The microscopic structure of the lingual papillae n the adult and newborn Egyptian Fruit Bat (*Rousettus aegyptiacus*)

Hanna Jackowiak[1], Joanna Trzcielińska[1], Szymon Godynicki[1], Paweł Botko[2]

[1]Department of Animals Anatomy, Agricultural University of Poznan; [2]Zoological Garden in Poznan

Abstract: The aim of study was to characterize the distribution of the lingual papillae in the fruit-eating Egyptian Fruit Bat and also to compare the structure of the lingual papillae in the first week after birth with adult specimens. The results show that the distribution of the fungiform papillae and giant filiform papillae on the anterior part of the tongue and vallate papillae on the root of the tongue is similar to the insectivorous Chiropterans. The characteristic features connected with diet of Egyptian Fruit Bat is the pattern of the filiform papillae on the posterior part of the body of the tongue. Our results showed that the development of mechanical papillae is continued after the birth of animals.

Key words: Tongue, gustatory papillae, mechanical papillae, Egyptian Fruit Bat

Introduction

The anatomy of the tongues and the lingual papillae in the Chiropterans were studied mainly in the insectivores species. In available literature the data about microscopical structure of the tongue and lingual papillae are scarce. The previous studies were conducted only in *Pipistrellus nathusii* and *Myotis nattereri* (Wilczyńska *et al.* 2005). Emura et al. (2001) reported on the structure of the tongue in the *Pteropus vampyrus.*)

In the lesser dog-faced fruit bat the structure of the tongue were characterized only in *Cynopterus brachyotis* (Emura *et al.* 2001).

In present study we aimed to characterize the distribution of the lingual papillae in the adult Egyptian Fruit Bat and also to compare the structure the lingual papillae in first week after birth with adult specimens.

Material and methods

Tongues of 4 adult Egyptian Fruit Bat of both sexes were used in the study and on 2 tongues of the newborn bats. The animals were donated by the Zoological Garden in Poznań (Poland).

For the observations under a light microscope (LM) samples of the tongue were fixed in 10% buffered formaldehyde at room temperature. Next the tissues were dehydrated in a series of ethanol with increasing concentrations (70-96%) and embedded in paraplast. The 4 mm thick histological slides were stained by the Masson – Goldner. Morphometric data were obtained using a Multiscan 6.08 computer morphometry system. The figures were documented under an Axioscope 2 plus light microscope (ZEISS).

For observations under a scanning electron microscope (SEM) the samples of fixed tongues were dehydrated in a series of ethanol (70%-99.8%) and acetone, and subsequently dried at critical point using CO_2 (Critical Point Dryer K850, EMITECH). All specimens were mounted on aluminum stubs covered with carbon tabs, sputtered with gold (Sputter Coater S 150B, EDWARDS) and observed under the SEM LEO 435 VP (ZEISS) at the accelerating voltage of 10-15 kV.

Results and discussion

The clongated flat tongue of adult Egyptian Fruit Bat is about 3.5 cm in length and ca. 1 cm in width, whereas in newborn animals the length is ca. 2,5 cm and width 0.8-0.9 cm (Figs 1, 2). On the dorsal surface of the lingual mucosa two types of mechanical papillae and two types of gustatory papillae were observed.

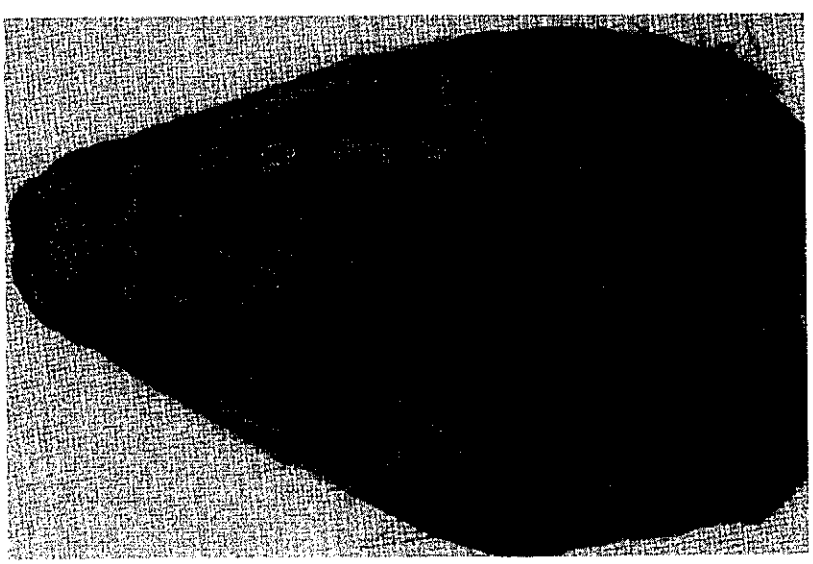

Fig. 1. Tongue in adult Egyptian Fruit Bat; gFi – giant filiform papillae, Fu – fungiform papillae, Vp – vallate papillae; arrows show a direction of processes of filiform papillae on the posterior part of the body of the tongue

The most numerous mechanical papillae on the apex and body of the tongue of Egyptian Fruit Bat are the filiform papillae (Figs.1). On the surface of the apex the and on the anterior part of the body of the tongue in the adult and newborn bats we distinguished small filiform papillae with a one bigger posterior process and several smaller anterior processes and giant filiform papillae with broad posterior process. This kinds of filiform papillae is common in bats and the giant papillae are also called as trifid filiform papillae (Emura *et al.* 2001, Emura 2001, Kobayashi 2001). Second types of mechanical papillae in the Fruit Egyptian Bat are the conical papillae distributed on the lateral margins of the root of the tongue. In the adult animals the filiform papillae, especially giant filiform papillae are well keratinized, this layer is about 27 mm., whereas in newborn bats the keratinization process in the epithelium already starts and on the surface is thin horny layer visible.

The characteristic features of the tongue in Egyptian Fruit bat is a distribution of filiform papillae with long thin processes in posterior part of the body of the tongue. The height of this papillae in adult is about 240 mm. The filiform papillae form a two opposite group, which processes are oriented to the middle line of the tongue. This phenomenon of variable distribution of filiform papillae on the body of the tongue was observed also in the small fruit eater marsupial feather tail glider (Jackowiak and Godynicki, unpublished data). In the newborn bats these papillae are shorter as in adult specimens ca. 180 mm, and their processes start to elongate.

The gustatory papillae in the Egyptian Fruit Bat are represented by numerous round fungiform papillae, ca. 230 mm in height, distributed on the apex and on the lateral margins of the anterior part of the lingual body and on the whole posterior part of the lingual body and three vallate papillae on the root of the tongue. Such distribution of gustatory papillae is typical for all bats (Emura 2001, Kobayashi 2001). In the

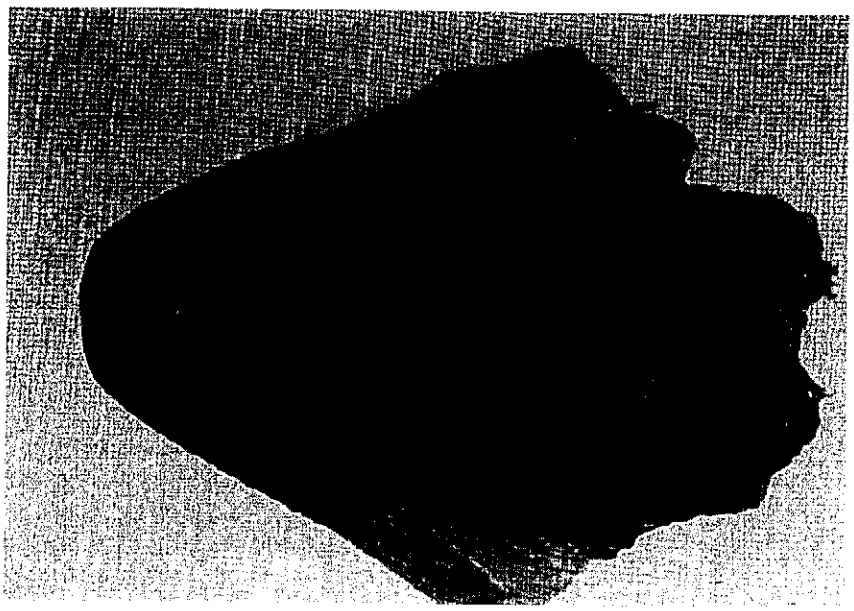

Fig. 2. Tongue in newborn Egyptian Fruit Bat; gFi – band of giant filiform papillae, Vp – vallate papillae

newborn Fruit bat the distribution and structure of the gustatory papillae resembles adult animals. The height gustatory fungiform papillae in newborn is 30 mm. The histological observations showed the differences in the size of these papillae and in height of mucosal epithelium such as in filiform papillae mucosal epithelium in adult is about 83 mm, in newborn is about 33 mm.

References

EMURA S., HAYAKAWA D., CHEN H., SHOUMURA S., ATOJI Y., AGUNGPRIYONO S. 2001. SEM study on the dorsal lingual surface of the lesser dog-faced fruit bat, *Cynopterus brachyotis*. Okajimas Folia Anat. Jpn., 78:123-8.

EMURA S., HAYAKAWA D., CHEN H., SHOUMURA S., ATOJI Y., WIJAYANTO H. 2001. SEM study on the dorsal lingual surface of the large flying fox , *Pteropus vampyrus*. Okajimas Folia Anat. Jpn., 79:113-9.

WILCZYŃSKA B., KOZŁOWSKA K., JAROSZEWSKA M., JACKOWIAK H., 2005.Morphology and anatomy of the tongue of two species of the bats: Nathusiu's pipistrelle (*Pipistrellus nathussi*) and Natterer's bat (*Myotis nattereri*). In: Zmiany w populacji ssaków jako pochodna dynamiki zmian środowiska, Wyd. Akademia Rolnicza w Krakowie, Rozdz. 25, 182-187.