Differentiation and Development of Fungiform Papillae in Buffalo Tongue

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ABSTRACT

The study was conducted on tongues of 36 buffalo foetii. The fungiform papillae were observed as semicircular dome shaped eminences, formed as a result of epithelial thickening at 10.7 cm CVR length. Taste buds comprising of neuroepithelial, sustentacular and basal cells were detected on the apical surface of fungiform papillae present on the torus area at 45.0 cm CVR length (175 days). It was concluded from the study that the development of fungiform papillae and taste buds proceed caudo-cranially.

Key words: Buffalo, Development, Fungiform papillae, Taste buds

RESULTS AND DISCUSSION

Development of taste papillae occurs prenatally and in a very specific spatial and temporal pattern leading to the suggestion that an organ patterning process is at work during tongue development. During prenatal life, the reports are available on histogenesis and morphogenesis of tongue in goat (Parmar et al., 1999), crossbred pigs (Sarma et al., 2003) and in buffalo (Uppal et al., 2006) but morphogenesis and differentiation of fungiform papillae in buffalo foetus was lacking, so the present work was planned.

MATERIALS AND METHODS

The present study was conducted on tongue of 36 buffalo foetii collected from abattoir. Curved crown rump length (CVR length) of the foetus was measured and the age was estimated as per formula given by Soliman (1975) in buffalo. Depending upon the CVR length, the foetii were grouped into group-I (up to 20 cm), group-II (20 cm up to 40 cm) and group-III (40 cm onwards). The tissue samples were collected from apex, body and root of both the sides and fixed in neutral buffered formalin and Bouin's fixatives. The tissues were processed for paraffin blocks preparation by acetone benzene schedule and sections of 5-6 µ were stained with hematoxylin and eosin, Masson’s trichrome and Holme’s stain (Luna, 1968).

In group-I at 10.7 cm CVR length (77 days), the papillae were observed as semicircular dome shaped eminences, formed as a result of epithelial thickening at 10.7 cm CVR length (77 days) on the anterior, middle and posterior parts of dorsal surface of the tongue. Such type of primitive papillae has been reported in sheep at 50th day of gestation (Mistretta and Haus, 1996) and in cross bred pig by 86th days of gestation period (Sarma et al., 2003).

In group-II at 45.0 cm CVR length (175 days), the papillae were better developed. The typical feature observed in this group was presence of large number of keratohyaline granules over the developing dome shaped papillae. The epithelium of developing papillae was comprised of stratum basale, stratum spinosum, stratum granulosum and stratum corneum. The stratum corneum had pyknotic nuclei and

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condensed cytoplasm but it was not fully keratinized at this stage. Some of the papillae were dividing into two stem domes with the connecting epithelial portion. The core of the papillae was richly supplied by nerve fibres. Some of the fungiform papillae were fully developed at 45.0 cm CVR length (175 days) and they resembled the adult papillae with the formation of taste buds in the apical surface and these papillae were projecting over the surface and were dome shaped (Figs. 3, 4).

The mean height and diameter of dome shaped papillae were recorded as 46.11±3.92 μ and 23.23±1.67 μ in group-I and 81.25±4.79 μ and 54.09±7.31 μ in group-II, respectively. Scala et al. (2005) reported numerous circular depressions of the 80 - 100 μ in diameter on the dorsal surface of tongue. In group-III, the mean height and diameter of fungiform was 432.35±39.387 μ and 301.46±32.37 μ. The mean diameter of fungiform in cranial, middle and caudal parts of tongue in sheep has been reported to be 921.70±34.40 μ, 1253.00±38.60 μ and 1918.00±73.16 μ and in goat as 899.00±28.10 μ, 920.30±28.30 μ and 1425.00±58.60 μ, respectively (Biradar et al., 2002).

In the present study, the papillae placodes were formed in the group-I but no taste buds were observed. In group-II, large number of fibres were seen penetrating into the core of the papillae but till the end of 40.0 cm CVR length (164 days) the taste buds were not differentiated.

In group-III, the first indication of primitive taste bud appearance was detected on the apical surface of fungiform papillae present on the torus area at 45.0 cm CVR length (175 days). The appearance of taste bud has been reported in sheep at 50th day of gestation (Hill and Mistretta, 1990) and in buffalo foetus by 30-35 cm CVR length (Scala et al., 2005), however at 45.0 cm CVRL no taste buds were observed towards body and apex of the tongue indicating that the development of taste buds proceed caudo-cranially. In group-III, taste buds were ovoid in shape. The cells of taste buds were elongated and slender or spindle shaped as reported in bovines (Tabata et al., 2006). The buds were covered by 3 or 4 layers of cells of superficial layers of epithelium. The taste bud was comprised of neuroepithelial, sustentacular and basal cells. Neuroepithelial or gustatory cells were having lightly stained elongated nuclei and their distinct processes extended towards taste pore while other cell type had dark nuclei and variable shape were supporting cells. The basal cells were found at the base of taste bud. There was increase in number of taste buds from 80.0 cm CVR length (254 days) to 99.5 cm CVR length (298 days). Taste cells were produced by the division of basal cells found at the margin of taste buds. With the maturation, taste cells differentiated and developed the characteristic fusiform shape and some taste bud cells made functional connection with the innervating nerve fibre.

The peripheral gustatory system is functional for at least last third of gestation and the foetus may receive taste stimuli in utero and can utilize the sense of taste to monitor its environment. Further if the activity in these receptors influences swallowing then changing taste of
amniotic fluid may induce or inhibit fetal swallowing providing the foetus with the mean of regulating amniotic fluid volume. The mean number of taste buds in fungiform was 3.19±0.20 whereas, Davies et al. (1979) reported 6.8-8.9 bud/papillae in adult bovine tongue. The height and diameter of taste buds observed in group-III was 56.04 ±4.06 µ and 42.44±3.24 µ. Earlier 54-76 µ length and 33-47 µ width of taste bud in fungiform papillae has been reported in pigs (Kumar and Bate, 2006), in goat 60-62 µ height and 30 to 35 µ width (Ramayya et al., 2000) and Tabata et al. (2006) reported height of 100-150 µ and a width of 20-40 µ of fungiform papillae.

REFERENCES


