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Histogenesis of Pituitary gland in prenatal sheep (*Ovis aries*)

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ABSTRACT

The pituitary is a master endocrine gland involved in homeostasis and regulation of growth, reproduction, sexual maturation, pregnancy, metabolism, lactation, and stress responses. Present study on pituitary gland of prenatal sheep revealed that in group I, Rathke's pouch formation was seen at 25 days of gestation. In group II, at 55 days of gestation, in pars distalis cells were differentiated into chromophils and chromophobes, at 85 days of gestation chromophils were differentiated into acidophils and basophils. In group III, the number of cells and capillaries were increased.

Key words : Histology, Pituitary Gland, Prenatal development, Sheep

MATERIALS AND METHODS

The embryos and fetuses of sheep were collected from slaughter houses in Andhra Pradesh. Uteri along with fetuses were collected immediately after slaughter. They were opened and the embryos or the fetuses present within the uteri were rinsed with normal saline. The CRL of embryos and fetuses was recorded. The fetuses were dissected and pituitary glands were carefully located, collected, rinsed in normal saline and were placed in the fixative. The gross and histological studies on these samples were conducted at the Department of Veterinary Anatomy, Veterinary College and Research Institute, Namakkal. The approximate age in prenatal age groups was calculated by obtaining the CRL and substituting in the formula given by Richardson (Noakes *et al*., 2009)

X = 2.1 (Y+17) where 'X' is the developmental age of fetus in days and 'Y' is crown rump length in centimetres.

The crown rump length was measured from the most anterior part of the crown to the base of the tail as described by Rao and Ramayya (2013). In case of fetuses upto 3cm CRL standard values given by Bryden *et al.* (1972) were used for estimation of age.

Research material for present study was collected from three different age groups with 6 animals in each group. The Prenatal age groups are classified as follows

Group I	Group II	Group III
1-50 days	51-100 days	101-150 days of gestation

RESULTS AND DISCUSSION

In pituitary gland of sheep, Rathke's pouch formation was seen at 25 days of gestation (Fig 1). This observation was similar to the findings of Perry *et al.* (1982) in sheep, Sasaki and Nishioka (1998) in Beagle breed of dog but it was in contrast with the reports of Sano and Sasaki (1969) in mouse, Schechter (1970) in rabbit and Kelberman *et al.* (2009) in mouse who stated that the Rathke's pouch formation was noticed on 12th, 10th and 9th day of post coitum respectively. The difference in the time of origin of Rathke's pouch formation may be due to species variation and also due to length of gestation.

Pars distalis was made up of stratified cuboidal cells and pars intermedia consisted of stratified cuboidal to stratified columnar cells. At some regions of pars distalis the cells of surface layer were arranged in groups surrounded by reticular fibres. Similar findings were noticed by Conklin (1968) in humans, Sano and Sasaki (1969) in mouse and Schechter (1970) who described that it was lined by loosely arranged irregular to elongated cells with apparent stratification in rabbits.

Pars distalis was separated from the pars intermedia by a cleft which was in concurrence with the findings of Attia *et al.* (2010) in water buffalo and Mahmood (2014) in rats.

Pars nervosa had stratified columnar cells which was formed by evagination of diencephalon

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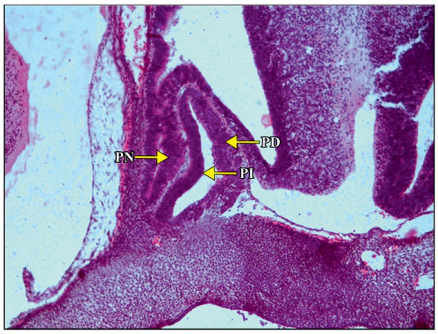
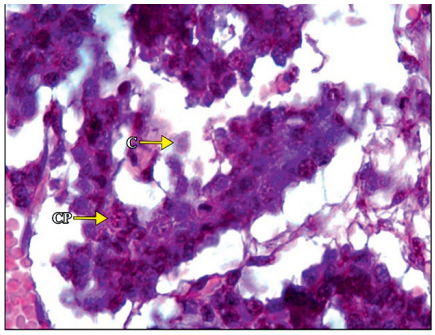




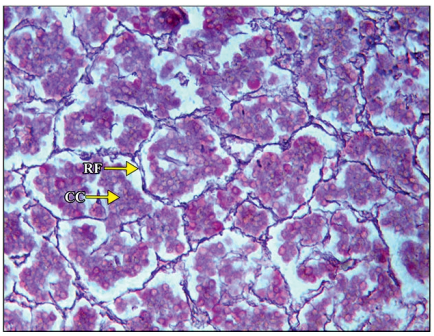
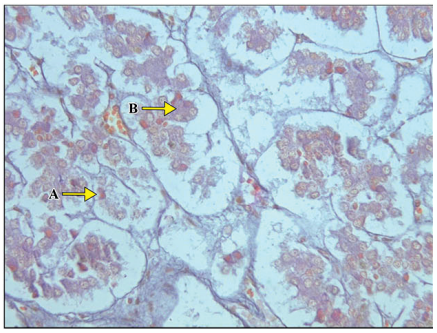
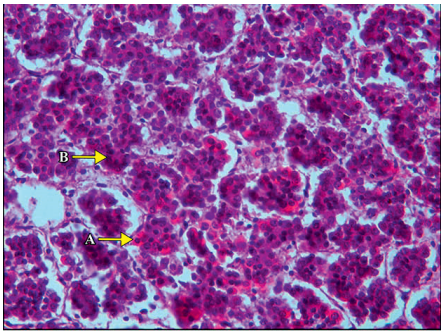


Fig 1. Photomicrograph showing Rathke's pouch formation in sheep fetus at 25 days of gestation, H&E 100, PD-Pars Distalis, PI- Pars Intermedia, PN-Prs Nervosa; **Fig 2.** Photomicrograph showing Pars distalis region of sheep fetus at 55 days of gestation stain and magnification should be mentioned CP-Chromaphil C-Chromophobe H&E 1000; **Fig 3.** Photomicrograph showing reticular fibres in pars distalis region of pituitary gland in sheep fetus at 85days of gestation CC-Clumpsofcells RF- Reticular fibres Gomori's method X 400





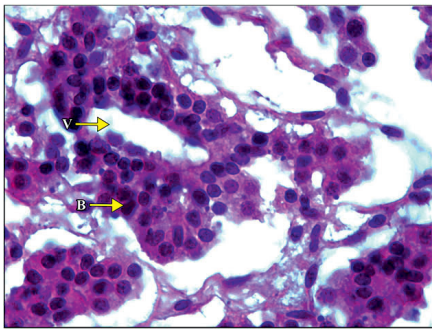
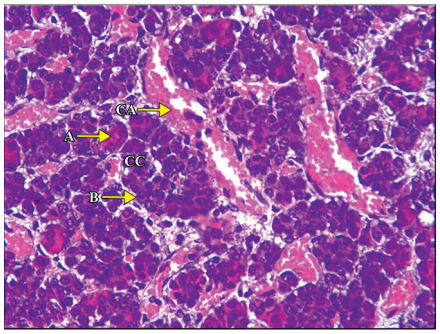


Fig 4. Photomicrograph pars distalis region of pituitary gland in sheep fetus showing acidophils and basophils at 85 days of gestation A-Acidophils B-Basophils Heaths method X 400; **Fig 5**. Photomicrograph of pars distalis in pituitary gland of sheep fetus at 85 days of gestation showing acidophils and basophils A-Acidophils B-Basophils H&EX400; **Fig 6 .** Photomicrograph showing pars intermedia of pituitary gland in sheep fetus at 85 days of gestation B-Basophilic cell V- Vesicles H&EX1000



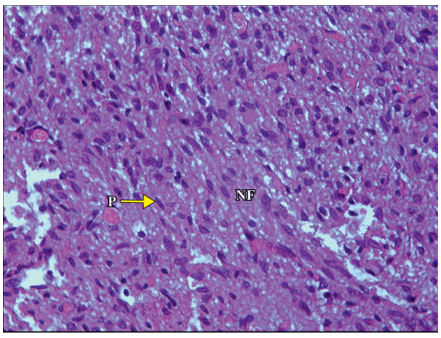


Fig 7. Photomicrograph of pars distalis of pituitary gland in sheep fetus at 128 days of gestation H&E X 1000 CA- Capillaries CC-Cords of cells A-Acidophils B-Basophils; **Fig 8**. Photomicrograph of pars nervosa in pituitary gland of sheep fetus at 85 days of gestation H&E 1000, P- Pituicytes, NF- Nerve Fibres

towards the Rathke's pouch. The infundibulum was made up of stratified columnar ciliated epithelium (Fig 1). Similar observations were made by Sethi and Singh (2009) in buffaloes.

At 55 days of gestation, the pituitary gland was surrounded by a thin connective tissue capsule as noticed by Banks (1993) in the domestic mammals whereas, Mahmood (2014) reported that the pituitary gland in rat was not surrounded by a true capsule. This might be due to species variation.

Different regions of the gland viz., pars distalis, pars intermedia and pars nervosa were identified. In pars distalis, the cells were differentiated into chromophils and chromophobes which were arranged in clumps and surrounded by reticular fibres and this was in resemblance with Attia *et al.* (2010) in water buffalo. Between these clumps of cells, numerous capillaries were observed. These findings were in accordance with the findings of Sano and Sasaki (1969) in mouse and Banks (1993) in the domestic mammals. Chromophobes were round in shape with centrally placed nucleus and had clear cytoplasm whereas, chromophils appeared basophilic (Fig 2). These observations were similar to the reports of Banks (1993) in domestic mammals and Attia *et al.* (2010) in Water Buffalo.

Pars intermedia consisted of basophilic cuboidal cells which were arranged in stratified layers. Pars nervosa consisted of pituicytes and

nerve fibres. These findings were in accordance with Attia *et al.* (2010) in water buffalo and Banks (1993) in the domestic mammals.

At 85 days of gestation, cells of pars distalis were arranged to form cords and clumps surrounded by reticular fibres (Fig 3). In between these clumps of cells, blood vessels, connective tissue cells and glial cells were seen. Chromophils were differentiated into acidophils and basophils (Fig 4). Similar findings were reported by Amar and Weiss (2003) in pituitary gland of humans. Acidophils were round shaped cells with eosinophilic cytoplasm and had eccentrically placed nucleus. Basophils were round with centrally placed nucleus and had basophilic cytoplasm (Fig 5). Few clumps of cells showed colloid material in the center similar to the observations of Ernst *et al.* (2019) in pituitary gland of humans.

Pars intermedia consisted of basophilic cells with centrally placed round nucleus arranged in stratified layers. Some cells were arranged to form vesicles but no colloid was seen (Fig 6). These findings were in contrast with the findings of Burkitt *et al.* (1993) in humans who reported that the cystic spaces of pars intermedia were filled with eosinophilic colloid. This indicates that the gland was in the process of development, hence only the vesicle formation was seen and colloid yet to be secreted.

Pars nervosa consisted of pituicytes and nerve fibres (Fig 3 and 4). These observations were similar to the findings of Ernst *et al.* (2019) in pituitary gland of humans.

At 128 days of gestation, the number of cells and capillaries were increased in the pars distalis as compared to group I and II as noticed by Sano and Sasaki (1969) in mouse. Cells were arranged to form cords as reported by Trautmann and Fiebiger (2015) in pars distalis of the domestic animals. Spaces between the cords of cells were reduce as compared to group I and II (Fig 7). Pars intermedia consisted of stratified layers of basophilic round cells with centrally placed nucleus, chromophobes and glial cells. Pars nervosa consisted of numerous pituicytes and nerve fibres (Fig 8) as observed by Mahmood (2014) in rats and Trautmann and Fiebiger (2017) in domestic animals.

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