

# Macroscopic and Light Microscopic Structure of Lingual Papillae on the Tongue of a Young Lion (*Panthera Leo*)

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## ABSTRACT

The lingual papillae on dorsal lingual surface of a young lion (*Panthera leo*) of two months of age were examined by macroscopic and light microscopic observations. The dimensions of the tongue of the young lion were about 9 cm in length and 3.5 cm in width. Three types of papillae, filiform, fungiform and vallate were observed. The filiform papillae were distributed over the entire dorsal surface of the tongue. The fungiform papillae were distributed among filiform papillae, and were smaller and more abundant in the apex of the tongue compared to on the lateral right and left sides. A few taste buds were found in the epithelium of the dorsal parts of the fungiform papillae. The vallate papillae were located on both sides on the posterior end of the lingual body. There were five vallate papillae in total. Taste buds of the vallate papillae were observed in the inner trench walls of the papillae. Von Ebner glands orifices opened at the bottom of the furrow of the vallate papillae.

**Keywords:** Lion, lingual papillae, taste bud, light microscopy

## INTRODUCTION

Much work has been published on the histological structure of the lingual surfaces of various animals. In the order *carnivora*, there are many scanning electron microscopic (SEM) studies of tongue of the cat (1), panther, black Asian bear (2), lion (3), tiger (4), raccoon dog, fox (5), Japanese marten (6), dog (7), silver fox (8) and ferret (9). Such studies revealed that there were some variations in morphology and distribution of papillae on the dorsal lingual surface among animal species. Besides, there have been several light and scanning electron microscopic (SEM) studies on the structure of lingual papillae in California sea lion (10), spotted seal (11) and Japanese badger (12) belonging to the order *carnivora*. However, there have been no light microscopic studies on the tongue of a young lion.

The purpose of this study is to examine the distribution pattern and form of the lingual papillae on the dorsal lingual surface of a young lion, macroscopically and light microscopically, in order to compare the results with those of previous reports carried out on other *carnivora*.

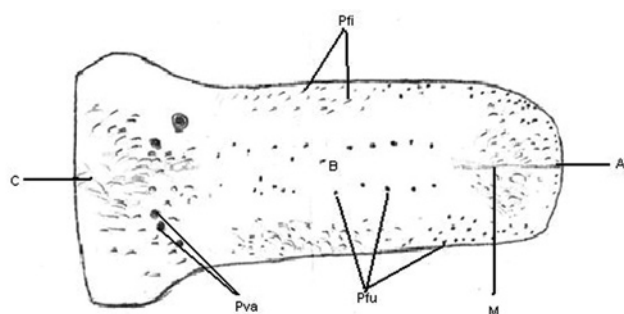
## MATERIALS AND METHODS

A tongue sample from one male lion (*Panthera leo*) of two months of age of the family *Felidae* was used in this study. The material was the tongue of an animal, which had died due to natural causes in the Zoo in Ankara city (Turkey). After macroscopic examination, the tongue was fixed in 10% formalin. Tongue sections were dehydrated with a graded series of alcohol. Following dehydration, specimens were embedded with paraffin and sliced into 5-7 $\mu$  thick sections. The sections were

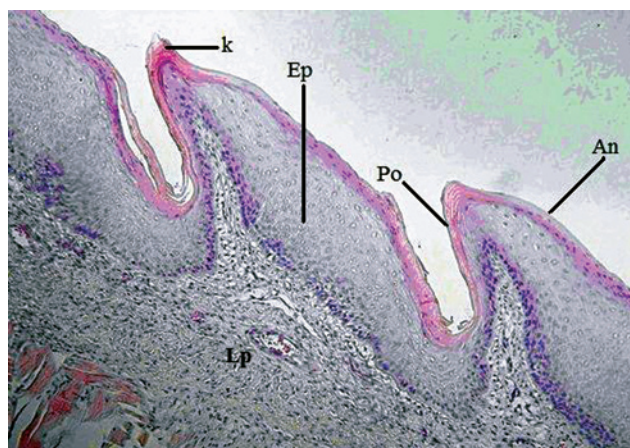
stained with hematoxylin-eosin (H&E). These slides were examined by a light microscope (Nikon Eclipse 80i, Japan).

## RESULTS

The macroscopic examination of the tongue of the young lion revealed that it was about 9 cm in length, 3.5 cm in width and the apex was rounded. The median sulcus was in the anterior part of the tongue. Three types of papillae were seen in the dorsal surface of the tongue. Firstly, the filiform papillae were distributed over the entire dorsal surface. These filiform papillae were inclined towards the posterior direction. The filiform papillae were also founded on the dorso-lateral aspect of the ventral surface of the lingual apex. Secondly, the fungiform papillae were distributed among the filiform papillae on the dorsal surface of tongue. These papillae were



**Figure 1:** Diagram of the tongue. A. Anterior part, B: Middle part, C: Posterior part and root, Pva: Vallate papillae, Pfu: Fungiform papillae, Pfi: Filiform Papillae, M: Median sulcus.



**Figure 2:** Light micrograph of the filiform papillae in a young lion. Ep: Epithelium, Lp: lamina propria, An: Anterior part of the filiform papillae, Po: Posterior part of the filiform papillae, k: keratinization. H&E. X 50.

more densely distributed on the peripheral region of the lingual apex. The fungiform papillae which were distributed on the marginal part of the tongue were somewhat smaller than those on the central part of the tongue. Lastly, in the posterior part of the tongue, there were five vallate papillae. Each papilla was surrounded by a groove (Fig. 1).

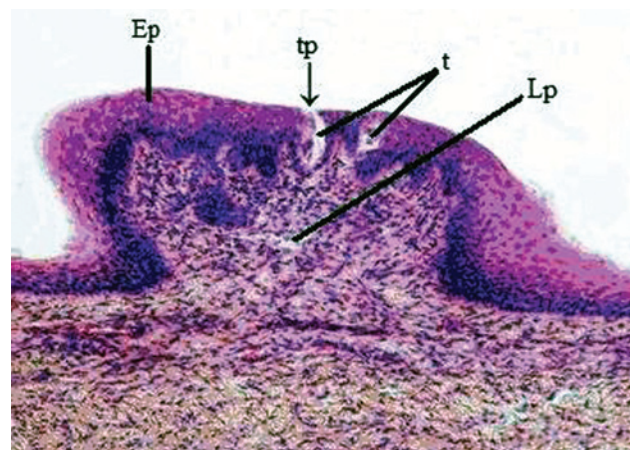
In the light microscopic examination it was seen that filiform papillae were covered with stratified squamous epithelium and had a core of connective tissue. A weak keratinization was observed in the anterior surface and posterior surface of the filiform papillae (Fig. 2).

The fungiform papillae were covered with stratified squamous epithelium and a few taste buds (*Calculus gustatorius*) were located at the top of the epithelium. These taste buds communicated with the oral cavity via taste pores (*Porus gustatorius*) (Fig. 3).

Two different cell types of fungiform taste buds were distinguished, light-stained cells (*Epitheliocytyus sensorius gustatorius*) and dark-stained cells (*Epitheliocytyus sustentans*) (Fig. 4).

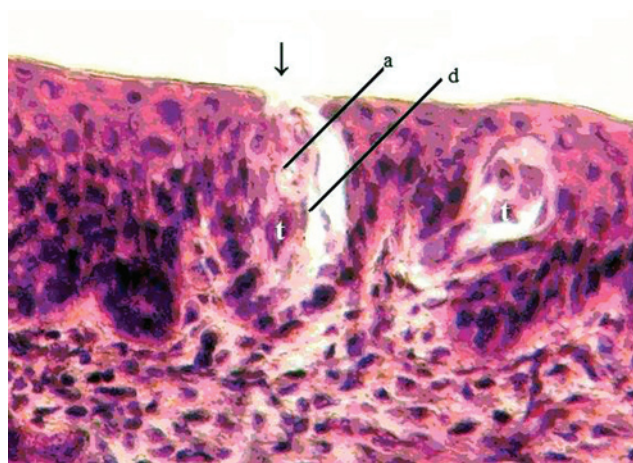
Five vallate papillae were observed in order on the dorsal surface of the lingual mucosa of the lion. Von Ebner glands were seen in the lamina propria and their orificies opened into a furrow. Taste buds of the vallate papillae were observed in the inner trench wall of the papillae. Taste buds were not seen in the outer trench wall and on the top of the vallate papillae (Fig. 5).

Mature taste buds opened to papilla furrows via taste pores. The cells forming vallate taste buds like those of fungiform taste buds were divided into two types: light-stained



**Figure 3:** Light micrograph of the fungiform papilla. Ep: Epithelium, Lp: Lamina propria, t: Taste buds, tp: Taste pore. H&E. X 50.





**Figure 4:** Light micrograph of taste buds in the fungiform papillae. t: Taste buds, arrow: Taste pore, a: light-stained cell, d: dark-stained cell. H&E. X 200.

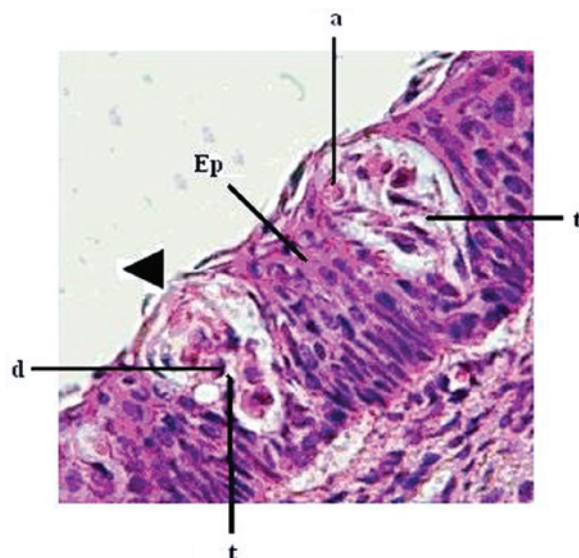


**Figure 5:** Light micrograph of the vallate papilla. Ep: Epithelium, t: Taste buds, H: sulcus of the vallate papillate. H&E. X 50.

cells (*Epitheliocytus sensorius gustatorius*) and dark-stained cells (*Epitheliocytus sustentans*) (Fig. 6).

## DISCUSSION

Emura *et al.* (2, 3, 4, 5, 6) have shown that filiform papillae were distributed on the entire dorsal surface of the tongue in the order *carnivora*. Emura *et al.* (4) reported that filiform papillae were found also on the ventro-lateral of the tongue in the tiger. In this study, filiform papillae were observed to have a similar distribution on the tongue of a young lion of two months of age. Yoshimura *et al.* (12) stated that there was a weak keratinization on the filiform papillae in the Japanese badger. Yoshimura



**Figure 6:** Light Micrograph of taste buds in the vallate papilla. Ep: Epithelium, t: Taste buds, (arrow head): Taste pore, a: light-stained cell, d: dark-stained cell. H&E. X 200.

*et al.* (10) reported that parakeratinization was seen on the filiform papillae but no lingual glands were in the *lamina propria* of the filiform papillae. In our study, a weak keratinization was observed on the filiform papillae.

In the present study, there were fungiform papillae scattered among the filiform papillae, especially at the tip and both lateral edges of the tongue in the young lion. Similar results have been reported on the dorsal lingual surface of the other *carnivora* (2, 3, 4, 5, 6, 13). In the cat, the fungiform papillae that were smaller than those on the postero-lateral sides of the lingual body were present on the tip of lingual apex (13). Our results appear to be consistent with those of Robinson and Winkles (13).

Yoshimura *et al.* (10, 12) reported that a few taste buds were found on the epithelium of fungiform papillae in the California sea lion and Japanese badger. Yoshimura *et al.* (12) observed a weak keratinization on the epithelium of fungiform papillae in the Japanese badger. In the present study, no keratinization were seen on the epithelium of fungiform papillae but a few taste buds were observed in the epithelium of fungiform papillae. Tabata *et al.* (14) reported that two types of taste cells were found in the taste buds of fungiform papillae. The findings of the present study were similar to those of Tabata *et al.* (14).

In most of mammals, it is reported that vallate papillae are located between the body and radix of both sides of the tongue (3-5). Several studies indicated that the vallate papilla were surrounded by a groove (5, 6) and had secondary papillae (15). The structure of vallate papillae in the lion is similar to

that of the tiger, Raccoon dog and fox by Emura *et al.* (4, 5) but secondary papillae were not seen in our study.

There are several studies on the number of the vallate papillae in mammals. On the tongue of American beaver, Shindo *et al.* (16) observed three vallate papillae. There were four vallate papillae in the tiger (4) and Japanese marten (6). There were five in the California sea lion (10), six in the small Indian civet cat (17) and seven in the Japanese badger (12). Five to eight vallate papillae were found in the adult lion (3). There were ten in the panther and seven or eight in the Asian black bear (2). In the present study, five vallate papillae were found in the lion. This result is similar to the findings of Emura *et al.* (3).

Yoshimura *et al.* (10) reported that taste buds were observed in the surface epithelium and in the trench wall epithelium of the vallate papillae, and lingual glands were found only in the *lamina propria* of lingual radix and its orifices opened at the bottom of the furrow groove of the vallate papillae in the California sea lion. In the Japanese badger (12) and American beaver (16), taste buds were found in the epithelium of trench of vallate papillae and von Ebner glands orifices opened at the furrow groove of vallate papillae. In the present study, taste buds were observed only in the epithelium of the inner trench of the vallate papillae. Taste buds were not seen in the surface epithelium and the outer trench epithelium of the vallate papillae.

Kanazawa (18) reported that vallate taste buds had one or occasionally two taste pores and five types of cells in the dog. In this study, vallate taste buds that opened at furrow trench by a taste pore had two types of cells, light-staining and dark-staining cells.

## CONCLUSION

The anatomical and histological findings of this study do not appear to represent the typical structure of lingual papilla of the lions in general, possibly due to the fact that only one animal was examined and possibly due to the age of this animal which was still in its developing and growing period.

In conclusion, the present study reveals the localization, structure and distribution of lingual papillae in a young lion in macroscopic and light microscopic level. It is considered that the findings of present study will contribute to knowledge in the area of study.

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