Morphology of the lingual papillae in the jaguar

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Summary: We examined the dorsal lingual surfaces of an adult jaguar (Panthera onca) by scanning electron microscopy. The tongue of the jaguar was about 17 cm long, and the center of the lingual apex became hollow. There were 7 vallate papillae in total. The filiform papilla on the lingual apex consisted of a larger main papilla and some secondary papillae. The connective tissue core of the filiform papilla was mountain-like in shape. The connective tissue core of the fungiform papilla was mushroom-like in shape. The filiform papilla on the anterior part of the lingual body was large and cylinder-like in shape. The connective tissue core of the filiform papilla consisted of a big conical papilla and many rod-like papillae. The filiform papilla on the central part of the lingual body was a big conical papilla. The connective tissue core of the filiform papilla consisted of a rod process and bowl-like structure. The vallate papillae were located on both sides of the posterolateral aspects. The vallate papillae were flattened-oval in shape and the papillae were surrounded by a groove and pad. The top of the connective tissue core of the vallate papilla had a rough surface with no spines.

Introduction

Many studies have been published on the structures of the lingual surfaces in various animals. In the order Carnivora, there have been some SEM studies on the tongues of the cat (Boshell et al., 1982), dog (Iwasaki and Sakata, 1985), mongoose (Iwasaki et al., 1987), Japanese weasel (Furubayashi et al., 1989), sea otter (Shimoda et al., 1996), bush dog (Emura et al., 2000), panther and Asian black bear (Emura et al., 2001), lion (Emura et al., 2003) and tiger (Emura et al., 2004). Such studies have revealed variations in the morphology and distribution of papillae on the dorsal lingual surface among animal species. However, no scanning electron microscopic (SEM) study of the tongues of the jaguar has been carried out. The purpose of this study is, therefore, to examine three-dimensionally the dorsal lingual surface of the jaguar, in order to compare the results with those of previous reports in other mammals.

Materials and Methods

The tongue of one adult jaguar (Panthera onca) of the family Felidae was used in this study. The tongue was fixed in 10% formalin. Small blocks containing papillae were cut with a razor blade, post-fixed with 1% osmium tetroxide for 1 h. Thereafter, the specimens were dehydrated through a graded series of acetone and critical-point-dried. To show the three-dimensional connective tissue structure of the lamina propria of the mucosa, some of the samples were washed in distilled water after fixation and macerated in 3.5N HCl at 35°C for 3 days. After maceration, tissues were washed in the distilled water and post-fixed in 1% osmium tetroxide for 1 h, and dehydrated in a series of acetone and critical-point-dried. All specimens were sputtered with Pt-Pd before being examined under SEM (Hitachi S-3500N, Tokyo, Japan) at an accelerating voltage of 10 kV.

Results

Macroscopically, the tongue of the jaguar was about 17
cm long, and the center of the lingual apex became hollow (Fig. 1). Filiform papillae are distributed over the entire dorsal surface of the lingual body (Fig. 1). Fungiform papillae were round in shape and more densely distributed on the tip of the lingual apex. There were no foliate papillae. Vallate papillae were located on both sides of the posterior end of the lingual body, and there were 7 vallate papillae in total.

Under SEM, the filiform papilla on the lingual apex consisted of a larger main papilla and some secondary papillae (Fig. 2a). The connective tissue core of the filiform papilla was mountain-like in shape (Fig. 2b). The connective tissue core of the fungiform papilla was mushroom-like in shape (Fig. 2b). The filiform papilla on the anterior part of the lingual body was large and cylinder-like in shape (Fig. 2c). The connective tissue core of the filiform papilla consists of a big conical papilla and many rod-like papillae (Fig. 2d). The filiform papilla on the central part of the lingual body was a big conical papilla (Fig. 3a). The connective tissue core of the filiform papilla consisted of a rod process and bowl-like structure (Fig. 3b). The vallate papillae were located on both sides of the posterolateral aspects. The vallate papillae were flattened-oval in shape and the papillae were surrounded by a groove and pad (Fig. 3c). The top of the connective tissue core of the vallate papilla had a rough surface with no spines (Fig. 3d).

**Discussion**

Shimoda *et al.*, (1996) reported that the filiform papillae on the margin of the tongue of the newborn sea otter were divided into two shapes which were horny or club-shaped papillae, and the fungiform papillae were also divided into two shapes: hemispherical or club-shaped papillae. Emura *et al.*, (2001, 2003) reported that the large papillae were observed on the margins of the lingual apexes of the newborn panther, newborn Asian black bear and lion. In the cat (Boshell *et al.*, 1982), newborn panther (Emura *et al.*, 2001), lion (Emura *et al.*, 2003) and tiger (Emura *et al.*, 2004), a marked transition occurred between the tip and midportion of the dorsum of the tongue. The transition was characterized by an increase in size of the projection of the filiform papillae. In the midportion of the tongue, the projections were very prominent. This finding is fairly consistent with the observations of the tongue of the jaguar. Furthermore, the marked regional variation in size and morphology of the filiform papillae in the jaguar tongue contrasts with the description of a plant-eating animals.

Many studies have been published on the three-dimensional structure of the vallate papillae in the mammalian tongue. Several studies have indicated that the vallate papillae were a flattened and oval in shape and the papillae were surrounded by a groove and pad (Krause and Cutts 1982; Chamorro *et al.*, 1986; Qayyum *et al.*, 1988; Chun-habundit *et al.*, 1992; Agungpriyono *et al.*, 1995; Atoji *et al.*, 1998). The vallate papillae of the cat, dog and flying squirrel were encircled by the filiform papillae in the posterior body (Boshell *et al.*, 1982; Iwasaki and Sakata, 1985; Emura *et al.*, 1999). Equine vallate papillae were composed of a primary papilla that was divided into several secondary papillae by intermediate grooves (Chamorro *et al.*, 1986). Sometimes, in bovine vallate papillae twin papillae were surrounded only by a primary papillary
The vallate papillae of the jaguar were surrounded by a groove and crescent pad, and in the dorsal surfaces of the papillae small conical papillae were observed. In addition, some vallate papillae of the Asian black bear were composed of primary papillae that were divided into several secondary papillae by intermediate grooves (Emura et al., 2001). The structure of the vallate papillae in the jaguar was similar to that of the lion reported Emura et al., (2003).

The number of the vallate papillae has been reported in many vertebrates. On the tongue of the tiger, Emura et al., (2004) observed 4 vallate papillae. Five vallate papillae...
were observed in the bush dog (Emura et al., 2000). There were 10 in the panther and 7 or 8 in the Asian black bear (Emura et al., 2001). Five to 9 vallate papillae were observed in the lion (Emura et al., 2003). In this study, 7 vallate papillae were observed in the jaguar. Additional studies are required to clarify the relationship between the species and the number of vallate papillae.

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References


