COMPARATIVE MORPHO-HISTOLOGY OF MUZZLE IN DEER AND GOAT

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ABSTRACT

Comparative morpho-histology of muz zle in deer and goat was invest igated in sambar deer, spotted deer and crossbred Malabari goats of various ages. Muzzle showed irregular lines mapping out small polygonal projecting areas. Minute spots were observed on the surface of muzzle in all the three species under study, representing the openings of the ducts of the nasolabial glands. Hairs were not observed on the muzzle of sambar deer and goat. The size of the hexagonal areas doubled as the age advanced from day–old to the adult stage. In spotted deer, the muzzle presented distinct elevations, which were separated by wide grooves with small intermediate projections. The intermediate space presented small scattered hairs rarely. Size of the elevations was smaller in goat than in the deer species with narrow intermediate spaces and resembled the pattern in spotted deer. Histologically, the muzzle of deer and goat was similar. Epidermis was composed of stratified squamous keratinized epithelium, which rested on highly vascular dermis. Large, lobulated nasolabial glands were partially located in the deep portion of dermis and mainly in the hypodermis.

INTRODUCTION

Specific body regions of mammals present structural and functional adaptations whichmake the animal suitable for the biological requirements of its environment. Thus in ruminants, theapex of the nose and the rostral portion of the maxilla are modified to form extensive moist glandular *planum nasolabiale* (nasolabial plate) in ox and *planum nasale* in small ruminants (sheep and goat) known as muzzle (Sarma *et al.*, 2001). The form and size of the muzzle and nature of the integument show considerable species differences (Konig and Liebig, 2009). Anatomically, the surface of the muzzle exhibits hexagonal shaped areas separated from each other by grooves andalso presentssmall rounded openings of the nasolabial glands (Farag, 2007). The present study was conducted to elucidate the comparative the species differences in the morphological and histological features of the muzzle in sambar deer (*Cervus unicolor*), spotted deer (*Axis axis*) and crossbred Malabari goats (*Capra hircus*).

MATERIALS AND METHODS

The present study was conducted using skin samples collected from five sambar deer, two spotted deer and twelve crossbred Malabari goats of various ages. The muzzle regionwas collected from the deer brought for post mortem at the pathology department of the College from Thrissur zoo or from Forest Department and of goat freshly slaughtered at the Meat Technology Unit of the College. After recording the gross surface observations under

a stereo zoom microscope, the specimens were fixed in 10 per cent neutral buffered formalin for 48 hours.The fixed specimens were washed, dehydrated and embedded in high melting paraffin (MP 58-60^{O}C). Serial sections of 5µm thickness were made and stained histologically using Gomori's one step trichrome method (Luna, 1968).

RESULTS AND DISCUSSION

Sambar deer and spotted deer presented dark brown muzzle *planum nasolabiale* (nasolabial plate), which corresponded to the baremiddle part of the external surface of the upper lip and the surface between the nostrils. Muzzle region or *planum nasale* in goat was restricted to thearea between the nostrils.

In sambar deer, even though the muzzle appeared smooth to the naked eye, under sterozoom microscope it showed irregular lines mapping out small polygonal projecting areas (Fig. 1). Minute spots were observed on the surface of muzzle in all the three species under study, which represented openings of the ducts of the nasolabial glands. In the buffalo, the small rounded openings of the nasolabial glands were in the center of the hexagonal shaped areason the surface of the muzzle (Farag, 2007).

In all domestic mammals other than the horse, the integument around the nostrils is hairless and sharply demarcated from the unmodified skin. In horses the unmodified skin with some tactile hairs surrounds the nostrils. In the ox, the integument of the rostral region is modified to form the smooth hair less muzzle (Konig and Liebig, 2009). In the present study, hairs were not observedon the muzzle of Sambar deer and it resembled in appearance that of the large ruminants, in accordance with the findings of Banks (1981), on the *planum nasolabiale* of the ox.

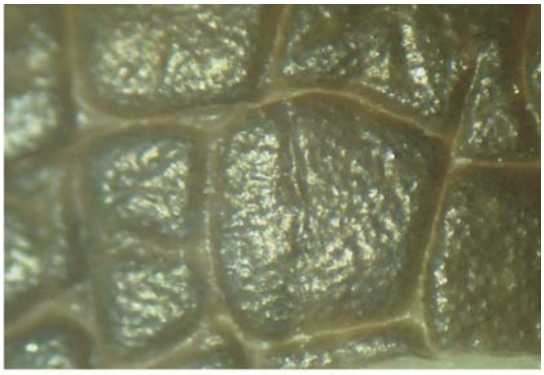

Fig.1 Muzzle from day–old- sambar deer. Stereo zoom microscopy x 200x

The size of the hexagonal areas doubled as the age advanced from day–old to the adult stage. But the gross morphological features remained the same (Fig. 2).

In spotted deer, the muzzle presented distinct elevations, which were separated by wide grooves with small intermediate projections. The intermediate space presented

Fig. 2 Muzzle from adult sambar deer. Stereozoom microscopy x 100 x

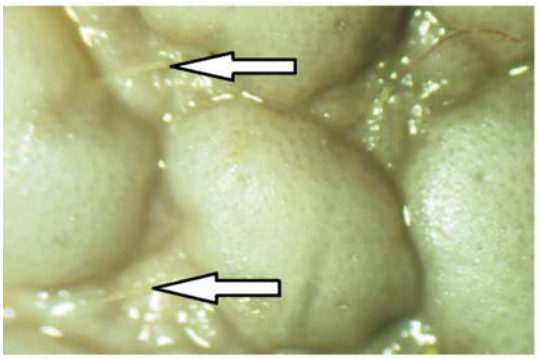

Fig.3 Muzzle from adult Female spotted Deer with hair (arrows) in the intermediate space. Stereo zoom microscopy x 200 x

small scattered hairs rarely (Fig.3).

The size of the elevations was smaller in goat (Fig.4) than in the deer species. These projections on the muzzle resembled the pattern in spotted deer. But the intermediate spaces were narrow and did not present any hair in goat. This finding confirmed the observations of Banks (1981) that the *planum nasale* of small ruminants (sheep and goat) are devoid of hairs. Towards the junction with the unmodified skin with the hair follicles reappeared and the thickness of the epidermis reduced (Figs.4, 5).

Histologically, the muzzle of deer and goat was found to consist of epidermis, dermis and hypodermis (Fig. 6). The epidermis was generally composed of stratified squamous keratinized epithelium, which rested on highly vascular dense irregular connective tissue (dermis) containing some bundles of skeletal muscle fibers and nerves. The large, lobulated nasolabial glands were partially located in the deep portion of dermis and mainly in the hypodermis. Each lobule was composed of secretory acini and the duct system. The secretory acini were lined by pyramidal shape cells with centrally located round nuclei resemble those of the serous end-pieces of the salivary glands. Each lobule was drained by intercalated duct which connects to highly acidophilic duct resemble the striated duct of salivary glands. These findings were in accordance with the observation made by

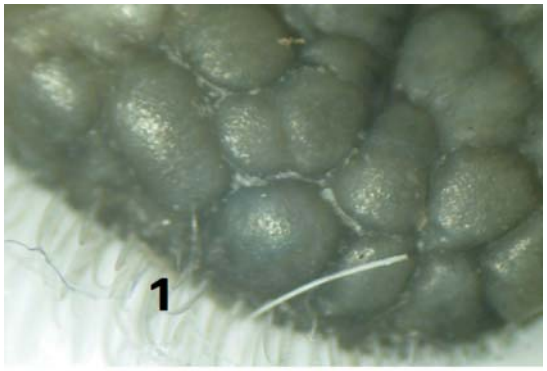

Fig.4 Muzzle from 5 months–old male Crossbred Malabary Goat. Stereo zoom microscopyx 200x

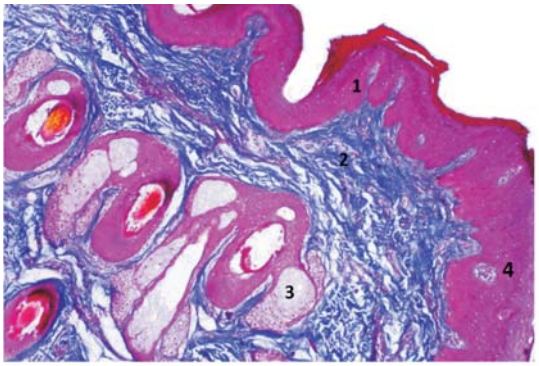

Fig.5 Junction of the muzzle with the unmodified skin in adult male Cross bred Malabary Goat. Gomori's One step trichrome x 100x

1.Epidermis of unmodified skin 2. Dermis 3. Gland 4.Thick epidermis of muzzle

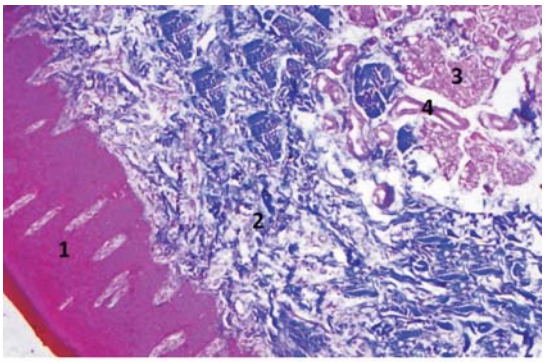

Fig.6 Muzzle region in adult sambar deer. Gomori's One step trichrome x 100x

1.Epidermis 2. Dermis 3. Glands 4. Duct

Kassab *et al.* (2008) n buffaloes.The serous glands within the mucosa keep cool and moisten the cornified epithelium overlying the skin of muzzle (Konig and Liebig, 2009).

The nature of the nasolabial glands is a matter of debate. Although, some investigators described these glands as eccrine glands resembling those found in foot pad of carnivores (Meyer and Tsukise, 1989) and carpus of the pig (Calhoun and Stinson, 1981), others considered them as a combined form of both eccrine and apocrine glands and refers to them as intermediate gland in pig (Montagna and Yun, 1964). Additionally, these glands were previously explained as specialized salivary glands. The secretion of these glands and other

glands on specific body regions have been shown to contain abundant glyc ol conjugates with various saccharides residues that have abroad biological significant to the skin function, such as, interspecies communication, the signalling of sexual activity, and water retention on the epidermal surface (Tsukise *et al.*, 1988).

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