

## MORPHOLOGICAL ANALYSIS OF MINOR SALIVARY GLANDS OF PIG: GROSS ANATOMICAL STUDIES

PRATEEK RAO and AMANDEEP SINGH\*

Department of Veterinary Anatomy, College of Veterinary Sciences,  
Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar-125 004, Haryana, India

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### ABSTRACT

The present study was aimed at elucidating the topographic anatomy of minor salivary glands viz., buccal, labial, lingual and palatine of ten healthy adult pigs of local mixed breed of either sex. The heads were procured from local slaughter house immediately after decapitation and then fixed in 10 per cent formalin solution to study the gross anatomical localization and distribution of glands. The buccal glands were found in the cheek region and were arranged in two rows as dorsal and ventral groups. The light yellowish coloured dorsal buccal gland was located along the maxillary-alveolar border and extended up to the angle of the mouth. It was covered laterally by buccinator, masseter and zygomatic muscles, fascia and skin of that region while medially, the gland was blended with the buccal mucosa. The ventral buccal gland was located on the lateral aspect of horizontal ramus of mandible, dorsal to ventral buccal nerve and ventral to buccinator nerve and inferior labial vein and covered superficially by inferior part of buccinator and depressor mandibularis muscles. The labial glands were distributed in the superior, inferior and commissural portions of the lips and were placed under the skin rostral to the insertion of the zygomaticus muscle embedded in the orbicularis oris muscle. These glands extended between the superior labial artery and inferior labial vein along the angle of mouth. The lingual glands were situated in the root of tongue, dorsal surface of body of tongue and vicinity of the circumvallate papillae. The tissues for the palatine glands were collected from the ridged portion of the hard palate and also from the oropharyngeal region of soft palate.

**Keywords:** Buccal glands, Labial glands, Lingual glands, Palatine glands, Pig

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Saliva is the first biological medium to confront external materials that are taken into the body as food. Thus, it serves as the first line of oral defence (Elewa *et al.*, 2010). These secretions have an important role in moistening the food stuffs, lubricating the upper digestive tube and protecting the lining cells of the mucosa against the injury. It also controls the bacterial flora by secreting lysozymes (Featherstone, 2000) and contains lactoperoxidase and Immunoglobulin- A which serve as a salivary antimicrobial system (Cunningham, 2002). Saliva, which is so important, is secreted from major and minor salivary glands. The smaller of these glands situated within the oral mucous membrane and were grouped as minor salivary glands. These are named according to their location, as lingual, labial, buccal and palatine glands located in the tongue, lips, cheek and palate, respectively (Arthur *et al.*, 1999). This wide distribution of the minor salivary glands is advantageous for the protection of the oral cavity against pathogens (Sannes *et al.*, 2002). The saliva was conveyed to the oral cavity through the excretory ducts. The literature revealed that most of the research work was confined to major salivary glands however, there is no detailed information available on minor salivary glands, and pig in particular. Hence, the goal of the present study was to describe the detailed topographic anatomy of minor salivary glands of pig.

### MATERIAL AND METHODS

The present study was undertaken on ten healthy adult pigs of local mixed breed of either sex. The heads were procured from local slaughter house immediately after decapitation and then fixed in ten per cent formalin solution. After four to five days of fixation, the dissection was performed with the aim to study the gross anatomical localization and distribution of buccal, labial, lingual and palatine glands of pig.

### RESULTS AND DISCUSSION

**Buccal glands:** The buccal glands in pig were observed in the cheek region and they were arranged in two rows viz., dorsal and ventral groups. The dorsal buccal gland was light yellowish in colour and located along the alveolar border of maxilla and was extended up to the angle of the mouth (Fig. 1). Laterally, it was covered by buccinator, masseter, zygomatic muscles, and fascia and skin of that region while medially, the gland was blended with the buccal mucosa. It had a rostral part and a caudal part. The rostral part was located in front of transverse facial artery, vein and dorsal buccal nerve. The glandular tissue was in the form of oval lobes of half an inch in diameter and each lobe had its own duct. The ventral buccal gland was a distinct yellow coloured compact mass and was located on the lateral aspect of horizontal ramus of mandible, between ventral buccal nerve (dorsally) and buccinator nerve

\*Corresponding author: dramandeep287@gmail.com

(ventrally) and the inferior labial vein (Fig. 1). It was covered superficially by inferior part of buccinator and depressor mandibularis muscles. The ducts of the buccal glands opened between the non-papillary parts of the buccal wall. These findings were in agreement with the observations of Narasimhan *et al.* (2000) in goat. However, it was in contrary to the findings of Habel (2002) that described the buccal glands in cattle were arranged as dorsal and ventral groups with a few scattered lobes forming an intermediate layer. The dorsal row extended on the maxilla, major part under the cover of the masseter muscle and few lobules under buccinator muscle up to the angle of the mouth. The ventral groups were brown in colour and present on the mandible under the depressor mandibular muscle. Intermediate group placed under the buccinator and extended backwards from the angle of the mouth. On the other hand, Bradley (2004) noticed that in the dog that the buccal glands were arranged in two rows.

The buccal glands were present as a series of glandular structures which were divided into dorsal and ventral groups in sheep. The former was situated at the maxillary alveolar border along the buccinator and was covered superficially by the cutaneous fascia and zygomatic muscle. It was arranged as thin rostral part across which transverse facial artery, vein and dorsal buccal nerve pass and a thick caudal part with compact lobulated tissue in the angle b/w the maxillary tuberosity and buccinator vein under the cover of masseter muscle. The ventral buccal gland located on the mandible under the cover of the depressor mandibular muscle was elongated and thin. The ducts of the dorsal and ventral buccal glands opened between the papillae within the vestibule of the mouth (May, 2004). However, Ayyangar and Alur (2007) reported that the buccal glands in ox were arranged in three rows. Dorsal row consisted of yellowish lobules which extended from the angle of the mouth between zygomaticus and the buccinator to the maxillary tuberosity. The middle row consisted of scattered yellowish lobules and was placed mostly on the deep face of the buccinator. The ventral row occurred as brownish lobules arranged from the angle of the mouth to a short distance under the masseter. These findings were in fully agreement with those of Saxena and Gupta (2007) which reported that the buccal glands of goat were arranged in dorsal, middle and ventral rows. The zygomatic gland in dog represented the posterior condensation of unilobulated dorsal buccal glands of other mammals (Miller, 2009). However, Getty (2012) observed that the buccal glands of horse were arranged in two rows, the superior row was placed on the outer surface of the buccinator, while the inferior ones in the submucous tissue at the lower border of the buccinator. The buccal glands of

sheep were arranged in three rows i.e., dorsal, middle and ventral as reported by Singh *et al.*, 2011.

**Labial glands:** The labial glands of pig were distributed in the superior, inferior and commissural portions of the lips. The commissural labial glands were found distributed around the commissure of the lips on either side (Fig. 1). The labial glands were placed under the skin rostral to the insertion of the zygomaticus muscle embedded in the orbicularis oris muscle. These glands extended between the superior labial artery and inferior labial vein along the angle of mouth. Similarly, Ayyangar and Alur (2007) described the presence of labial glands in ox between the mucous membrane and the muscles of the lip. Their ducts opened in the mucous membrane. The superior labial glands of sheep were distributed in two zones *viz.* external and rostral (nasolabial) zones. The labial gland of external zone continued rostrally from the commissural labial glands distributed under the skin and orbicularis oris muscle over the mucosa. The rostral zone of superior labial gland was comprised of globular aggregations of the glandular lobes, which were wider at the philtrum but narrower towards the commissure. The inferior labial glands were the continuation of the commissural labial glands into the inferior labium between the mucosa and orbicularis oris muscle internally and the skin externally. Bevelander (2000) found small serous and mucous glandular structures in the lips of humans and their secretions passed through short ducts into vestibule. The labial glands of goat were grouped as commissural, superior and inferior glands as reported by Saxena and Gupta (2007). In sheep, the labial glands were present as commissural, dorsal and ventral labial glands (Singh *et al.*, 2014) which are in accordance with the present findings.

**Lingual glands:** The lingual glands of pig were observed in the root of tongue, dorsal surface of body of tongue and vicinity of the circumvallate papillae. However, the glands were absent in the tip region. These findings were in fully agreement with the findings of Bourne (1993) in goat, which reported the presence of lingual glands in the deeper portion of the corium of the tongue and among its muscle bundles. Their ducts opened on its epithelial surface between papillae. These glands were not abundant at the base of the organ and found along its margin extending up to the tip. Ebner's glands were present below the circumvallate papillae. The presence of lingual glands were reported histologically by Prakash and Rao (2000) in Indian buffalo, Kadhim *et al.* (2014) in the black francolin, Javad *et al.* (2016) in the Persian squirrel and Kuru *et al.* (2017) in mole rat (*Spalax leucodon*).

**Palatine glands:** The tissues for the study of palatine

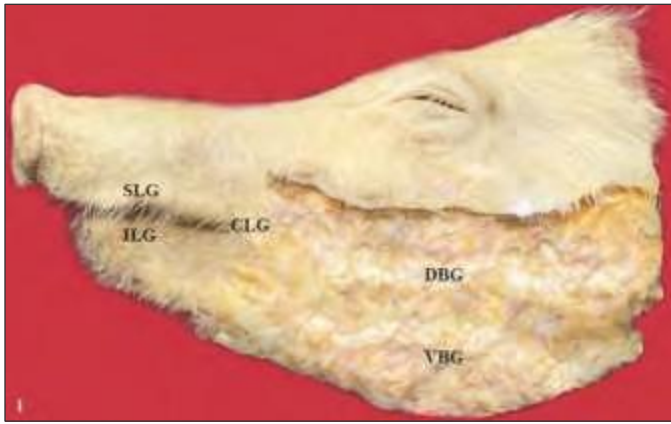


Fig. 1. Photograph of dissected head of pig showing the distribution of buccal and labial glands. (DBG: Dorsal buccal glands; VBG: Ventral buccal glands; SLG: Superior labial glands; ILG: Inferior labial glands; CLG: Commissural labial glands)

glands were collected from the hard palate (rostral, middle and caudal portions) and also from oropharyngeal region of the soft palate (Fig. 3). Similar findings were reported by Eurell and Frappier (2006) which showed the presence of branched tubuloacinar mucous glands in the caudal part of the hard palate in domestic animals except in the pigs. The palatine glands were earlier reported by Abbas *et al.* (2020) histologically, which showed that the mucous glands were embedded in the submucosal layer of the soft palate in cat. However, Nabipour (2011) stated that the palatine glands of camel were located in the caudal part of the hard palate and in the entire length of the soft palate and the palatine gland was most numerous at the apex of the soft palate. On the other hand, Mohamed (2020) reported that the sero-mucoid glands were present in the rostral and caudal parts of the hard palate, as well as in the soft palate of domestic animals.

### CONCLUSION

It was concluded that the buccal glands in pigs were found in the cheek region and were arranged in two rows as dorsal and ventral groups. The dorsal buccal gland was situated along the maxillary-alveolar border and extended up to the angle of the mouth and was covered laterally by buccinator, masseter, zygomatic muscles, and fascia and skin of that region while medially, the gland was blended with the buccal mucosa whereas, the ventral buccal gland was located on the lateral aspect of horizontal ramus of mandible, between ventral buccal nerve (dorsally) and buccinator nerve (ventrally) and inferior labial vein. The labial glands were distributed in the superior, inferior and commissural portions of the lips and were placed under the skin rostral to the insertion of the zygomaticus muscle. The lingual glands were placed at the root of tongue, dorsal surface of body of tongue and vicinity of the circumvallate papillae. The palatine glands were absent in ridged portion



Fig. 2. Photograph of oral cavity of pig showing the distribution of lingual glands. (R: Root of tongue; Arrow: Circumvallate papillae; \*: Different regions of body of tongue)



Fig. 3. Photograph of oral cavity of pig showing the distribution of palatine glands. (S: Soft palate; \*: Different regions of hard palate)

of hard palate and present at the oropharyngeal region of the soft palate.

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