Morphology of the lingual papillae in the roan antelope

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Summary: We examined the dorsal lingual surfaces of an adult roan antelope (Hippotragus equinus) by scanning electron microscopy. Filiform, fungiform and vallate papillae were observed. The filiform papillae consisted of a larger main papilla and smaller secondary papillae. A top of the connective tissue core of the filiform papilla showed several depressions. The connective tissue core of the papilla with a long process was rarely observed. The fungiform papillae were round in shape. The connective tissue core of the fungiform papilla was flower-bud shaped. The lenticular papillae of large size were limited on the torus lingua. The connective tissue core of the lenticular papilla consisted of numerous small spines. The vallate papillae were located on both sides of the posterolateral aspects. The vallate papillae were flattened oval shaped and the papillae are surrounded by circular trench. The connective tissue core of the vallate papilla was covered with numerous small spines.

Materials and Methods

The tongue of an adult roan antelope (Hippotragus equinus) of the family Bovidae 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 2 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-3000N, Tokyo, Japan) at an accelerating voltage of 10 kV.

Results

General observations

Macroscopically, the tongue of the roan antelope is about 30 cm long and the lingual body has lingual prominence on the posterior third (Fig. 1). Fungiform papillae are round in shape and more densely distributed as compared to those of the lingual body on the tip and ventral
surface of the lingual apex (Fig. 1). There is no foliate papilla.

*Scanning electron microscopy*

The filiform papillae consist of a larger main papilla and smaller secondary papillae (Fig. 2a). A top of the connective tissue core of the filiform papilla shows several depressions (Fig. 2b). The connective tissue core of the filiform papilla with a long process is rarely observed (Fig. 3a,b). The fungiform papillae are round in shape (Fig. 2a). The connective tissue core of the fungiform papilla is flower-bud shaped (Fig. 2b). The lenticular papillae of large size are limited on the torus lingua (Fig. 4a). The connective tissue core of the lenticular papilla consists of numerous small spines (Fig. 4b). The vallate papillae are located on both sides of the posterolateral aspects. The vallate papillae are flattened-oval shaped and the papillae are surrounded by a semicircular trench (Fig. 5a). The connective tissue core of the vallate papilla is covered with numerous small spines (Fig. 5b).

*Discussion*

Agungpriyono *et al.* (1995) reported that filiform papillae consist of a larger main papilla and smaller secondary papillae, and in the filiform papillae that the distribution of the secondary papillae in the lesser mouse deer, being present from the anterior part of the tongue to the end of the middle third and rare or absent in the posterior part, is relatively restricted. Atoji *et al.* (1998) observed filiform papillae and conical papillae, and reported that the filiform papillae have secondary papillae in the Formosan serow. Emura *et al.* (1999, 2000a) also observed similar filiform papillae in the blackbuck and Barbary sheep. The filiform papillae of the roan antelope in this study were morphologically similar to those of the blackbuck and Barbary sheep (Emura *et al.*, 1999, 2000a). A top of the connective tissue cores of the filiform papillae distributed in the roan antelope’s tongue shows several depressions. The connective tissue core of the filiform papilla with a long process is rarely observed. This finding is not reported in other mammal animals.

The fungiform papillae were more densely distributed on the tip and ventral surface of the lingual apex in Japanese serow, Formosan serow, blackbuck and Barbary sheep, and the papillae were smaller than that of the body (Funato *et al.*, 1985; Atoji *et al.*, 1998; Emura *et al.*, 1999, 2000a). These reports coincide with the findings on the roan antelope. The connective tissue core of the fungiform papilla on the roan antelope’s tongue was flower-bud shaped.

The vallate papillae surrounded by a groove was round or oval in shape (Funato *et al.*, 1985; Atoji *et al.*, 1998). It was reported that a pair of long-flat vallate papillae were observed in the lesser mouse deer tongue (Agungpriyono *et al.*, 1995). Equine vallate papillae were composed of a primary papilla which was divided into several secondary papillae by intermediate grooves (Chamorro *et al.*, 1986). In this study, the vallate papillae were flattened-oval shaped and the papillae were surrounded by a semicircular trench. The connective tissue of the round central papilla in the Japanese serow was covered with numerous small spines and numerous slender processes delivered from the lateral surface of the surrounding wall (Yamaguchi *et al.*,...
Fig. 2. Scanning electron micrographs of the lingual apex of the roan antelope. (a) A filiform papilla on the apical surface consists of a main papilla and secondary papillae (arrows). The fungiform papillae (Fu) are round in shape. (b) A top of the connective tissue core of the filiform papilla shows several depressions. The connective tissue core of the fungiform papilla (Fu) is flower-bud shaped.

Fig. 3. Scanning electron micrographs of the lingual apex of the roan antelope. (a,b) Note the connective tissue core of the filiform papilla with a long process (asterisks).
Fig. 4. Scanning electron micrographs of the lingual prominence of the roan antelope. (a) Note the lenticular papillae of large size. (b) The connective tissue core of the lenticular papilla consisted of numerous small spines.

Fig. 5. Scanning electron micrographs of the vallate papilla of the roan antelope. (a) The vallate papillae are flattened-oval shaped and the papillae are surrounded by a semicircular trench. (b) The connective tissue core of the vallate papilla is covered with numerous small spines. V = vallate papilla.
In this study, the connective tissue core of the valvate papilla was covered with numerous small spines.

In the order Perissodactyla, the filiform papillae on the lateral sides of the lingual apex and body of the black rhinoceros had a hair-like shape, and consist of main papillae and some smaller secondary papillae (Emura et al., 2000b). The fungiform papillae were scattered among the hair-like papillae (Emura et al., 2000b). On the lingual apex of the donkey, the filiform papillae were abundant with more or less slim cylindrical form with pointed endings (Abd-Elnaeim et al., 2002). On the caudal part of the body, the filiform papillae were thinner than those on the apex, very long, cylindrical and abundant (Abd-Elnaeim et al., 2002).

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References
