



ISSN: 2456-2912

NAAS Rating: 4.61

VET 2025; 10(6): 90-93

© 2025 VET

www.veterinarypaper.com

Received: 05-03-2025

Accepted: 10-04-2025

Shailendra Chaurasia

Department of Veterinary
Anatomy, College of Veterinary
and Animal Sciences, Banda
University of Agriculture and
Technology, Banda, Uttar
Pradesh, India

R Menaka

Department of Veterinary
Anatomy, College of Veterinary
Science and Animal Husbandry,
KU, Navsari, Gujarat, India

Swarup Debroy

Department of Veterinary
Anatomy, College of Veterinary
and Animal Sciences, Banda
University of Agriculture and
Technology, Banda, Uttar
Pradesh, India

Corresponding Author:

Shailendra Chaurasia

Department of Veterinary
Anatomy, College of Veterinary
and Animal Sciences, Banda
University of Agriculture and
Technology, Banda, Uttar
Pradesh, India

Development and distribution of connective tissue fibres in the thymus of prenatal Surti goats (*Capra hircus*)

Shailendra Chaurasia, R Menaka and Swarup Debroy

DOI: <https://www.doi.org/10.22271/veterinary.2025.v10.i6b.2312>

Abstract

The present study was conducted to elucidate the developmental changes in the thymic connective tissue framework of 42 healthy Surti goat fetuses at different stages of their development ranging from 38 to 140 days. The thymic tissue at the age of 38 days was surrounded by a thin layer of immature collagen fibres. As development progressed between 44 to 45 days, the mesenchymal tissue radiates from capsule and divided the thymic parenchyma into irregular shaped lobules. The thymus at the age of 59 days showed strands of connective tissue fibres arises from interlobular septa that penetrated the parenchyma of thymus and divided periphery of the lobules into small chambers which forms cortex part of thymus. These connective tissue strands reached up to corticomedullary junction, therefore medulla of lobules were not divided. The thymus shows an increased concentration of collagen fibres in capsule and septa from 64 to 140 days of gestation. The thymus also showed reticular fibres in capsule, septa and endothelium of developing blood vessels. The number and thickness of reticular fibres were increased both in cortex and medulla as age advancement; however, there number was more in medulla as compared to cortex. The association of reticular fibres with Hassall's corpuscles was observed only from the age of 135 days onwards. The elastic fibres were not observed at any stage of development.

Keywords: Collagen fibres, goat, Hassall's corpuscles, thymus, development

Introduction

The thymus is a distinctly lobulated organ which is surrounded by a connective tissue capsule continuous with thin septa that subdivide the organ into interconnecting lobules of variable sized and orientation (Banks, 1993; Eurell and Frappier, 2006) ^[1, 2]. The reticular connective tissue can also be demonstrated in the capsule, trabeculae and perivascular regions with reticulin staining, however, unlike other organs, there is little supporting tissue (Pearse, 2006) ^[6]. The number and distribution of connective tissue fibres in thymus varies during prenatal development, therefore, the aim of present investigation is to elucidate the development and distribution of connective tissue framework in the thymus of prenatal Surti goats.

Materials and Methods

The study was carried out on the thymus of 42 healthy and normal Surti goat fetuses at different stages of their development ranging from 38 to 140 days (2.6 to 38.8 cm CR length). The approximate age of each foetus was estimated on the basis of crown-rump length (CRL) as per the normograph stated by Lyngset (1971) ^[5]. The Surti goat fetuses were divided into three age groups based on approximate age viz., 38 to 63 days (2.6 to 12.0 cm CR length in group I), 64 to 103 days (12.2 to 26.8 cm CR length in group II) and 104 to 140 days (27.2 to 38.8 cm CR length in group III). The thymus was aseptically collected from Surti goat fetuses and fixed in 10 % neutral buffered formalin. The fixed tissues were subjected to paraffin embedding and sectioning technique. The tissue sections of 5 µm thickness were obtained and stained with Harris' Haematoxylin and Eosin method, Gomori's method for reticulum, Van Gieson's method for collagen fibres, Masson's Trichrome method for collagen fibres and Verhoeff's elastic stain for elastic fibres (Luna, 1968; Singh and Sulochana, 1997) ^[4, 9].

Results and Discussion

In present study, the entire thymic tissue was surrounded by a thin layer of immature collagen fibres at the age of 38 days (2.6 cm CR length), which forms a future capsule of the thymus (Figure 1). As age progressed between 44 to 45 days, mesenchymal tissue radiates from the capsule into the thymic parenchyma and differentiated into interlobular connective tissue which represented early formation of septa and trabeculae of thymus (Figure 2). This interlobular connective tissue divided the organ into various sized lobules which were triangular to polygonal in shape. The thymus at the age of 59 days showed strands of connective tissue fibres arises from interlobular septa that penetrated the parenchyma of thymus and divided periphery of the lobules into small chambers which forms cortex part of thymus. These connective tissue strands reached up to corticomedullary junction, therefore medulla of lobules were not divided (Figure 3). The blood vessels also reached corticomedullary junction by the way of these connective tissue strands. Similar findings were reported by Tiwari *et al.* (1981) [10]; Waghaye (2007) [12] in goat foetuses and Trautmann and Fiebiger (2002) [11] in domestic animals. The thymus of group II (64 to 103 days) foetuses shows an increased concentration of collagen fibres in capsule and septa. The septa were reached up to corticomedullary junction thus common medulla was observed through several lobules. These observations were in accordance with findings of Waghaye (2007) [12] in goat foetuses. The capsule and trabeculae contained blood vessels with free RBCs, lymphocytes, differentiated mesenchymal cells, epithelial reticular cells, fibroblast cells and occasional macrophages in this group. In the age group III (104 to 140 days), the thick collagen fibres were observed in capsule of thymus. The number and thickness of collagen fibres in capsule were increased up to late prenatal period (Figure 4). The collagen fibres were also demonstrated in the arterioles of thymus at late prenatal period (Figure 5).

The reticular fibres were also noticed into the periphery of lobules, interlobular septa, trabeculae as well as endothelium of developing blood vessels of thymus of group I Surti goat foetuses. However, these fibres were found in the form of small reticules in the parenchyma of thymus (Figure 6). Similar findings were reported by Prakash and Chandra (1999) [7]; Ramayya *et al.* (2008) [8] in prenatal buffalo and Waghaye (2007) [12] in goat foetuses.

In group II, the reticular fibres were increased in number and thickness. These fibres form the rim of peripheral cortex and also associated with blood vessels found in corticomedullary junction, cortex and medulla (Figure 7). In medullary region these fibres were mainly associated with blood vessels; however, reticular fibres were not found in association with Hassall's corpuscles of group II Surti goat foetuses. At the end of this group, the numbers of reticular fibre were increased both in cortex and medulla but increase is noticeable in medulla as compared to cortex.

The thymus of group III foetuses showed increase number of reticular fibres in cortex and medulla which form a supportive stroma for lymphocytes. At late gestation the reticular fibres were distributed throughout medulla, however, scanty distribution was noticed in cortex. The reticular fibres form double sheath around the blood vessels of thymus. In this group at the age of 135 days (37.4 cm CR length) onwards reticular fibres were observed in association with Hassall's corpuscles (Figure 8). Ramayya *et al.* (2008) [8] reported that

reticular fibres formed double layered sheath around the blood vessels of interlobular septa. Furthermore, they observed presence of reticular fibres in the Hassall's corpuscles of thymus in late stages of gestation in buffalo foetuses. In the present study, the elastic fibres were not noticed in the stroma of Surti goat foetuses in all three age groups of prenatal period. Present findings were similar with those of Prakash and Chandra (1999) [7] in buffalo foetuses and Gautam *et al.* (2013) [3] in goat foetuses.

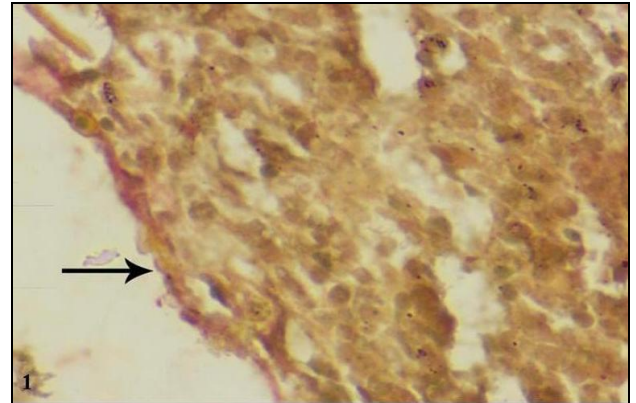


Fig 1: Photomicrograph of thymus at 2.6 cm CRL (38 days) foetal age showing immature collagen fibres in capsule (arrow), (Van Gieson's method X 40)

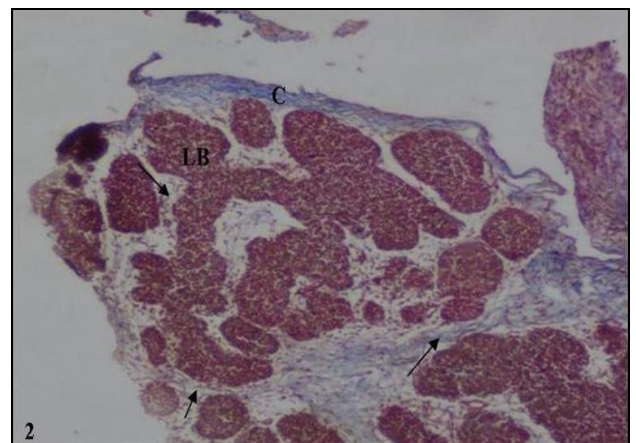


Fig 2: Photomicrograph of thymus at 4.0 cm CRL (44 days) foetal age showing immature capsule (C), lobules (LB) and mesenchymal tissue (arrows), (Masson's trichrome method X 4)

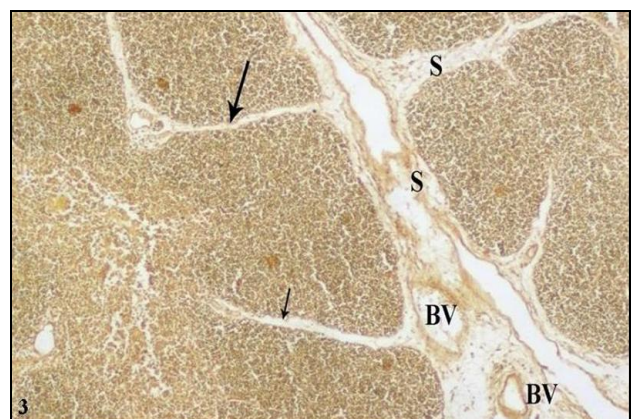


Fig 3: Photomicrograph of thymus at 10.2 cm CRL (59 days) foetal age showing collagen fibres in interlobular septa (S), connective tissue trabeculae (arrows) and blood vessels (BV), (Van Gieson's method X 10)

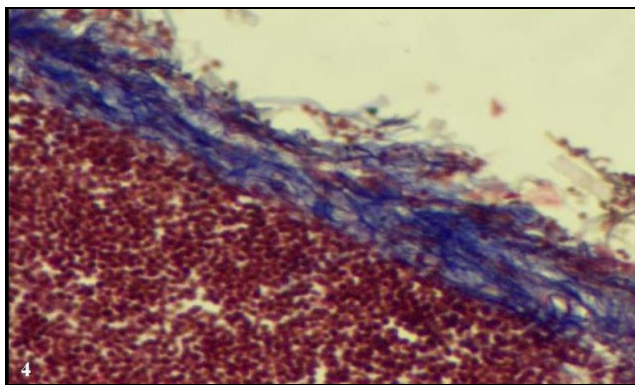


Fig 4: Photomicrograph of thymus at 37.4 cm CRL (135 days) foetal age showing blue collagen fibres in capsule, (Masson's trichrome method X 20)

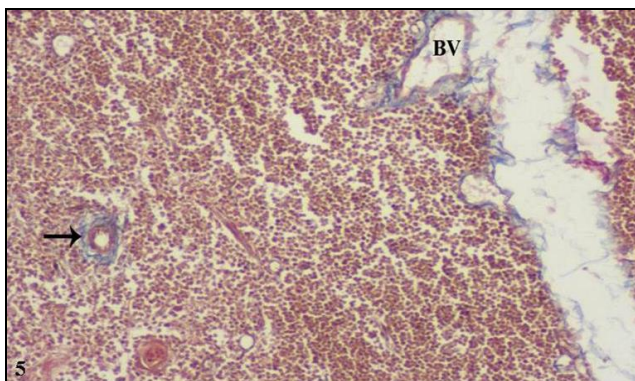


Fig 5: Photomicrograph of thymus at 38.8 cm CRL (140 days) foetal age showing blue collagen fibres in arterioles (arrow) of medullary region and blood vessels (BV), (Masson's trichrome method X 10)

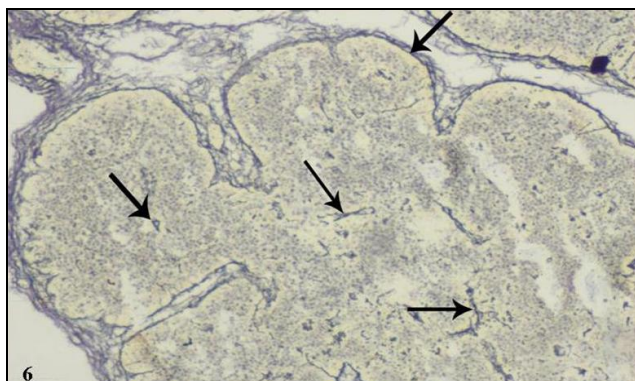


Fig 6: Photomicrograph of thymus at 9.3 cm CRL (58 days) foetal age showing black reticular fibres in periphery of lobules, cortex and medulla (arrows), (Gomori's method X 10)

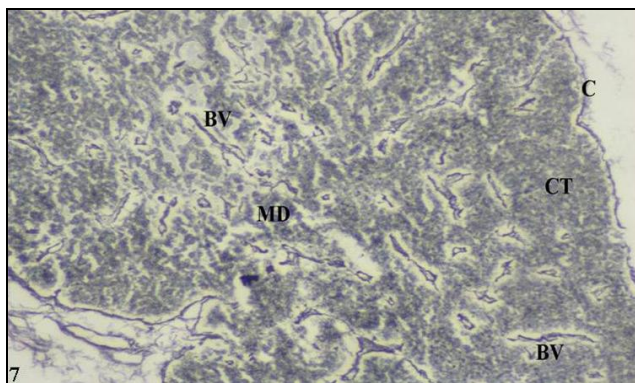


Fig 7: Photomicrograph of thymus at 26.8 cm CRL (103 days) foetal age showing black reticular fibres in capsule (C), cortex (CT), medulla (MD) and blood vessels (BV), (Gomori's method X 10)

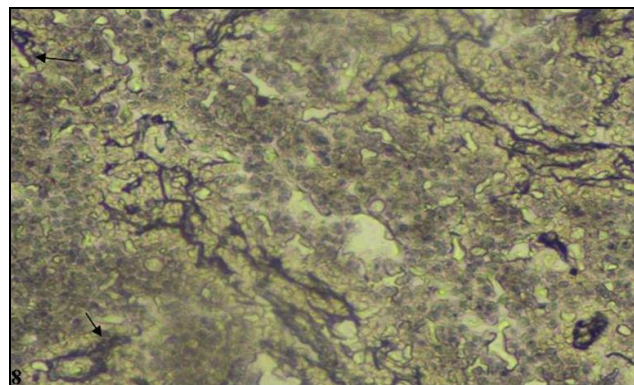


Fig 8: Photomicrograph of thymus at 37.4 cm CRL (135 days) foetal age showing black reticular fibres in association with Hassall's corpuscles (arrows), (Gomori's method X 20)

Conclusions

In conclusion, the collagen fibres were predominantly formed the connective tissue framework of prenatal thymus. The reticular fibres were also distributed throughout the thymus, however, their numbers were more in medulla as compared to cortex. The elastic fibres were not noticed in the stroma of thymus at any stage of prenatal development in Surti goats.

Conflict of Interest

Not available

Financial Support

Not available

Reference

1. Banks WJ. Lymphatic system and immunity. In: Applied Veterinary Histology. Edn 3, Mosby Year Book, USA, 1993, p. 289-292.
2. Eurell JA, Frappier BL. Immune system. In: Dellmann's Textbook of Veterinary Histology. Edn 6, Blackwell Publishing Ltd., Oxford, UK, 2006, p. 147-151.
3. Gautam AK, Mishra UK, Mandal AK. Histomorphological study on thymus of goat during prenatal development. Indian J Field Vet. 2013;8(3):5-9.
4. Luna LG. Manual of histological staining methods of the armed forces institute of pathology. Edn. 3, McGraw Hill Book Company, New York, 1968, p. 38-99.
5. Lyngset O. Studies on reproduction in the goat. VII. Pregnancy and development of the foetus and the foetal accessories of the goat. Acta Vet Scand. 1971;12:185-201.
6. Pearse G. Normal structure, function and histology of the thymus. Toxicol Pathol. 2006;34(5):504-514.
7. Prakash A, Chandra G. Histoarchitectural and certain histochemical observations on the connective tissue framework of prenatal thymus of buffalo (*Bubalus bubalis*). Indian J Vet Anat. 1999;11(1):15-18.
8. Ramayya PJ, Singh O, Roy KS. Origin and distribution pattern of reticular fibres in thymus of pre- and post-natal buffalo (*Bubalus bubalis*). Indian J Anim Sci. 2008;78(6):615-617.
9. Singh UB, Sulochana S. Handbook of histological and histochemical techniques. Edn 2, Premier Publishing House, Hyderabad, 1997, p. 43-63.
10. Tiwari GP, Ramkrishna V, Vaish KC. Note on the microanatomy of fetal thymus in goat. Indian J Anim Sci. 1981;51(10):1000-1002.

11. Trautmann A, Fiebiger J. Fundamentals of the histology of domestic animals. Edn. 1st Indian reprint, Greenworld Publisher, Lucknow, India, 2002, p. 141-142.
12. Waghaye JY. Histomorphological, histochemical and immunohistological studies on some lymphoid organs in goat (*Capra hircus*). Ph.D. thesis, Maharashtra Animal and Fishery Sciences University, Nagpur, 2007.

How to Cite This Article

Chaurasia S, Menaka R, Debroy S. Development and distribution of connective tissue fibres in the thymus of prenatal Surti goats (*Capra hircus*). International Journal of Veterinary Sciences and Animal Husbandry. 2025;10(6):90-93.

Creative Commons (CC) License

This is an open-access journal, and articles are distributed under the terms of the Creative Commons Attribution-Non Commercial-Share Alike 4.0 International (CC BY-NC-SA 4.0) License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.