



ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; SP-11(10): 976-978
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www.thepharmajournal.com
Received: 28-08-2022
Accepted: 30-09-2022

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Comparative histochemical study of superficial lymph nodes in deccani sheep (*Ovis aries*) and Bidri goat (*Capra hircus*)

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Abstract

The present study was carried out to elucidate Comparative histomorphology and histochemical study of superficial lymph nodes in Deccani sheep (*Ovis aries*) and Bidri goat (*Capra hircus*). Superficial lymph nodes namely prescapular, prefemoral, parotid, mandibular and inguinal lymph nodes of both species consisted of capsule which covered whole parenchyma except at hilus.

Weak PAS positive results showed presence of less amount of mucopolysaccharides in capsule, trabeculae and cytoplasm of lymphocytes and connective tissue surrounding lymphocytes. Alcian blue reaction at pH 2.5 confirms the presence of sulfomucin and sialomucins in capsule, trabeculae and connective tissue surrounding lymphocytes in both species. Parenchyma of prescapular and inguinal lymph nodes showed the presence of lipids when stained with Oil red O stain.

Keywords: Histochemical study, lymph nodes, deccani sheep, *Ovis aries*, *Capra hircus*

Introduction

Small ruminant like sheep and goat form an important economical and ecological niche of agricultural system in India. Goat and sheep seem to be best choice of livestock component to provide security to the growing population and wellbeing of society. There has been considerable progress in science and technology to understand small ruminant biology and knowledge in this field need to be transformed into practice for sustainable production. Small ruminant population in India is about 200.20 million, amongst that sheep and goat population is about 65.06 million and 135.17 million respectively (19th livestock census). The livestock sector alone contributes nearly 25.6% of value of agriculture output including fisheries and forestry sectors. Sheep and goat farming contribute 10% GDP in the total value of livestock sector. The predominant breeds in Bidar district are Deccani sheep and Bidri goat. Sheep and goat are important source of food (milk & meat) and many farmers especially small and marginal farmers depend mainly on sheep and goat husbandry and it is the main income source for them because even goat is considered as poor man's cow. The lymphatic system protects the body against diseases and infections. It encompasses the lymphoid organs such as thymus, bone marrow lymph nodes and spleen and these are the major components of immune system. The components of immune system are kept in communication by a continuous traffic of lymphocytes. The lymph node plays a vital role in the immune system (Gadre *et al.*, 1982) [4]. Lymph nodes are considered as secondary lymphatic organ and functions as a secondary defense mechanism. Lymph nodes trap antigen circulating in lymphatics and neutralizes the antigen by its phagocytic property. The lymph fluid inside lymph nodes contains lymphocytes, these lymphocytes which continuously flow through lymph nodes and finally drain into blood. Any foreign particle present in lymph called antigens, may be taken up by dedicated antigen presenting cells such as dendritic cells into lymph system and then into lymph nodes. In response to antigens, the lymphocytes in lymph node make antibodies, which will go out of lymph node into circulation, seek and target pathogens producing antigens by targeting them for destruction by other cells and complement. Other immune system cells will be made to fight infection and sent to lymph nodes. The increased number of immune system cells fighting infection will make the node expand and become swollen which has a diagnostic value. Lymph nodes become enlarged due to a localized infection. This increase in size is primarily due to an elevated rate of trafficking of lymphocytes into node from blood, exceeding the rate of outflow from node. They may also be enlarged secondarily as a result of activation and proliferation of antigen-specific T and B cells.

Lymph nodes are usually bean shaped and vary in shape and size from about 1mm to several centimetres (Banks, 1993) [3]. Histologically lymph node consists of capsule, cortex, medulla, lymphatic nodules and hilus. The capsule composed of dense irregular connective tissue with some muscle fibres, and from its internal surface are given off a number of membranous processes or trabeculae. The cortex of lymph node is peripheral portion underneath capsule and consists of lymphatic nodules, trabeculae, fine stromal elements and lymph sinuses. Lymphatic population are organised in to nodules within lymph node mainly present at the cortical region as primary nodule which are devoid of germinal centres where as a secondary nodule consists of two parts viz., germinal centre and corona part. Germinal centre mainly composed of mature lymphocytes, lymphoblast, plasma cells dendritic cells and macrophages. Medullary cords contain accumulations of plasma cells and macrophages. The cortex is continuous around medulla except at the hilus, where medulla comes in direct contact with the hilus (Zidan & Pabst, 2014) [9]. Thin reticular cells and fibres form a supporting meshwork called a reticular network inside node. Lymphocytes, the most prominent ones being lymphocytes, are tightly packed in follicles consisting (B cells) and the cortex (T cells). As part of reticular network there are follicular dendritic cells in B cell follicle and fibroblastic reticular cells in the T cell cortex. The reticular network not only provides structural support, but also surface for adhesion of dendritic cells, macrophages and lymphocytes. It allows exchange of material with blood through high endothelial venules and provides growth and regulatory factors necessary for activation and maturation of immune cells. It has been observed that there is a variation in structure of lymph nodes among animals. The lymph node with dense lymphocytic population makes defense system of body that can serve as a model for understanding other body immune systems. There is very limited scientific work carried on comparative histomorphological and histochemical study of superficial lymph nodes in Deccani sheep and Bidri goat.

Materials and Methods

Materials

The present research was conducted in the Department of Veterinary Anatomy and Histology, Veterinary College Karnataka Veterinary Animal and Fisheries Sciences University Bidar, on six adult Bidri goats and six adult Deccani sheep. The tissue samples required for the work were collected from different local slaughter houses in normal saline. After the linear parameters small sample of 1cm was cut from each lymph node of sheep and goat and washed in normal saline and later fixed in fixative 10% Neutral buffered formalin. The lymphoid tissue fixed in Neutral buffered formalin were pre-frozen for 1-2 hrs and embedded in freezing media, using cryostat and 6-7 μ m thickness sections were cut and utilized for lipid studies.

Methods

The following staining techniques were carried out to study histochemical features of superficial lymph nodes in Deccani sheep and Bidri goat.

Histochemical staining techniques

1. PAS technique for mucopolysaccharides (Bancroft, *et al.*, 2008) [2].
2. Alcian blue pH 2.5 for sulphated sulfomucins and sialomucins (Bancroft *et al.*, 2008) [2].

3. Oil red O for lipids (Luna, 1968) [5].

Results

Mild PAS positive reaction was observed in capsule, trabeculae, connective tissue surrounding lymphocytes (Plate 01) and cytoplasm of lymphocytes (Plate 02). in all prescapular, prefemoral, parotid, mandibular and inguinal lymph nodes in both deccani sheep ad Bidri goat.

3Capsule, trabeculae and connective tissue surrounding lymphocytes showed positive reaction when stained with Alcian blue at pH 2.5 in all superficial lymph nodes nodes in both deccani sheep ad Bidri goat.

Parotid and inguinal lymph node Parenchyma showed the existence of lipid when stained with Oil red O stain (Plate 03) nodes in both deccani sheep ad Bidri goat.

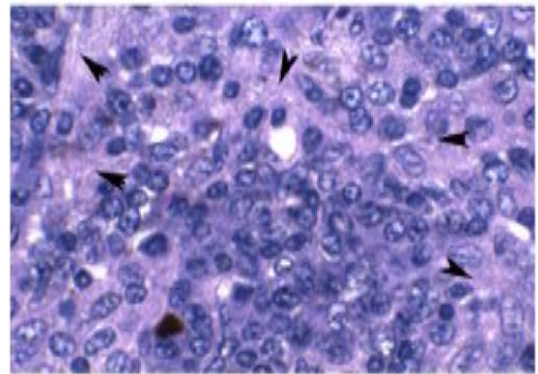


Plate 1: Photomicrograph of prescapular lymph node of Bidri goat showing mild PAS positive reaction (arrow) in the connective tissue surrounding lymphocytes (PAS stain X 100)

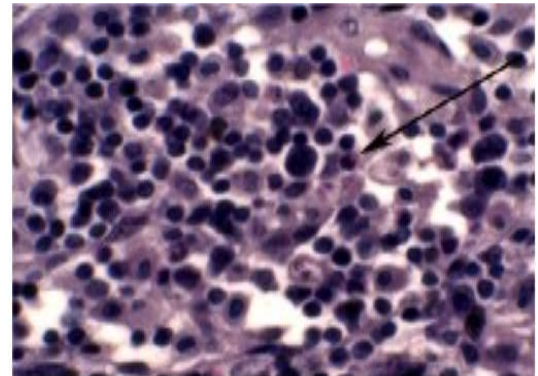


Plate 2: Photomicrograph of prescapular lymph node of Bidri goat showing mild PAS positive reaction (arrow) in the cytoplasm of lymphocytes (PAS stain X 100)

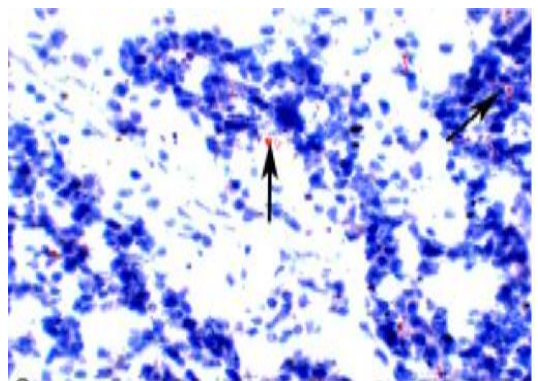


Plate 3: Photomicrograph of inguinal lymph node of Bidri goat showing lipid (arrow) in the parenchyma (Oil red O X 40)

Discussion

In the present study Capsule, trabeculae and connective tissue surrounding lymphocytes showed weak reaction for PAS in both Bidri goat and Deccani sheep. These findings were similar to earlier statements of Makoto Sugimura (1962) ^[6] in cat. However in present study capsule, trabeculae and connective tissue surrounding lymphocytes were also positive for alcian blue technique indicating the presence of sulfomucin and sialomucins. The cytoplasm of lymphocytes exhibited mild PAS reaction in prescapular, parotid, mandibular and inguinal lymph nodes in Bidri goat and prescapular, parotid and mandibular lymph nodes in Deccani sheep. This was in accordance with findings of Asha Antony *et al.* (2012) ^[1] in goat foetus. However, prefemoral lymph node in Bidri goat and prefemoral and inguinal lymph nodes in Deccani sheep did not show any PAS reaction in lymphocytes indicating very scarce to nil amount of mucopolysaccharides in cytoplasm of lymphocytes. This may be attributing to the breed and species variation. Makoto Sugimura (1962) ^[6] in cat, Magnusson & Majeed (1978) ^[7] in rat.

Trautmann and Fiebiger (2002) ^[8] in swines, Asha Antony *et al.* (2012) ^[1] in goat foetus observed fat deposits in parenchyma of lymph node. Similar observations were also recorded in the present study in prescapular and inguinal lymph nodes in both species.

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