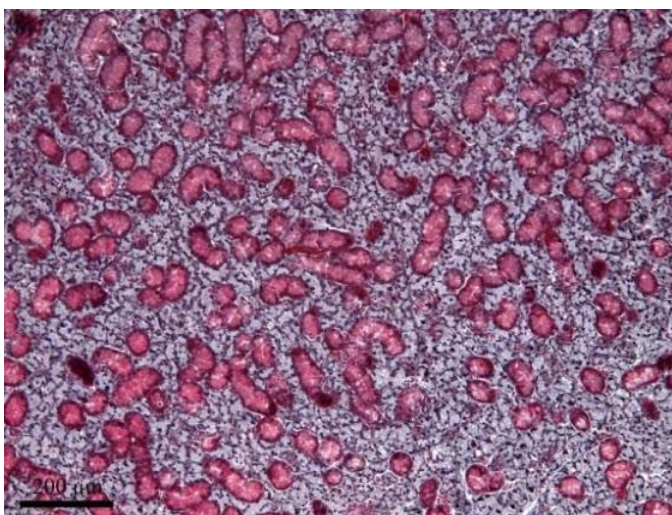


Fig. 1. Wistar rat mandibular gland (H-E)

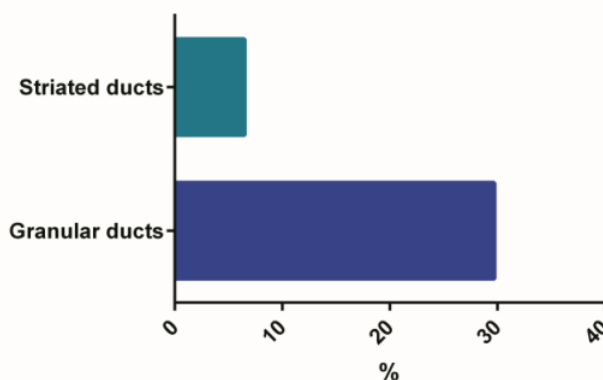


Fig. 2. Percentage of striated and granular ducts in Wistar rat mandibular gland

Mandibular gland in 4 weeks of life rats consists mainly of acini (45%), intercalated ducts (20%) and striated ducts (16%). Only few granular cells are found in striated ducts,

close to the intercalated ones. This number doubles until the rat reaches 8 weeks of life. Morphologically, the granules in granular ducts cells grow both in size and number. These cells contain a various number of round-shaped granules, located in the apical half of the cell. Granular ducts cells grow considerably at 8 weeks of life (68×10^6) as compared to the number of cells in 4 weeks of life (3×10^6). At 12 weeks of life, granular ducts are $25.5 \pm 2.3\%$ and striate ones are $7.9 \pm 2.9\%$ (Srinivasan and Chang, 1975; Ruberte et al., 2017).

CONCLUSION

Our study highlights that in mandibular gland in Wistar rat, the area occupied by the granular ducts is significantly larger than the one occupied by the striated ones. This aspect demonstrates the particular importance of the secretion of granular ducts cells in rat.

REFERENCES

1. Jayasinghe N.R., G.H. Cope, S. Jacob, 1990, Morphometric studies on the development and sexual dimorphism of the submandibular gland of the mouse. *J Anat* 172:115-127
2. Pritam S.S., J.A. Popp, J.F. Hardisty, C. Gopinath, 2013, Toxicologic pathology: Nonclinical safety assessment. CRC Press, chapter. 9, 258-304
3. Ruberte J., A. Carretero, M. Navarro, 2017, Morphological mouse phenotyping: Anatomy, Histology and Imaging. Elsevier, chapter 5, 89-91
4. Srinivasan R., W.W.L. Chang, 1975, The development of the granular convoluted duct in the rat submandibular gland. *Anat Rec* 182:2940
5. Turner R.J., S. Hiroshi, 2002, Understanding salivary fluid and protein secretion. *Oral Diseases* 8:3-11