

INDIRECT ASSESSMENT OF CELLULAR SECRETORY ACTIVITY FROM INTRALOBULAR DUCTS IN RAT MANDIBULAR GLAND

Ruxanda Flavia, A. F. Gal, L. Bogdan, Bianca Matosz*, V. E. Luca, V. Miclăuş

Faculty of Veterinary Medicine, University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, 3-5 Mănăştur St., 400372, Romania. *Corresponding author, e-mail:

bianca.matos@usamvcluj.ro

Abstract. The mandibular gland in rat contains secretory intralobular ducts, but the intensity of their secretory activity is different. Unlike other species, adult rats contain a third type of mandibular ducts, called granular ducts, due to their aspect in light microscopy. Studies disagree on the secretory activity of these ducts in various species, stating that it is sometimes more intense than the acinar one or absent. Thus, we considered as opportune to indirectly evaluate the secretory activity of the cells lining the intralobular ducts by assessing the cellular load with Golgi complexes. We harvested the mandibular glands from 5 male albino Wistar rats and processed them to highlight the Golgi apparatus. Our results show that cells lining the granular ducts have a more significant secretory activity, but neither the secretory activity of the cells from striated ducts is negligible, both types of ducts participating in the enrichment of saliva with different substances.

Keywords: Golgi, granular, mandibular, rat, striated.

INTRODUCTION

Apart from acini, the mandibular gland comprises another secretory compartment: the ducts (Coire *et al.*, 2003). Rodents present three types of ducts associated with the mandibular gland: intralobular, excretory and main excretory duct. Intralobular ducts are represented by: intercalated, granular and striated ducts (Tandler *et al.*, 2001). Some authors affirm that the granular ducts arise from the striated ones, with the differentiation of the cells lining the striated ducts (Coire *et al.*, 2003). The differences between the two types of ducts are obvious in adult rats. It seems that the striated ducts do not show signs of secretory activity in all animal species (Tandler *et al.*, 2001).

Other authors state that granular ducts are far better represented than striated ducts and even acini in albino Wistar rat's mandibular gland, demonstrating the particular importance of the cells lining them and might have a more representative role in saliva formation in this species (Matosz *et al.*, 2017).

In an earlier study, we highlighted the importance of striated and granular ducts in albino laboratory mice and albino Wistar rats, reflected by the large numbers and significant surface occupied by these types of ducts, but the study did not concentrate on the secretion activity (Ruxanda *et al.*, 2017a). On the other hand, we did notice different types of secretory mechanisms, including holocrine, which suggests that the granular ducts do have a secretory activity in rats (Ruxanda *et al.*, 2017b; Ruxanda *et al.*, 2017c).

The aim of our study was the indirect evaluation of the secretory activity of the cells lining the striated and granular ducts from rat mandibular gland, by assessing the cellular load with Golgi complexes.

MATERIAL AND METHODS

The study was approved by the Bioethics Committee of University of Agricultural Sciences and Veterinary Medicine in Cluj-Napoca and unreeled following all regulatory controls. The biological material was represented by 5 male albino Wistar rats, sacrificed by prolonged exposure to inhaled anesthetics. We harvested the mandibular glands and processed them in order to highlight Golgi complexes. The samples were fixed with Elftman solution (distilled water, 37% concentrated neutral buffered formalin and silver nitrate) and subsequently reduced in hydroquinone solution. Then, the samples were immersed in 10% buffered formalin and further processed for histological examination.

The slides were examined under an Olympus BX41 light microscope and the images were obtained with an Olympus E-330 camera. The images were further processed with Adobe Photoshop CS2 software.

RESULTS AND DISCUSSION

The cells in granular ducts which do not have abundant granulations in their cytoplasm present Golgi complexes in larger numbers (Fig. 1), while Golgi complexes are encountered in smaller quantity and most of the times in the basal pole of the cells rich in secretory products (Fig. 2).

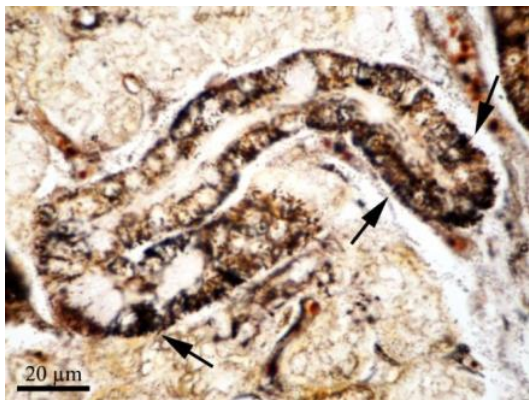


Figure 1. Granular duct – Cells filled with Golgi complexes

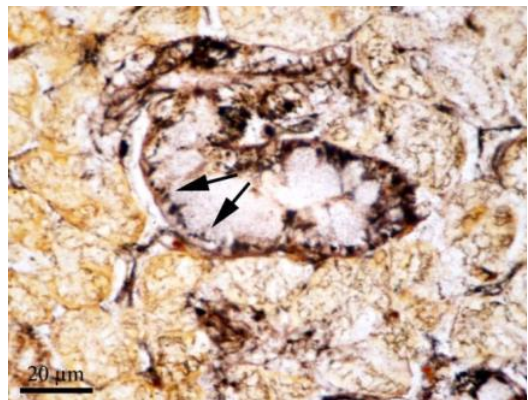


Figure 2. Granular duct – Golgi complexes in the basal pole of the cells

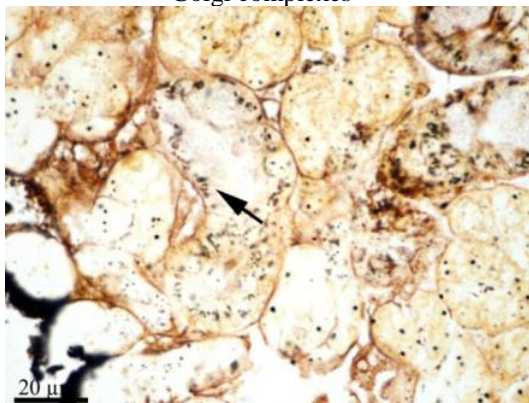


Figure 3. Granular duct – Cells with a reduced quantity of Golgi complexes

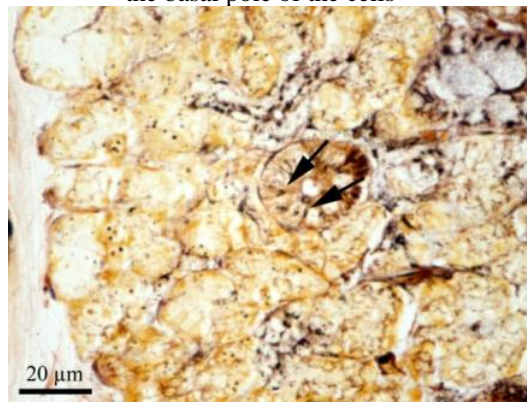


Figure 4. Striated duct – Cells with supranuclear Golgi complexes

There are granular ducts lined by cells which contain Golgi complexes in very small quantity (Fig. 3). Golgi complexes are also found in the cells from striated ducts, but in smaller quantity in comparison to the cells lining the granular ducts. These organelles are situated in the supranuclear area or laterally to the nucleus (Fig. 4).

Cells lining the ducts in mandibular gland in rat secrete a series of substances (e.g. bioactive polypeptides, hormones, growth factors), which subsequently end up in saliva in an exocrine fashion (Amano *et al.*, 2012). Thus, it is expected for them to contain Golgi complexes in large quantities.

Both type of ducts studied by us (granular and striated) present Golgi complexes in the cells lining them, but in different quantities. Golgi complexes were best represented in the cells from granular ducts, but the cellular load with these organelles can depend on the quantity of secretory product present intracellularly.

Tandler *et al.* (2001) write that Golgi complexes from the cells in striated and granular ducts can be noticed in the supranuclear area, but sometimes laterally to the nucleus, aspects also noticed by us in the present study. Another researcher affirms that Golgi complexes had a perinuclear location in the cells lining the granular ducts in rat mandibular gland (Gresik, 1994).

The literature mentions the fact that the secretory activity of the striated ducts can differ interspecifically in bats, some presenting striated ducts with a more intense secretory activity, while others do not present signs of secretion for this type of ducts (Tandler *et al.*, 2001).

CONCLUSIONS

The cells lining both types of intralobular ducts present Golgi complexes in their cytoplasm, but their number is significantly higher in the cells from granular ducts when compared to the striated ones. This aspect suggests a highly more significant secretory activity in the cells from granular ducts in comparison to the striated ones.

REFERENCES

1. Amano O., K. Mizobe, Y. Bando, K. Sakiyama, 2012, Anatomy and Histology of Rodent and Human Major Salivary Glands, *Acta Histochem Cytochem.* 45(5): 241–250.
2. Coire F. A. S., A. L. Odahara Umemura, T. M. Cestari, R. Taga, 2003, Increase in the cell volume of the rat submandibular gland during postnatal development, *Braz J morphol Sci*, 20(1):37-42.
3. Gresik E.W., 1994, The granular convoluted tubule (GCT) cell of rodent submandibular glands. *Microsc. Res. Tech.* 27, 1-24.
4. Matosz Bianca, Flavia Ruxanda, A. F. Gal, V. E. Luca, V. Miclăuș, 2017, Morphometric study of intralobular ducts in Wistar rat mandibular gland, *Agriculture – Science and Practice*, no. 3-4:103-104.
5. Ruxanda Flavia, A.F. Gal, Bianca Matosz, V.E. Luca, V. Miclăuș, 2017a, Comparative stereological study of the striated and granular ducts in mouse and rat mandibular glands, *Agriculture – Science and Practice*, no. 3-4:103-104.
6. Ruxanda Flavia, C. Rațiu, Bianca Boșca, Bianca Matosz, V. Miclăuș, 2017b, Holocrine secretory mechanism in granular ducts in Brown Norway rat. *Histological study*, *Lucrări Științifice*, vol 60, *Medicină Veterinară*, partea 1, 129-133.

7. Ruxanda Flavia, Gabriela Muțiu, A. Gal, Bianca Matosz, C. Rațiu, V. E. Luca, V. Miclăuș, 2017c, Secretory mechanisms in granular ducts in rat mandibular gland, *Annals of R.S.C.B.*, vol. XXI(3):7-12.
8. Tandler B., E. W. Gresik ,T. Nagato, C. J. Phillips, 2001, Secretion by striated ducts of mammalian major salivary glands: review from an ultrastructural, functional, and evolutionary perspective. *Anat. Rec.* 264; 121–145.