Morphostructural Characterization of Hassall's Corpuscles in Lamb

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Abstract

The aim of this study is to assess Hassall's corpuscles in lamb. Thymus samples were harvested from 10 lambs (3 months old) and histologically processed. From the harvested samples, 5 µm seriated sections were made, stained with Goldner's trichrome method and examined under light microscope. In the medulla of the thymic lobules there are on average 7-8 highly polymorphic Hassall's corpuscles. The majority of the corpuscles (80%) have a diameter between 5 and 50 µm, 15% between 50 and 100 µm and only 5% have a diameter of over 100 µm. Only 20-25% among them have a typical „onion-like” structure, 40-45% present different keratinization degrees and 3-5% are cavitory corpuscles, containing degenerated cell fragments. Hassall's corpuscles in lamb are numerous and highly polymorphic.

Keywords: *Hassall's corpuscle, lamb, polymorphism*

INTRODUCTION

Hassall's corpuscles, described for the first time by Hassall (1846), are specific structures, very polymorph (Rotaru, 1977), present in the medulla of the thymic lobule. After some authors, the size of Hassall's corpuscles ranges between 10 and 1000 µm (Bodey, 1977; Bodey and Hadjioloff, 1977), while others report sizes between 20 and 150 µm (Izard, 1965; Rotaru, 1977). Ever since the first description, Hassall's corpuscles were the subject of many research in different animal species (Kohnen and Weiss, 1964; Cesarini *et al.*, 1968; Cabanie and Mirouze, 1971; Chapman and Allen, 1971; Pfoch, 1971; Frazier, 1973; Miclăuș *et al.*, 2009). Aspects related to their structure and function were studied. Hassall's corpuscles are relatively scarce and small in rats (Harland, 1940) and mice (Clark, 1963), whereas in bovine (Rotaru, 1977), nutria (Miclăuș *et al.*, 2009) and guinea pig (Kohnen and Weiss, 1964) they are larger and more numerous. Although various studies

have been made, nowadays, there are still a lot of questions, especially concerning the role of this specific structures present in the medulla of the thymic lobules. In this context, we considered it opportune to conduct investigations regarding the frequency and polymorphism of these structures in lamb.

MATERIAL AND METHODS

Thymus samples were harvested from 10 clinically healthy, 3 months old lambs, (5 males and 5 females, hybrid merino, sacrificed for own consumption by private breeders from Bistrița-Năsăud county) and fixed in Stieve's solution, dehydrated in ethanol, clarified in butanol and embedded in paraffin. We made seriated sections with a 5 µm thickness from each paraffin block and then stained them with Goldner's trichrome method. 5 slides (every 10th slide from each animal) were examined under light microscope (Olympus BX41, equipped with Olympus E 330

camera). The Hassall corpuscles present on the section surface were counted and pictures were taken. We measured the diameter of the corpuscles in these images using Adobe Photoshop CS 2 program, 9.0 version. In order to calibrate the measurements, we used a blade micrometer and the statistical analysis was made using Microsoft Excel (2003).

RESULTS AND DISCUSSION

Hassall's corpuscles were identified in the medulla of the thymic lobules in large numbers. In each lobule there are on average 7-8 Hassall's corpuscles. Their size varies between wide limits. The majority of the identified corpuscles (approximately 80%) have a diameter between 5 and 50 μm , 15% between 50 - 100 μm , and 5% over 100 μm . Generally, the majority of the corpuscles have small sizes in the incipient stages of organization and are formed out of a small number of epithelioreticular cells in various stages of degeneration. The great majority of these cells are in incipient stages of degeneration, some in advanced stages and sometimes, some cells present incipient signs of keratinization (Fig. 1).

In the case of Hassall's corpuscles of medium sizes, at most 20-25% among them are round or oval and have a typical „onion-like” structure (Fig. 2), 25-30% have other shapes (Fig. 3) and 45-55% among them are compound corpuscles, resulted after merging of the neighbouring corpuscles. Cells forming the medium Hassall's corpuscles present advanced signs of degeneration and in approximately 60% among them, the epithelioreticular cells are keratinized. Only a few of the medium sized corpuscles (3-5%) are cavitory.

There are also large corpuscles and 95% among them are compound corpuscles, resulted after merging of 2 or more neighbouring corpuscles (Fig. 4) and approximately 50% among them are keratinized (Fig. 5). A relatively small number (5-10%) among the corpuscles are cavitory and contain cell fragments in advanced stages of degeneration (Fig. 6).

It's worth noting that in the structure of large sized corpuscles there are both cells that present incipient signs of degeneration and cells in advanced or very advanced stages of degeneration. Microscopical examination highlighted that in lamb, Hassall's corpuscles

Fig. 1. Small Hassall's corpuscles (Goldner's Trichrome stain)

Fig. 2. Hassall's corpuscle with a typical aspect (Goldner's Trichrome stain)

Fig. 3. Polymorph Hassall's corpuscles (Goldner's Trichrome stain)

Fig. 4. Compound Hassall's corpuscle (Goldner's Trichrome stain)

Fig. 5. Keratinized Hassall's corpuscles (Goldner's Trichrome stain)

Fig. 6. Cavitory Hassall's corpuscles with cellular debris (Goldner's Trichrome stain)

are relatively numerous, with relatively large differences from one lobule to another. Thus, there is a small number of lobules in which there are no corpuscles on the section surface, others contain 2-3 corpuscles, but there are also lobules in which they are numerous (up to 15-16 corpuscles/lobule).

The number of Hassall's corpuscles in lamb is comparable with the one described in bovines (Rotaru, 1977; Miclăuș *et al.*, 1997), humans (Raica *et al.*, 2006) and guinea pigs (Kohnen și Weiss, 1964), is less numerous than the one in nutria (Miclăuș *et al.*, 2009) and far numerous than the one in mice (Clark, 1963; Kohnen and Weiss, 1964) and rat (Harlam, 1940; Pfoch, 1971). Furthermore, the polymorphism and keratinization degree of Hassall's corpuscles in lamb is comparable to the one described in bovines (Rotaru, 1977), a lot more keratinized and polymorph than the ones present in the medulla of thymic lobules in rat and mouse (Harlam, 1940; Clark, 1963; Kohnen and Weiss, 1964; Pfoch, 1971), but less polymorph and keratinized than the ones described in nutria (Miclăuș *et al.*, 2009).

CONCLUSIONS

Lamb thymus displays a relatively large number of Hassall corpuscles, on average 7-8 corpuscles in each lobule, but with relatively large differences from one lobule to another.

They are very polymorph regarding their shape, from approximately round with a typical „onion-like” structure aspect, to elongated, branched and even strange shapes.

Hassall's corpuscles in lamb are also very polymorph in size. There are small corpuscles in incipient stages of development, to macro-corpuscles resulted from merging of some neighbouring corpuscles.

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