International Journal of Advanced Biochemistry Research

ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2025): 5.29
IJABR 2025; 9(8): 688-691
www.biochemjournal.com
Received: 10-06-2025
Accepted: 13-07-2025

Dr. GSS Chandana
Assistant Professor, Department of Veterinary Anatomy, College of Veterinary Science, Garividi, Andhra Pradesh, India

K Balasundaram
Professor, Centurion University of Technology and Management, Odisha, India

R Ezakial Napolean
Retd. Professor, Department of Veterinary Gynaecology and Obstetrics, Veterinary College and Research Institute, Namakkal, TANUVAS, Chennai, Tamil Nadu, India

P Selvaraj
Department of Veterinary Physiology, Veterinary College and Research Institute, Namakkal, TANUVAS, Chennai, Tamil Nadu, India

P Srinivasan
Department of Veterinary Pathology, Veterinary College and Research Institute, Namakkal, TANUVAS, Chennai, Tamil Nadu, India

K Archana
Assistant Professor, Department of Veterinary Anatomy, NTR College of Veterinary Science, Gannavaram, Andhra Pradesh, India

Corresponding Author:
Dr. GSS Chandana
Assistant Professor, Department of Veterinary Anatomy, College of Veterinary Science, Garividi, Andhra Pradesh, India

Histological studies on the pituitary gland of sheep (*Ovis aries*)

GSS Chandana, K Balasundaram, R Ezakial Napolean, P Selvaraj, P Srinivasan and K Archana

DOI: https://www.doi.org/10.33545/26174693.2025.v9.i8i.5298

Abstract
Present study was carried out in the Department of Veterinary Anatomy, Veterinary college of Research Institute, Namakkal, TANUVAS. Pituitary glands were collected from (n = 18) sheep which were divide into three groups. Group I (birth to three months) Group II (seven to nine months) Group III (two years and above). Pars distalis of pituitary glands of all the samples collected consisted of acidophils, basophils and chromophobes. Acidophils were numerous and larger in size compared to basophils and chromophobes. Acidophils were pyramidal in shape with abundant granular eosinophilic cytoplasm and large round nucleus located towards the base. These were grouped together to form tight clumps. Basophils were polymorphic in shape. In group I, acidophils were grouped together to form tight clumps and basophils were found distributed between the clumps of acidophils. Pars intermedia comprised of basophilic cells. Pars nervosa had pituicytes and nerve fibres. In group II, acidophils and two types of basophils, namely the beta and delta basophils were distinguished. In group III, number of acidophils and beta basophils was high compared to delta basophils.

Keywords: Acidophils, basophils, chromophobes pituitary gland, sheep

Introduction
The pituitary is a master endocrine gland involved in homeostasis and regulation of growth, reproduction, sexual maturation, pregnancy, metabolism, lactation, and stress responses. Studying the developmental stages that a structure or region that it undergoes during its development gives important clues in understanding normal structure and anatomical variations that can occur. It provides a logical basis for understanding the overall organization of the body. Recognition of timing of embryological events is of crucial importance in the analysis of birth defects and various medico legal contexts (Carlson, 2019) [4]. The present study gives scientific basis for understanding normal developmental process of pituitary gland. Thus, by understanding the normal histogenesis of the gland any abnormal development leading to the hinderance in growth, metabolism, reproductive efficiency and homeostasis can be compared. Sheep acts as an excellent model for the study of major physiological systems including endocrinological systems and perinatology. They have short gestational period and give birth to young of similar weight to human babies making them excellent for studying development and genetics (Nathanielsz, 1976) [10].

Materials and Methods
Present studies were conducted at the Department of Veterinary Anatomy, Veterinary College and Research Institute, Namakkal.

Age groups		
Group I(Prepubertal)	Group II (Pubertal)	Group III (Adult)
Birth to 3 months	7-9 months	2 years and above

Immediately after slaughter, heads of the animals were collected, pituitary glands were dissected rinsed in normal saline, and for histological study, the tissue pieces were fixed in neutral buffered formaldehyde and Bouin's fluid. The fixed tissues were processed as per the methods described by Luna (1968) [8].

Paraffin sections of 3-5µm thickness were cut using a Leica Rotary Microtome (RM 2145) and subjected to the following techniques.

1. Harri's Haematoxylin and Eosin (H&E) method for the routine histological study (Bancroft and Stevens, 1996) [1].
2. Monroe Frommer method for pituitary (Singh and Sulochana, 1996) [12].

Results and Discussion

Group I

Pars distalis of pituitary gland in sheep consisted of acidophils, basophils and chromophobes (Fig 1).

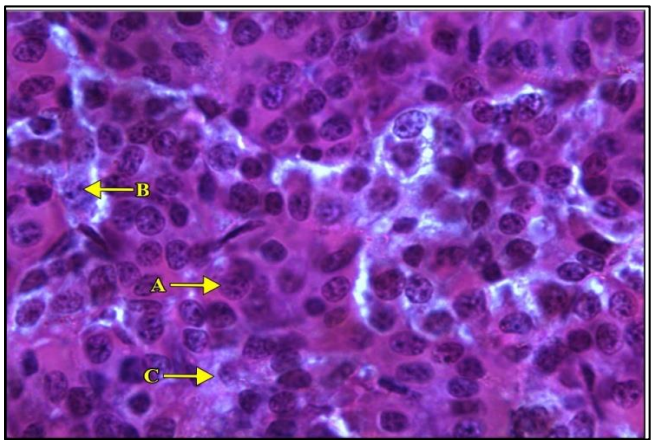

Fig 1: Photomicrograph showing pars distalis of pituitary gland in 2 months old sheep
A-Acidophil B-Basophil C-Chromophobe H & E X 1000

This finding was in uniformity with the findings of Banks (1993) [2] in domestic mammals. Acidophils were numerous than basophils and chromophobes (Table 1) as observed by Gartner and Hiatt (1997) [5] in humans.

Acidophils were larger in size compared to basophils and chromophobes. On contrary to these findings, Banks (1993) [2] in domestic mammals observed that basophils were larger than acidophils. While Mahmood (2014) [9] reported that the chromophobes were largest cells and acidophils were smallest in pars distalis of rat. Acidophils were pyramidal in shape with abundant granular eosinophilic cytoplasm and large round nucleus located towards the base and were grouped together to form tight clumps (Fig 2).

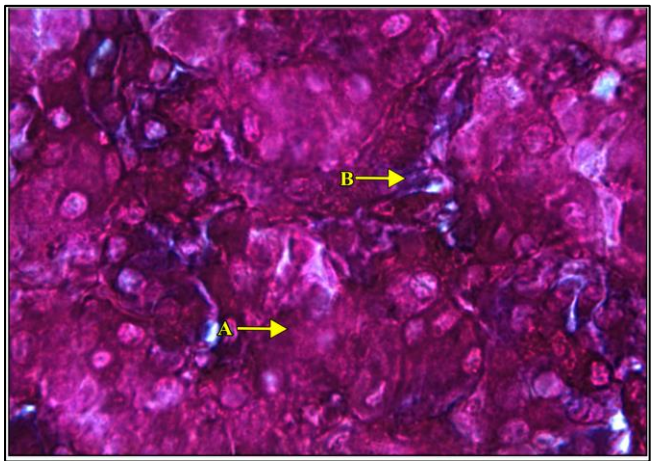

Fig 2: Photomicrograph showing pars distalis of pituitary gland in 2 months old sheep
A-acidophil B-Basophil C-chromophobe Monroe Frommer X 1000

These findings were in obedience with the findings of Khatra and Nanda (1981) [7] in pituitary gland of goat between one and three months of age.

Pars intermedia consisted of stratified layers of basophilic cells which was similar to the findings of Banks (1993) [2] in domestic mammals, Burkitt *et al.* (1993) [3] in humans and Trautmann and Fiebger (2015) [13] in domestic animals.

In pars nervosa pituicytes and numerous nerve fibres were observed. This was similar to the findings of Pathak and Bansal (2017) [11] in pars nervosa of pituitary gland in Indian buffalo.

Group II

In pars distalis of pituitary gland of sheep between seven and nine months of age, clumps and cords of cells were observed. Each clump consisted of acidophils, basophils and few chromophobes and these observations were in conformity with findings of Banks (1993) [2] in domestic mammals, Burkitt *et al.* (1993) [3] in humans and Trautmann and Fiebger (2015) [13] in domestic animals.

At the Centre of few clumps of cells colloid material is observed. These findings were in accordance with Khatra and Nanda (1981) [7] in goat.

When stained with Monroe Frommer method, acidophils and two types of basophils, namely the delta and beta basophils were distinguished. Acidophils appeared red in colour, pyramidal in shape with round nucleus located towards the base. Delta basophils were purple coloured, oval to pyramidal shaped cells with nucleus located towards the base was. This was according to the reports of Goldberg and Chaikoff (1952) [6] in pars distalis of dog.

Beta basophils appeared green in colour, polymorphic in shape with rounded centrally located nucleus whereas, Goldberg and Chaikoff (1952) [6] reported that in pars distalis of dog beta cells were large, irregular, polygonal cells with a distinct cell boundary and irregularly shaped nuclei. The number of delta basophils was more followed by acidophils and beta basophils (Fig 3).

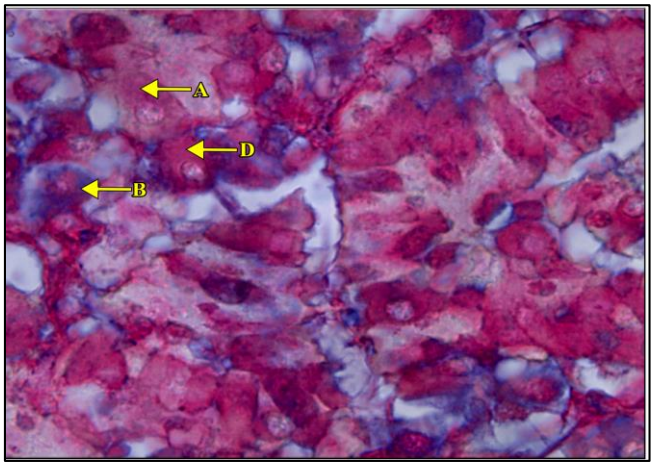

Fig 3: Photomicrograph showing pars distalis of pituitary gland in 9 months old sheep
A-acidophil B-Beta Basophil D-Delta basophil Monroe Frommer X 1000

The increased number of delta basophils in this group may be attributed to its need for more steroid hormone synthesis at pubertal age.

The mean length and width of acidophils and basophils was increased compared to group IV (Table 1) was similar to observations of Khatra and Nanda (1981) [7] in goat.

Table1: Mean (±SE) values of histometric parameters of acidophils and basophils in pars distalis of pituitary gland in postnatal age groups of sheep

Group	Acidophils		Basophils	
	Length(µm)	Width(µm)	Length(µm)	Width(µm)
IV	15.44±1.30	9.36±1.02	11.18±0.95	7.53±0.44
V	18.62±1.19	10.12±0.58	14.80±1.32	10.43±0.35
VI	7.67±0.25	7.60±0.24	7.61±0.47	7.60±0.44

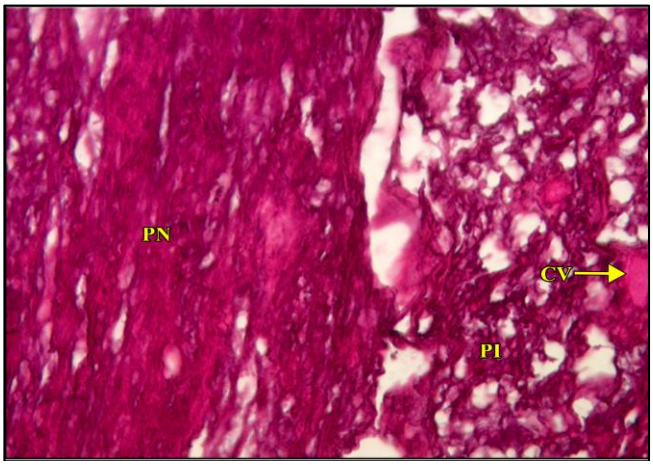

Fig 4: Photomicrograph showing pars intermedia of pituitary gland in 9 months old sheep
PI-Pars intermedia PN-Pars Nervosa CV-Colloidal Vescicle Monroe FrommerX 1000

Pars intermedia consisted of stratified layers of basophilic cells and cysts filled with colloid as noticed by Burkitt *et al.* (1993) [3] in humans and Trautmann and Fiebtger (2015) [13] in domestic animals.
Pars nervosa consisted of pituicytes and numerous nerve fibres and few capillaries (Fig 4).
These findings were in uniformity with findings of Pathak and Bansal (2017) [11] in pars nervosa of pituitary gland of Indian buffalo.

Group III

In pars distalis, acidophils were round in shape with centrally placed vesicular nucleus and eosinophilic cytoplasm. They were smaller compared to group IV and V. Beta and delta basophils were rounded with centrally placed nucleus. The number of acidophils and beta basophils was high compared to delta basophils (Fig 5).
Whereas, Goldberg and Chaikoff (1952) [6] reported that in pars distalis of dog beta cells were large, irregular, polygonal cells with a distinct cell boundary and irregularly shaped nuclei and the delta cells were large, oval or round cells with round or oval nucleus. This might be due to the species difference. It indicates the decreased gonadotropic activity and increases in metabolism as the age advanced compared to pubertal age groups.
Collagen fibres surrounding the acini increased from group IV to VI. The mean length and width of acidophils and basophils was lesser compare to groups IV and V (Table 1) and this was similar to observations of Khatra and Nanda (1981) [7] in goat.

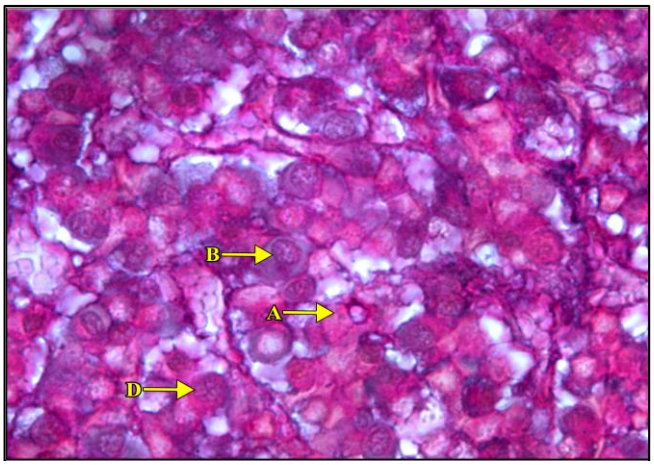

Fig 5: Photomicrograph showing pars distalis of pituitary gland in 3 years old sheep
D-Delta basophil B-Beta basophil A-Acidophil Monroe FrommerX 1000

Pars intermedia comprised of basophilic cells. Pars nervosa had pituicytes and nerve fibres as observed by Banks (1993) [2] in Trautmann and Fiebger (2015) [13] in domestic animals.

Conclusion

Pars distalis of pituitary gland in sheep consisted of acidophils, basophils and chromophobes. Acidophils were larger in size compared to basophils and chromophobes. In group II two types of basophils, namely the delta and beta basophils were distinguished. The number of delta basophils was more followed by acidophils and beta basophils. The increased number of delta basophils in this group may be attributed to its need for more steroid hormone synthesis at pubertal age. In group III the number of acidophils and beta basophils was high compared to delta basophils. It indicates the decreased gonadotropic activity and increases in metabolism as the age advanced compared to pubertal age groups. Pars intermedia comprised of basophilic cells. Pars nervosa had pituicytes and nerve fibers.

References

1. Bancroft JD, Stevens A. Theory and practice of histological techniques. 4th ed. Edinburgh: Churchill Livingstone; 1996.
2. Banks WJ. Applied veterinary histology. 3rd ed. St. Louis: Mosby Year Book; 1993.
3. Burkitt HG, Young B, Heath JW. Functional histology. 3rd ed. Edinburgh: Churchill Livingstone; 1993.
4. Carlson BM. Human embryology and developmental biology. 6th ed. Philadelphia: Elsevier; 2019.
5. Gartner LP, Hiatt JL. Color textbook of histology. Philadelphia: W.B. Saunders Company; 1997.
6. Goldberg RC, Chaikoff IL. On the occurrence of six cell types in the dog anterior pituitary. Anatomical Record. 1952;112(2):265-274.
7. Khatra GS, Nanda BS. Age related changes in the histomorphology of the adenohypophysis of the goat. Anatomia, Histologia, Embryologia. 1981;10(3):238-245.
8. Luna LG. Manual of histologic staining methods of the Armed Forces Institute of Pathology. 3rd ed. New York: McGraw-Hill; 1968. p. 111-112.

9. Mahmood B. Anatomical and histological study of pituitary gland of the rats in Iraq. Journal of Kerbala University. 2014;12(3):221-228.
10. Nathanielsz PW. Fetal endocrinology: an experimental approach. Vol. 2. Amsterdam: North Holland; 1976. p. 11-27.
11. Pathak D, Bansal N. Histomorphological and histochemical studies on the neurohypophysis of Indian buffalo. Ruminant Science. 2017;6(2):255-258.
12. Singh UB, Sulochana S. Handbook of histological and histochemical techniques. 2nd ed. Hyderabad: Premier Publishing House; 1996. p. 98-103.
13. Trautmann A, Fiebiger J. Fundamentals of the histology of domestic animals. New Delhi: CBS Publishers & Distributors Pvt. Ltd.; 2015. p. 145-146.