A Microanatomical Insight into the Reticuloepithelial Cells in the Thymus of TANUVAS Aseel Chicken

Sivakumar,S.A., T.A.Kannan, Sabiha Hayath Basha, V.Leela, S.Vairamuthu and S.Ushakumari

Dept. of Veterinary Anatomy, Veterinary College and Research Institute, TANUVAS, Salem-636 112

Received: January 2024 *28/24* *Accepted: October 2024*

ABSTRACT

This study comprehensively analyses the histological structure of reticuloepithelial cells (RECs) in the thymus of TANUVAS Aseel birds. RECs were observed in both the cortex and medulla, with a higher concentration in the medullary region. Various groups of RECs formed reticular structures in diverse shapes. The study identified three types of RECs: Type I, Type II, and Type III. Type-I RECs were noticed in the cortex, Type-II RECs were observed in both cortex and medulla, and Type-III RECs were noticed at the cortico-medullary junction and in medulla. These cells play a significant role in the formation of Hassall's corpuscles within the thymic parenchyma. The medullary regions exhibited an increased number of reticular cells around Hassall's corpuscles compared to the cortical regions.

Keywords: TANUVAS Aseel Chicken, Thymus, RECs, Microanatomy

INTRODUCTION

In birds, the thymus, as a primary lymphoid organ, mediates T cell development and maturation. The thymic microenvironment is established by a reticuloepithelial cell network filled with thymocytes (blood cell precursors of T cells) in different developing stages. The reticuloepithelial cells and thymocytes are the most important components in the thymus, which are necessary for the production of functionally competent T lymphocytes and self-tolerance (Savino and Santa-Rosa, 1982).

RECs release humoral factors that are essential for the production, development, and maturation of lymphocytes in the bursa and thymus of chickens. This suggests a crucial role of RECs in supporting the lymphocytic functions and overall immune system in poultry (Boyd *et al.,* 1983).

The three-dimensional arrangement of the RECs, yielding a cytoreticulum in which the lymphocytes are interposed, provides a special support for the latter. The presence of actin and myosin in the RECs plays a role in the intrathymic migration and movement of lymphocytes (Savino and Santo-Rosa, 1982).

Native chickens are renowned for their adaptability to local agro-climatic conditions, robustness, and the capacity to thrive on locally available feed with minimal care and management. TANUVAS Aseel chicken is a dual-purpose bird, well-received by the farming community because of its better growth rate and egg production capability (Om Prakash *et al.,* 2018).

While numerous studies have investigated the role of RECs in immunological functions across various species, there is a noticeable lack of reference regarding the microanatomical details of RECs in the TANUVAS Aseel chicken. Consequently, this study aims to document the histological details of RECs in this dual-purpose native chicken breed.

MATERIALS AND METHODS

For the present study, healthy TANUVAS Aseel birds were procured from the Poultry Research Station, Madhavaram Milk Colony, Chennai. Totally, six birds were chosen from each age group, such as day-old, four, eight, 18, and 32 weeks.

Thymus tissue samples were collected in 10 per cent Neutral buffered formalin, Bouin's fluid, Zenker's fluid for histological and histochemical studies. Fixed tissues were

processed for microtomy as per the standard procedure (Bancroft and Stevens, 1996).

RESULTS AND DISCUSSION

The primary structural framework of the thymus was predominantly constituted by a network of reticuloepithelial cells. These cells exhibited a stellate shape with a large vesicular nucleus and eosinophilic cytoplasm. The cytoplasmic processes of neighbouring reticuloepithelial cells are interconnected, forming a lattice-like cytoreticulum. The RECs differed from the lymphocytes by the abundance of cytoplasm in RECs as reported by (Savino and Santo-Rosa, 1982).

The current study identified three types of RECs. The first type, located in the cortex, displayed long cytoplasmic processes, a pale nucleus with acidophilic cytoplasm, and one or two nucleoli, as illustrated in Fig. 1. The second type possessed a darker, elongated nucleus and darker cytoplasm, with vacuoles similar to those present in the first type of RECs (Fig. 2). Notably, this second type was observed in both the cortex and medulla. A third type of REC was identified in the cortico-medullary junction and the medulla, characterized by a pale, oval nucleus containing one or two nucleoli (Fig. 3). These observations align with the findings reported by Kannan *et.al.* (2015) in Nandanam chicken and Jayachitra (2022) in turkey.

In day-old and four-week-old birds, all three types of RECs were noticed. Regardless of the type, the study revealed a higher prevalence of RECs in the medulla compared to the cortex.

These observations are in contrast with the findings of Saratha Kathiresan (2007) in humans, who identified five types of RECs. In the human study, Type IV epithelial cells were noticed in the cortico-medullary junction and medulla, while Type V RECs were located in and around Hassall's corpuscles. The differences in the types and distributions of RECs may reflect species-specific variations in thymic structure and organization.

At 4 weeks of age, moderate PAS activity was observed in the cytoplasm of reticular cells. Combined PAS-Alcian blue staining showed a moderate positive reaction in RECs. In 18-week-old birds, RECs showed a strong positive reaction for acid and alkaline phosphatase activity, as reported by Maheshkumar (2010) in chicken.

CONCLUSION

Reticuloepithelial cells are stellate-shaped cells, present in both the cortex and medulla of the thymus. However, an increased number was found in the medulla than in the cortex. Three types of RECs were observed in the TANUVAS Aseel chicken. The presence of these types varied among age groups; however, all three types were noticed in day-old and four-week-old birds.

ACKNOWLEDGMENT

The authors are grateful to the Dean of Madras Veterinary College for providing the facilities to carry out this work.

REFERENCES

Bancroft, J. D. and A. Stevens (1996), Theory and Practice of Histological Techniques. 4th Edn. Churchill Livingstone, Edinburgh, London.

Boyd, R.L., H.A. Ward and H.K. Muller (1983), The growth of non-lymphoid thymic components *in vitro*: Age-related differences during development. *J. Reticuloendothel. Soc*., **34:** 371 - 82.

Jayachitra, S. (2022), Morpho-histology of Immune organs in Turkey, PhD thesis submitted to Tamil Nadu Veterinary and Animal Sciences University.

Kannan, T. A., Geetha Ramesh, S.Ushakumari, S.Venkatesan and S.Vairamuthu (2015), Histological and Ultrastructural details of Thymic Reticuloepithelial cells in Nandanam Chicken, *Int. J. Adv. Res*., **3**(9), 841 – 846.

Mahesh Kumar (2010), Histochemical studies on the thymus in chicken, M.V.Sc. thesis submitted to Tamil Nadu Veterinary and Animal Sciences University.

Omprakash, A.V., C.Pandian and S.Ezhil Valavan (2018), *TANUVAS Technical Reporter*, **2**(0): 1-2.

Savino W and Santa-Rosa GL (1982). "Histophysiology of thymic epithelial reticular cells". *Arch Histol Jpn*. **45** (2): 139–44.

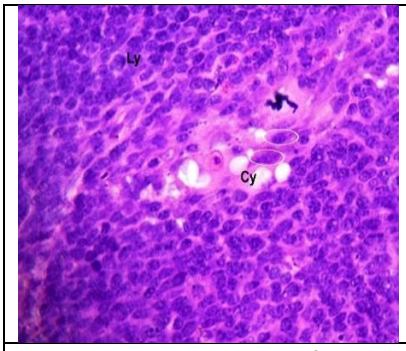	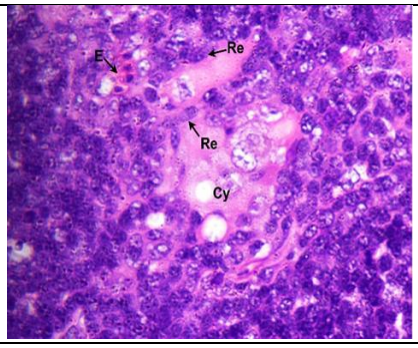	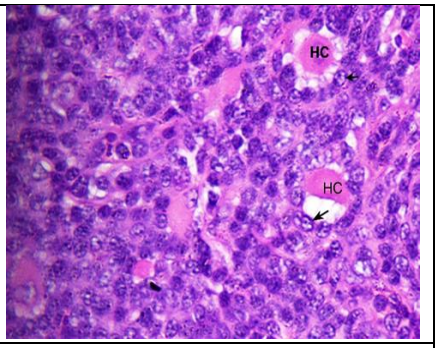
Fig. 1. Photomicrograph of Type-I Reticuloepithelial cell (circle) Cy-Multicellular cyst; Ly-Lymphocytes (H&E x 1000)	**Fig. 2. Photomicrograph of Type-II Reticuloepithelial cell (Re)** Cy-Multicellular cyst; E-Erythrocytes (H&E x 1000)	**Fig. 3. Photomicrograph of Type-III Reticuloepithelial cell (arrow)** HC-Hassall's corpuscles (H&E x 1000)