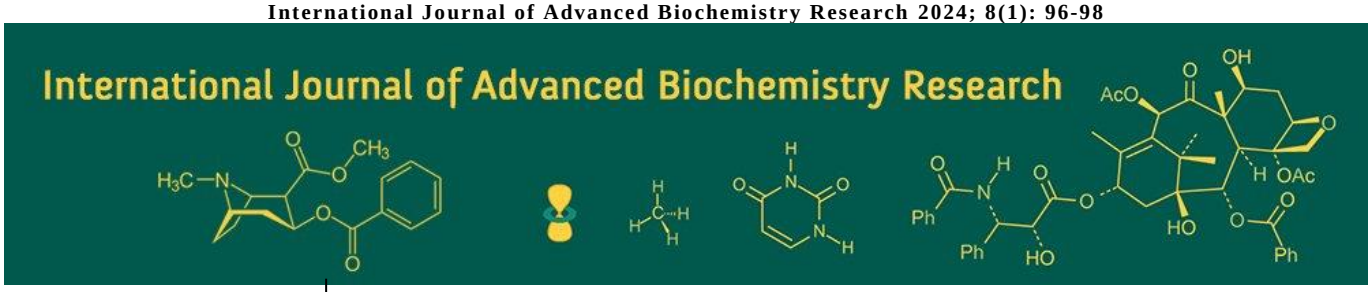

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Light microscopic details of Hassall's corpuscles in TANUVAS Aseel chicken

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Abstract
The primary objective of this study was to document the microscopic characteristics of thymic Hassall's corpuscles in Aseel Chickens across various age brackets, ranging from day-old to thirty-two weeks. The Hassall's corpuscles were identified as circular, uniform eosinophilic masses, surrounded by flattened reticular cells. While these corpuscles were predominantly located in the medulla of the chicken thymus, their presence was also observed in the cortical regions of day-old, four-week, and eight-week age groups. Six distinct types of Hassall's corpuscles were identified in Aseel chickens based on their structural arrangements. The number of corpuscles increased with age, featuring a central hyalinized mass surrounded by concentric layers of reticuloepithelial cells.

Keywords: Thymus, Hassall's corpuscles, light microscopy, Aseel chicken

Introduction
The thymus serves as a crucial lymphoid organ where T-cell precursors originating from the bone marrow undergo differentiation, maturation, and subsequently migrate as positively selected thymocytes to peripheral lymphoid organs. Notably, the thymus undergoes involution with advancing age, distinguishing it from other lymphoid organs (Ciriaco *et al*., 2003 and Hassan *et al*., 2014) [3, 5].
Hassall's corpuscles, also referred to as thymic or medullary thymic corpuscles, are structures present in the thymus gland of various vertebrates, including birds. These corpuscles were initially identified by Arthur Hill Hassall in the mid-19th century. Their presence is a distinctive feature of the thymus, and their morphology can vary across different species. In both birds and mammals, the thymus plays a crucial role in the development of a functional immune system. Examining these structures contributes to our comprehension of the intricate processes involved in T cell development and immune system functionality. Given the immunological significance of the thymus and the limited data available for Aseel chickens, this study aims to document the light microscopic details of Hassall's corpuscles in TANUVAS Aseel chicken.

Materials and Methods
The materials for this study were sourced from TANUVAS Aseel Chickens raised in a healthy environment at the Poultry Research Station, Madhavaram Milk Colony, TANUVAS, Chennai-51. Thymic tissue specimens were collected from more than 30 individuals across five distinct age groups: day-old, four weeks, eight weeks, eighteen weeks, and thirty-two weeks. In each age group, a total of six birds were utilized. The thymus was promptly extracted following high cervical dislocation and then fixed for both light and electron microscopy following the method outlined by Gilmore *et al*. in 1974.
For the light microscopic examinations, tissue fragments were fixed in 10% neutral buffered formalin and subjected to processing using the paraffin embedding technique. Sections of the tissue, cut to a thickness of 5 microns, were employed for the routine Haematoxylin-eosin staining method as per the procedure outlined by Bancroft *et al*. in 2013[1]. Ethical approval for the study was obtained from the Institutional Animal Ethical Committee at Madras Veterinary College, Chennai-07.

Results and Discussion

The Hassall's corpuscles were found to be a round, homogenous eosinophilic mass lined by flat, reticular cells and were more commonly observed in the medulla of chicken thymus. However, the presence of Hassall's corpuscles were also noticed in the cortical areas of younger age groups as reported by Kannan *et.al.* (2015) [6] in Nandhanam chicken**.**

In this current investigation, six distinct types of Hassall's corpuscles were identified based on their structural arrangements. Type I Hassall's corpuscles manifested as an acidophilic mass devoid of any surrounding cells, observed in both the cortex and medulla (Fig. 1). Type II featured a centrally located, deeply stained eosinophilic homogeneous mass encircled by a halo (Fig. 2). Type III Hassall's corpuscles comprised a larger central acidophilic mass surrounded by reticular cells (Fig. 3). The formation of Type IV corpuscles involved concentrically arranged eosinophilic rings with reticuloepithelial cells located peripherally. Type V exhibited a concentrically arranged homogeneous mass with degenerating reticuloepithelial cells, displaying a central halo and a cystic appearance, observed in various shapes such as round, oval, and irregular (Fig. 4). Type VI corpuscles showcased a central acidophilic mass encircled by multilaminar reticuloepithelial cells and lymphocytes, surrounded in a concentric manner by myoid cells. This particular type was observed in the 32-week age group (Fig.5).

In contrary to the present findings in Aseel chicken, Muthukumaran *et al.* (2011) [7] noticed only three types of Hassall's corpuscles in turkey thymus. Similarly, Panwar *et al.* (2020) [9] in Kadaknath fowl stated that the Hassall's corpuscles were classified as solid and cystic types.

The Hassall's corpuscles functioned as a repository for apoptotic and deceased thymocytes while also contributing to the maturation of developing lymphocytes in the thymus, as suggested by Senelar *et al.* (1976) [10]. Additionally, Watanabe *et al.* (2005) [11] noted that Hassall's corpuscles play a role in inducing the proliferation and differentiation of T lymphocytes.

The identification of apoptotic cells and macrophages in close proximity to Hassall's corpuscles in the current study strongly supports the conclusion that these corpuscles serve as repositories for a substantial number of aging cells (Blau, 1973 and Olsson and Classon, 1975) [2, 8]. This observation contradicts the findings in guinea pigs, where it was suggested that Hassall's corpuscles function as privileged areas for the maturation of medullary lymphocytes (Senelar *et al*., 1976) [10].

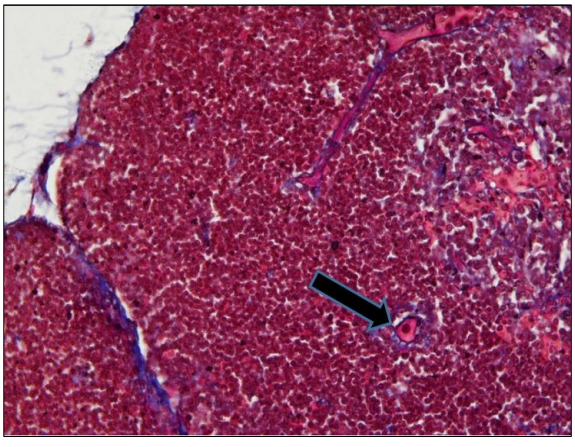

Fig 1: Photomicrograph of Type-I Hassall's corpuscle MTC x 400

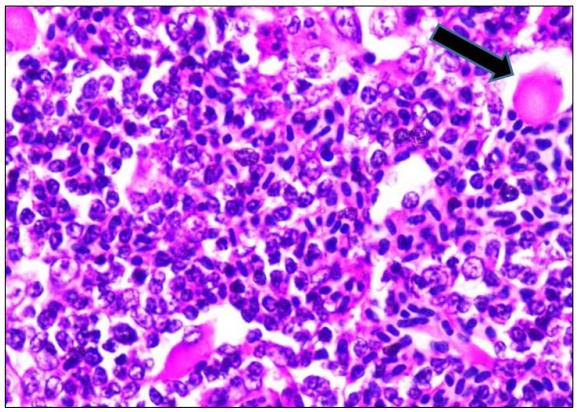

Fig 2: Photomicrograph of Type-II Hassall's corpuscle H&E x 1000

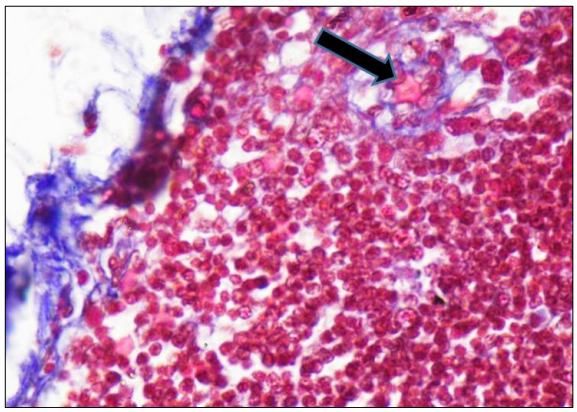

Fig 3: Photomicrograph of Type-III Hassall's corpuscle MTC x 1000

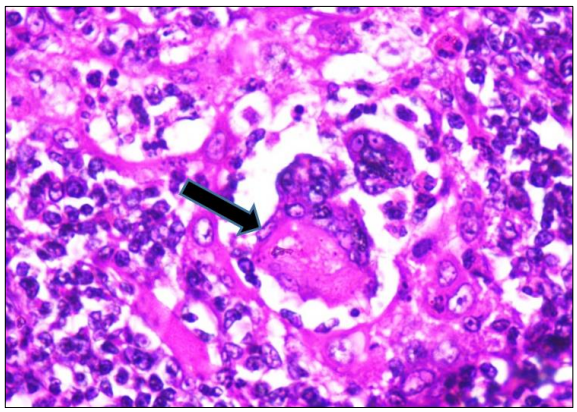

Fig 4: Photomicrograph of Type-V Hassall's corpuscle H&E x 1000

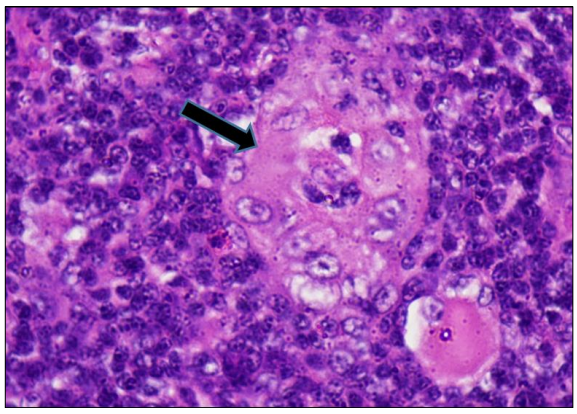

Fig 5: Photomicrograph of Type-VI Hassall's corpuscle H&E x 1000

Conclusion

Hassall's corpuscles, a distinctive structure in the thymus, were observed in both the cortex and medulla. The quantity of Hassall's corpuscles was found to escalate with advancing age. These corpuscles were characterized by a homogeneous, eosinophilic mass enveloped by concentrically arranged reticuloepithelial cells. These observations suggest that Hassall's corpuscles play a dual role in both the elimination of apoptotic thymocytes and the maturation of developing thymocytes within the thymus. However, the precise function of Hassall's corpuscles remains elusive and continues to be a subject of mystery.

Acknowledgments

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