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Radiographical, Histomorphological and Histochemical Study of Pharyngeal Tonsil in Adult Indigenous Sheep (*Ovis aries*) and Goat (*Capra aegagrus hircus*) Comparative Study

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small ruminants.

A B S T R A C T

The present study has been conducted on 24 heads of adult local sheep and goats. Their ages ranged between 4-6 months. All of them are clinically healthy and slaughtered in Mosul slaughterhouse. Samples of (1 cm) of pharyngeal tonsils have been fixed in 10% neutral formalin solution for 48 hours. The results of the X-ray study shows that the pharyngeal tonsils located in the posterior part of the nasopharynx caudal to the vomer bone in sheep and extend upwards towards the nasal septum in goats. Whereas the results of the histological and histochemical study which use the routine and special stains, respectively, show the presence of two types of reticular and non-reticular epithelium, and they have been interspersed with crypts. What is more, it is possible to notice the appearance of primary and secondary follicles. The submucosal felt sheet is characterized by the presence of colloidal and reticular fibers in addition to the presence of fatty tissue, while the glandular tissue represented by secretory units and their ducts give a positive result by using PAS-AB/PH2.5 in the pharyngeal tonsils of adult local sheep and goats. The areas adjacent to the follicle have high endothelial venules appeared large in size and few in number in sheep, and many in number and small in size in goats. Out of the present study, it can be concluded that there are differences in the location, histological composition and histochemical composition of the pharyngeal tonsil between adult domestic sheep and goats.

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Introduction

Sheep and goats are bred mainly for the production of meat, wool, hair, milk and hides, in addition to the use of their waste materials in the production of fertilizer. In Iraq, sheep and goats have been bred for thousands of years in the Mesopotamia region, which was the cradle of civilizations, where agriculture and animal husbandry flourished since the ancient times [1] It must be mentioned that the lymphatic system consists of lymphatic organs, lymphocytes and lymphatic vessels. Lymphatic organs can be divided into two parts: primary lymphatic organs, also called central lymphatic organs. They include bone marrow, lymph nodes, thymus, spleen, and the secondary lymphoid organs also called peripheral lymphoid organs. The lymphatic includes Mucosa-associated tissue (MALT), tonsils [2]. There are six types namely: lingual tonsil, palatine tonsil, soft palate tonsil located in the oropharynx, pharyngeal tonsil, tubular tonsil in the nasopharynx, and paraepiglotes in the laryngopharynx.

All the tonsils together form a ring of lymphoid tissue in the wall of the pharynx, called the "Waldeyer's ring" [3,4], of which the pharyngeal tonsil forms a large part and plays a major role in immunity and this is considered as the first line of defense for this place , where huge amounts of foreign bodies enter the body during feeding and breathing [5,6].

The present study aims at identifying the anatomical location of the pharyngeal tonsil in sheep and goats, the histological structure, cellular description and ultrastructure of the epithelial cells of the tonsil, which increased interest in tonsils in field animals. Because of its significance for the human consumption for food safety, it is infected with many diseases, including bacterial diseases that infect ruminants, such as tuberculosis [7], and viral diseases, some of which play an important part, such as foot-and-mouth disease [8] and bovine viral diarrhea. It has already been discussed by [9], scrapie and prions including transmissible spongiform encephalopathies of sheep (TSEs) [10,11]. Although there are many studies that have tackled the morphology and histology of the tonsil in different animal species, there are no comprehensive and comparative studies between two types of field animals.

Materials and Methods

The Samples of the Study

Pharyngeal tonsils have been collected from 24 clinically healthy male sheep and goats of a local breed, aged (6-9 months) for the period from November 20, 2023 to January 20, 2024, and their weights ranged from 40 to 60 kg, purchased from Mosul slaughterhouse. The head has been taken immediately after washing it with water, opening the lower jaw and making a short incision in the hard palate to reach the pharyngeal tonsil. The animals are divided as follows: 24 heads of each of sheep and goats, 12 sheep and 12 goats, 5 sheep and 5 goats for X-ray study, 7 sheep and 7 goats for histological and histochemical study.

X-ray

Using the X-ray machine in the Veterinary Teaching Hospital with the following specifications:

Name of system: SHIMADZU CORPORATIOM - AI. EQ. 1.0mm

PROTECTION: CLASS I - MANUF ACTURED: 2010 March, Made in Japan, Nishinokyo – Kuwabaracho. Nakagyo, ku. K yoto 604-8511 Japan.

The head of the animal is placed on the device table equipped with the radiographic film, using dimensions and wavelengths fixed within the device's software so that the image is clear on its computer screen. The maximum voltage of the device was (64-150 KV (MAX.TUBE Kvp at 16 milliamps per second ((MAS 16 and the distance was 90 cm)). Barium sulfate (Barex) is used in powder form, mixed with water to become a liquid, then drawn using a syringe and injected into the pharyngeal tonsil from the back to ensure the distribution of the substance within the tonsil body, where the substance spreads easily within the tissue to reach the precise location of the tonsil in male local sheep and goats.

Histological study

Histological examination using a light microscope

The samples have been collected from the pharyngeal tonsils and cut into appropriate parts of approximately 1 cm square and placed in 50 ml cylindrical tubes. The samples were fixed in Neutral Buffered Formalin Solution for 48 hours. Then the samples are treated with ethyl alcohol of increasing concentration for the purpose of dehydration starting from a concentration of 70% for 24 hours, then a concentration of 90% with two passes, each pass for 3 hours, then a concentration of 100% also with two passes at a rate of 3 hours for each pass. Xylene was used at a rate of two passes, each pass for 5 minutes, for the purpose of clearing. Then the samples passé through pure paraffin wax with a melting point of 58-60 °C twice, and one hour is allocated for each pass inside an electric oven at a temperature of 60 °C. Later on, the samples are poured into wax molds clearly marked [12,13,14]. The specimens are cut by using a rotary microtome to obtain tissue slices with a thickness of 5-7 micrometers and fixed on glass slides using a thin layer of egg albumin or what is called Mayer's adhesive [12]. The following tissue

stains were used to show the different tissue structures:

- Harris Hematoxylin and Eosin stain to determine the general tissue structure of the tonsils of both types and in preparation for taking microscopic measurements.
- Masson's Trichrome stain to differentiate between colloidal and muscle fibers.
- Van Gieson stain to differentiate between colloidal, elastic and muscle fibres distributed within the tonsil parenchyma of local male sheep and goats [15].

The following variables have been measured in the tonsil of all the studied samples:

1. Thickness of the non-reticular epithelium of the tonsil of adult sheep and goats.
2. Thickness of the reticular epithelium of the tonsil of adult sheep and goats.
3. Diameters of primary and secondary lymphoid follicles for all study samples.
4. Depth of crypt in the pharyngeal tonsil of sheep and goats.

The Histochemical study

In the present study, periodic acid-Schiff stain with Alician blue (PAS-AB/PH2.5) is used to detect carbohydrates, including acidic glycoprotein and neutral glycoprotein. Toluidine Blue used to detect Glucosaminoglycans (GASG) [14].

Microphotography

The tissue sections have been photographed by using an AmScope camera equipped with image analysis software. The microscopic camera is calibrated on the four objective lenses of the AmScope microscope using a Stage micrometer and measurements are taken using the micrometer unit.

Statistical analysis

The data of the study are analyzed by using the T-TEST and all data involved in the study have been expressed as the mean and standard error (M ± SE) to determine the statistical differences between almond variables and compare them between local sheep and goats at a significance level of $P \leq 0.05$[16].

Results and Discussion

Radiography

By using an X-ray device, the results of the current study shows the exact shape and correct location of the pharyngeal tonsils in the nasal cavity. In order to obtain an accurate image sections, barium sulfate is injected into the pharyngeal tonsils to identify their location inside the nasal cavity, where they appeared in goats extending upwards towards the nasal bone septum, whereas they extended to the end of the vomer bone in sheep. These tonsils appeared hollow in most of their parts, so the injection is not difficult and the lymphatic tissue appeared clearly, as it is shown in Figure (1). No studies have been found s in sheep and goats by using radiographs, but sources in humans are found [17,18], where X-rays is taken to determine the size of the tonsils and their location before and after removal in children.

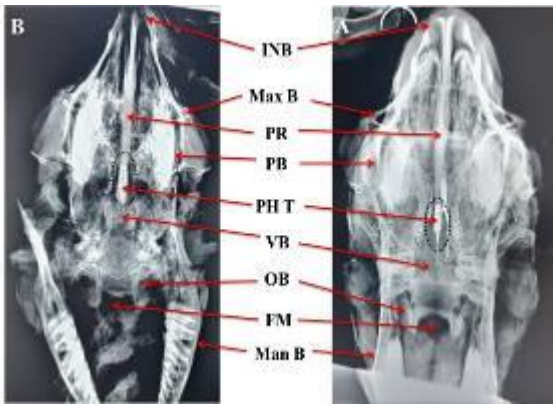

Figure 1. Radiograph of the head (ventral section) in sheep **A** and goat **B**, showing the pharyngeal tonsils **PH T**, incisor bones **INB**, maxillary bone Max **B**, palatine raphe **PR**, palatine bone **PB**, pharyngeal tonsil **PH T**, vomer bone **VB**, occipital bone **OB**, foramen magnum **FM** and mandible bone, **Man B**.

Histological Study

A light microscope is used to show the histological structure of the pharyngeal tonsils in local sheep and goats, two types of epithelium are found, the non-reticular epithelium and the reticular epithelium. The first is a pseudostratified columnar epithelium consisting of basal cells with nuclei close to the basement membrane, round to oval in shape, supported by an integral basement membrane, and ciliated columnar cells containing oval nuclei directed towards the middle part of the cell, with cilia at the cell tips, this is consistent with what has been mentioned by [19].

Goblet cells appeared vacuolated using hematoxylin and eosin staining Figure (2). This is consistent with what has been reported by [20] in horses, [19] in goats (Capra hircus), [21] in sheep, [22] in cows, and [23] in their anatomical study and histological characteristics of tonsils in field animals. Isolated cells are also found randomly distributed on the surface of the ciliated respiratory epithelium and between its cells, and they are closely related to B and T lymphocytes, as they play an important role in the immune response by creating an epithelial barrier against viral and bacterial infections. They are called intraepithelial lymphocytes (IELs).

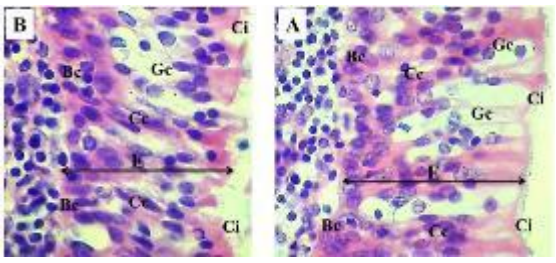

Figure 2. Microphotograph of the pharyngeal tonsils in sheep **A** and goat **B** showing the pseudostratified

columnar epithelium **E** composed of basal cells **Bc**, goblet cells **Gc**, columnar cells **Cc** and cilia **Ci**, hematoxylin and eosin, A&B - X400.

The results of the study also show the presence of lymphocytes within the submucosal layer of the felt layer called Lamina Propria Lymphocytes (LPLs), where they are spread within the components of the connective tissue under the basement membrane on which the epithelial layers are based. Both types of lymphocytes act as an independent gateway to take antigen samples and transfer them across the epithelial membrane to the B and T immune cells spread in the lymphatic tissue and stimulate immune responses. Plasma cells with acidic cytoplasm and basophilic lateral nuclei resembling a clock-face or cartwheel are clearly seen using hematoxylin and eosin stain Figure (3). This is consistent with what researchers [21] observed in sheep, where they found a small number of lymphocytes infiltrating the epithelium, as reported in the horse [20] and in the camel [24] and [25] in their histological and histochemical study of the soft palate tonsil in sheep.

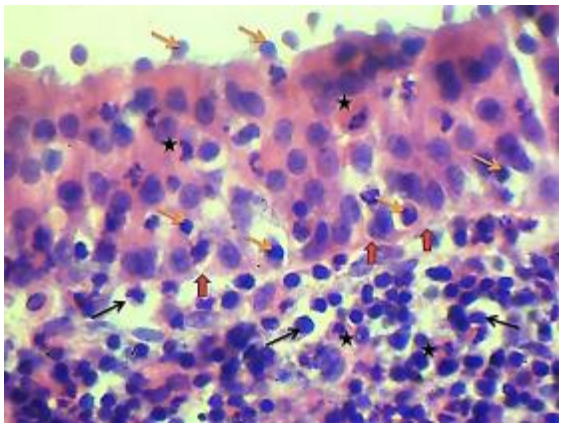

Figure 3. Microphotograph of the non-reticular epithelium of the pharyngeal tonsil in goat showing intraepithelial lymphocytes (orange arrow), intralamellar lymphocytes (black arrow), plasma cells (black star) and basement membrane (red filled arrow), H and E, X400.

The second is the reticular epithelium, which appeared in the pharyngeal tonsils of sheep and goats, simple columnar or stratified, associated with the follicle (FAE), and this is called the lymphoid epithelium or reticular epithelium as a result of the high infiltration of lymphocytes and plasma cells through it, with loss of cilia, absence of goblet cells, and discontinuous basement membrane, as in Figure (4). This is consistent with what has been mentioned by both researchers like [26,21] in their study on the nasopharyngeal tonsils in goats and sheep, respectively, and [22] in cows, where they called the epithelium close to the lymphoid follicles the lymphoid epithelium, which differs in its cells from the respiratory epithelium covering the nasopharyngeal tonsil.

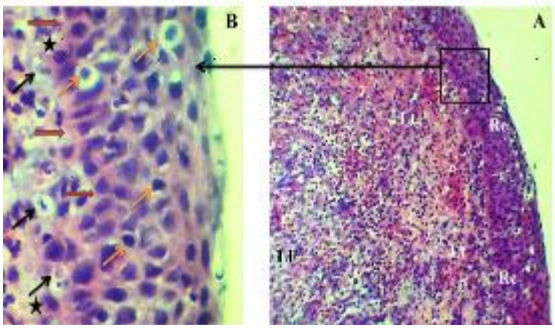

Figure 4. Microphotograph of the reticular epithelium of the pharyngeal tonsil in sheep **A**, showing reticular epithelium **Re**, diffuse lymphoid tissue **Lt**, lymphoid follicles **LF** and **B** showing intraepithelial lymphocytes (orange arrow), intralamellar lymphocytes (black arrow), plasma cells (black star) and basement membrane (filled red arrow), H and E, A- X100, B- X400.

The results of the present study show that there is no significant difference in the thickness of the epithelium of both types between local sheep and goats, as it is shown in Table (1), but the thickness of the non-reticular epithelium is higher compared to the reticular epithelium (99.5-54.9 micrometers) in sheep, respectively, whereas in goats (101.4-53.9 micrometers), respectively. This may help facilitate the movement and transfer of lymphocytes towards the surface of the epithelium to receive antigens and generate immunity.

This is relevant to what has already been stated by [27] in his histological study of the pharyngeal tonsil in goats, where the height of the pseudostratified columnar epithelium was 87.33±1.20 µm and the height of the epithelium associated with the follicle was 52.33±5.21µm. Primary and secondary crypts or tufts extend from the epithelium, dividing the pharyngeal tonsil parenchyma into several lobes, and this was clear in sheep and goats.

Table 1. The histological measurements of the pharyngeal tonsils in local sheep and goats using the micrometer unit of measurement.

Parameters (µm)	Pharyngeal tonsil		T-Value	P-Value
	Sheep M±SEM	Goats M±SEM		
Thickness of pseudostratified columnar epithelium	99.5±1.01	101.4±2.01	0.881	0.39
Reticular lymphoid epithelium thickness	54.9±0.81	53.9±1.66	0.517	0.61
Primary lymphoid follicle diameters	*480.4±2.40	436.4±3.78	9.74	0.00
Diameter of secondary lymphoid follicles	*389.6±3.35	269.1±2.32	29.55	0.00
Depth of the crypt	*1802.1±22.3	997.9±20.5	26.52	0.00

M ± SEM: Mean and Standard Error
* Indicates a statistically significant difference between both species (same row) for each variable.

These tufts appeared covered with a pseudostratified columnar epithelium and sometimes changed to lymphoid epithelium due to the presence of lymphoid follicles near them, as it is clear in Figure (5). This is relevant to what has been proved by [28] in his study of age-related changes in the pharyngeal tonsils of bulls of the type (*Bos grunniens*). The depths of these tufts and the extent of their extension within the tonsil tissue are quite different, as the statistical results showed that the depth of the tufts in sheep is higher than in goats, Table (1).

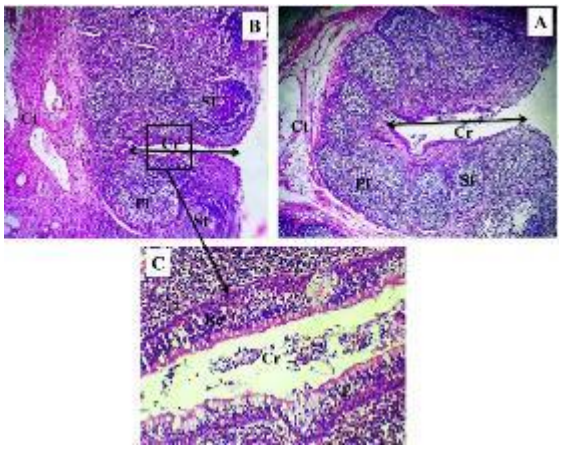

Figure 5. Histological image of the pharyngeal tonsil in sheep **A** and goat **B** showing the ferrule **Cr** and the double-headed arrow shows their depth, primary lymphoid follicles **Pf**, secondary lymphoid follicles **Sf**, connective tissue **Cf**, while the histological section **C** represents the magnified part of the crypts epithelium of the pharyngeal tonsil in goats showing the reticular epithelium **Re**, non-reticular epithelium **E** and the ferrule **Cr**, H and E, A&B- X 25, C- X100.

The results of this study in the pharyngeal tonsils of local sheep and goats show that the lymphatic tissue appeared as a lymphatic nodule represented by primary and secondary follicles and a lymphatic diffuse tissue around the lymphatic follicles (peri-follicular lymphoid tissue) and between them (interfollicular lymphoid tissue).

What is more and in addition to the appearance of the marginal zone at one end of the secondary lymphoid follicle, the marginal zone, whose center often appears pale due to the presence of the germinal center, this goes with what is explained by [29] for the lymphoid follicles in the soft palate tonsil of the horse and [30] for the pharyngeal tonsil in the buffalo.

The diameters of the lymphatic follicles differed, and using statistical analysis, the diameters of the primary and secondary follicles in sheep appeared larger than those in goats, as it is shown in both Table (1), Figure (6). This is consistent with [27] in his histological study of the pharyngeal tonsils in goats and with [31] on the numbers and sizes of lymphatic follicles and the differences between types of tonsils in their study of the morphological description of tonsils in bulls by using Masson's trichrome stain for tissue sections of the pharyngeal tonsils in sheep and goats, collagen fibers appeared under the epithelial tissue and between the lymphocytes in the nodular and diffuse tissue, Figure (7).

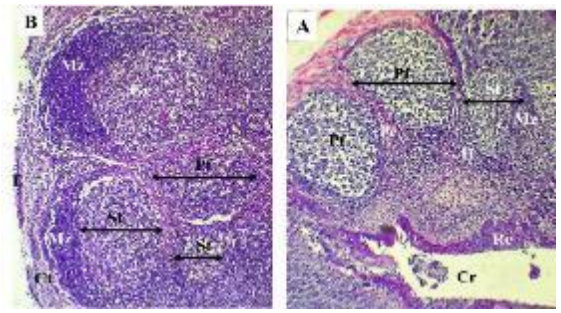

Figure 6. Histological image of the pharyngeal tonsil in sheep **A** and goat **B** showing the diameter of the primary follicle **Pf**, the secondary follicle **Sf** (double-headed arrow), the germinal center **Gc**, the marginal zone **Mz**, the interfollicular tissue **If**, the perifolliculus **Pe**, the ferrule **Cr**, the reticular epithelium **Re**, the non-reticular epithelium **E**, the connective tissue **Ct**, H and E, X40 - A&B.

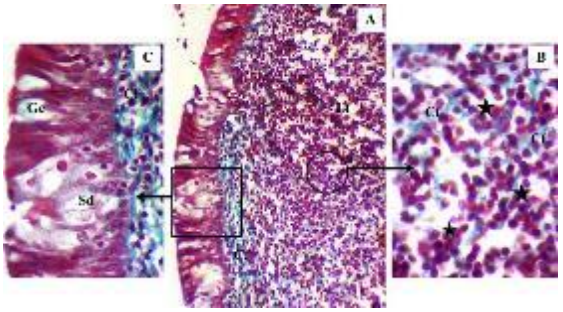

Figure 7. Histological section of the pharyngeal tonsil in sheep **A**, showing the pseudostratified columnar epithelium **E**, the lymphoid follicle **Lf**, and the collagen fibers **Cf**, B is an enlarged section of the lymphoid follicle showing the presence of collagen fibers **Cf** between the black star lymphocytes, **C** is an enlarged part of the pseudostratified columnar epithelium with the presence of the secretory duct of the glands **Sd** and the goblet cells **Gc**, Masson's Trichrome stain, A- X100, B&C- X400.

In addition to the presence of colloidal fibers surrounding the lymphatic follicles distributed below the pharyngeal tonsil and between the blood vessels and around the lymphatic vessels, they also appear around the cross-sections of the muscles that extended below the pharyngeal tonsil in the areas of their connection to the tissues located in the nasal cavity, Figure (8). This is relevant to what is mentioned by [32] in his study of the pharyngeal tonsils in sheep in vivo and outside the laboratory, and with what was mentioned by [33] in his study of embryonic growth and the formation of the germinal center of the lymphoid follicles in the pharyngeal tonsils of cows.

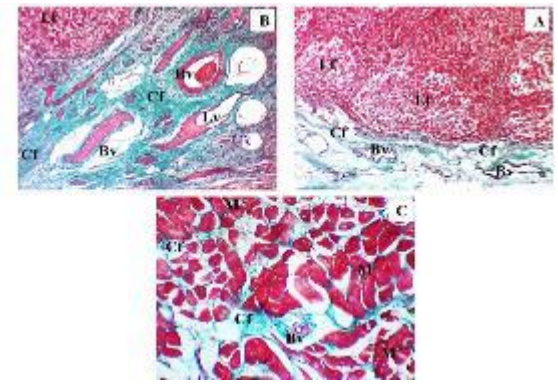

Figure 8. Microphotograph of the pharyngeal tonsil in sheep **A, C** and goat **B**, showing the distribution of colloidal fibers **Cf** around the lymphatic follicles **Lf** in **A**, and surrounding them with blood and lymphatic vessels in **A, B** and **C**, and in **C** they extended around the muscle sections M, Masson's Trichrome stain, A&B&C- X100.

By using Van Gieson stain for histological sections of the pharyngeal tonsils in local sheep and goats, elastic fibers are found surrounding the lymphoid follicles, and are also observed between the lymphocytes in the form of thin threads, and appear within the layers of the blood vessel wall and between the secretory units of the glands with colloidal fibers, Figure (9).

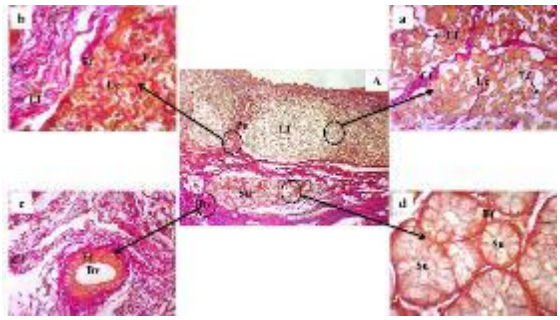

Figure 9. Histological section of the tonsil in local sheep **A- b&c**, showing the presence of elastic fibers **Ef.** In a, we notice the thin elastic fibers (black arrow) between the lymphocytes **Lc** accompanied by thin bundles of colloid fibers **Cf**. In **b**, we notice the elastic fibers, perifollicular area **Pe** followed by colloid fibers **Cf**. **c**, we notice the presence of elastic fibers within the blood vessel layers **Bv**. **d**, shows the presence of elastic fibers **Ef** accompanied by colloid fibers **Cf** around the serous secretory units **Su**, Van Gieson stain, A- X40, - a&d X400, - b&c X100.

When examining the tissue slides of the pharyngeal tonsils in both sheep and goats using 400X magnification, the results of the study show that the lymphoid follicles are composed of B and T lymphocytes, plasma cells, reticular cells, and macrophages, Figure (10) and Figure (11), where all of these types of cells are found in the nodular and diffuse lymphoid tissue. Moreover, the results of this study show the presence of high endothelium veinules (HEVs) in large sizes and small numbers in the tonsils of sheep, while in goats they appeared in small sizes and large numbers and were distributed around the lymphatic follicles and between them and under the epithelium where they are lined with high cuboidal cells and play a fundamental role in facilitating the entry of lymphocytes from the bloodstream into the lymphatic tissue, Figure (12).

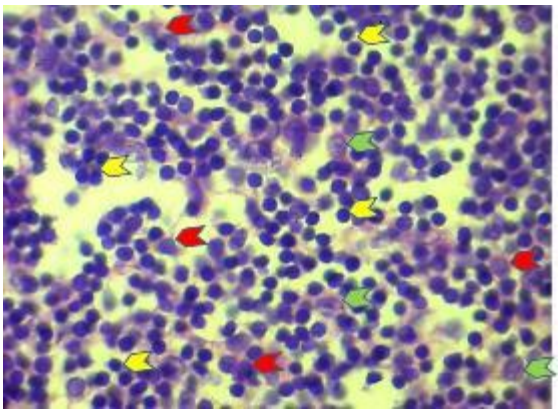

Figure 10. Histological image of the tonsillar follicle in goats, where the (red arrowhead) indicates the reticular cells, the (yellow arrowhead) indicates the lymphocytes and the (green arrowhead) indicates the macrophages, H and E, X400.

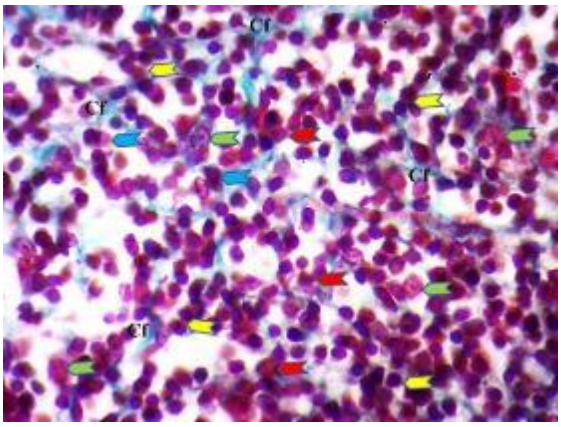

Figure 11. Microphotograph of the tonsillar follicle in goats, where the (red arrowhead) indicates the reticular cells, the (yellow arrowhead) indicates the lymphocytes, the (green arrowhead) indicates the macrophages, and the (blue arrowhead) indicates the plasma cells and colloid fibers **Cf**, Masson Trichrome stain, X400.

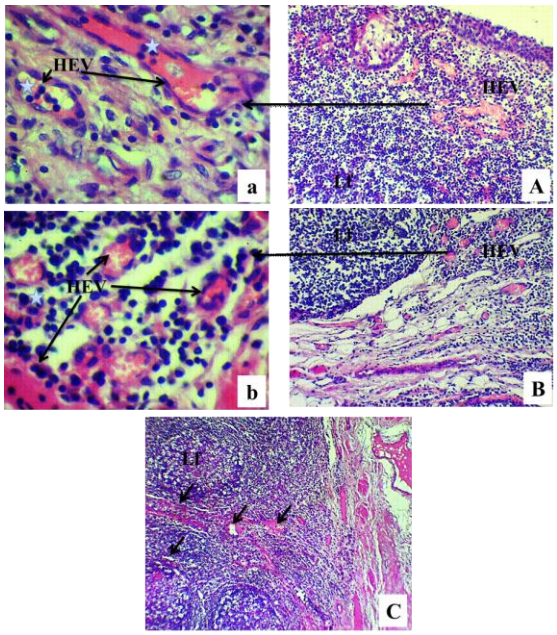

Figure 12. Histological section of the pharyngeal tonsil **A** and a – in sheep, **B** , **b** and **C** in goats showing the high endothelial veins **(HEV)** under the epithelium and between the lymphatic tissue in image **A**, around the lymphoid follicles **Lf** in section **B** where sections **a** and **b** are magnified images where we notice the presence of lymphocytes within the high endothelial veins (blue star) and in image **C** also the high endothelial veins spread between the lymphoid follicles and around them the (black arrow), Hematoxylin and Eosin, A&B&C- X100 - .a&b- X400.

This is consistent with what is achieved by [34] in their study of the superstructure of cells, blood vessels and lymphatics in humans and animals, and also consistent with [35] in their comparative histological study of the pharyngeal tonsils in humans.

The irregular layers of smooth muscle extending between the lymphoid tissue and the mucous secretory units will be dominant ones in our study, if they are compared to the serous secretory units of the glands and their excretory ducts, except in a few places where the glandular tissue breaks and extends into the connective tissue of the felt sheet.

Finally, the two types of units have been surrounded by adipose tissue Figure (13B), which is consistent with what is mentioned by [25] in their histological and histochemical study of the soft palatine tonsils in sheep. The internal and external glandular ducts are lined by simple cuboidal to stratified cuboidal epithelium and opened towards the free surface of the epithelium, Figure (14 and 13A).

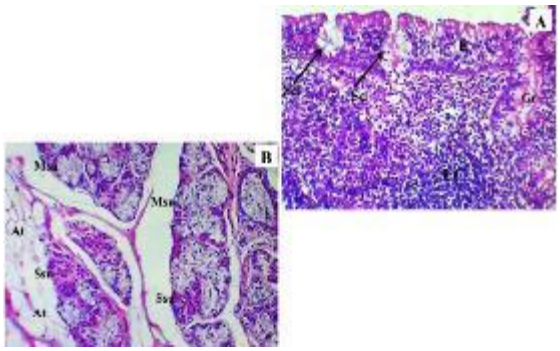

Figure 13. Histological image of the pharyngeal tonsil in goat, **A** shows the secretory units **Sd** ducts opening into the non-reticular epithelium, **E**, the ferrule **Cr** extending between the lymphoid follicles **Lf** and in section **B** we note the mucous secretory units **Msu** and serous secretory units **Ssu** with the presence of fatty tissue **At**, H and E, A&B – X100.

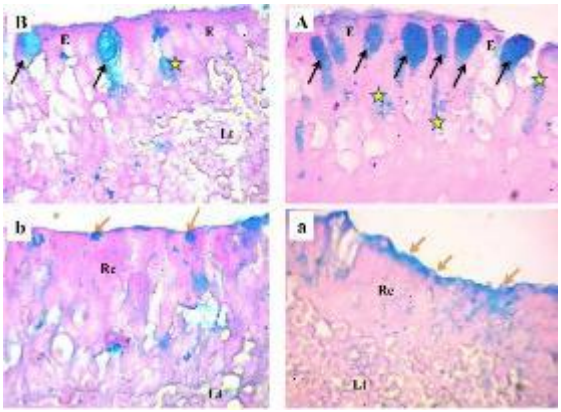

Figure 14. Microphotograph of the pharyngeal tonsil in sheep **A,a** and goat **B,b**. Images **A** and **B** show goblet cells (black arrow), secretory unit ducts (yellow star), in addition to the presence of lymphoid tissue **Lt**. Images **a** and **b** show the reticular epithelium **Re**, where the outer surface of the epithelium responds to the Alcian blue dye (orange arrow), PAS-AB/PH2.5, X400.

Histochemical Results

The results of the current study by using periodic acid-Schiff stain with Alician blue PAS-AB/2.5 for the pharyngeal tonsil in sheep and goats show staining of the goblet cells of the pseudo-stratified columnar epithelium that presented a hollow appearance using routine staining.

The goblet cells appear strongly positive for this stain, which is used to detect acidic glycoprotein and neutral glycoprotein. The outer surface of the retinal epithelium is stained blue, indicating the presence of acidic glycoprotein. This is relevant to what was stated by [36], when they used periodic acid-Schiff stain to show the goblet cells of the tubal tonsil epithelium in sheep, and [29], in their study of the same tonsil in horses.

Most of the secretory units of the glands and their ducts extending towards the epithelium have also been strongly positive for PAS/AB2.5 staining and present an interesting pattern and distribution, Figures (14 and 15). This is in agreement with [20]

in their study of the pharynx and pharyngeal tonsils in horses.

Toluidine blue stain, which is used to detect glycosaminoglycans, metachromasia appeared in the pseudostratified columnar epithelium of the pharyngeal tonsil in sheep and goats, and a number of epithelial cells and some cells lining the secretory units were stained. Whereas in the retinal epithelium, the lymphocytes within the epithelium took on a pink color indicating the presence of Glycosaminoglycansfal, and their presence has not been observed in the lymphoid follicles of both sheep and goats, Figure (16). This is consistent with [22] in his study of the pharyngeal tonsils in cows.

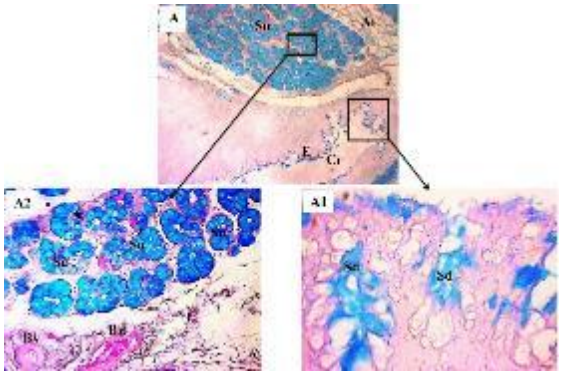

Figure 15. Histological image of the pharyngeal tonsil in sheep **A, A1, A2 -** Image **A** shows the epithelium, the **Cr** ferrule and the **Su** secretory unit clusters, Image **A1** is an enlarged section of the epithelium, Image **A2** shows the staining of the secretory units of the glands in addition to the appearance of blood vessels **Bv**, periodic acid-Schiff with Alician blue. X40 A-A1 and A2 X 100.

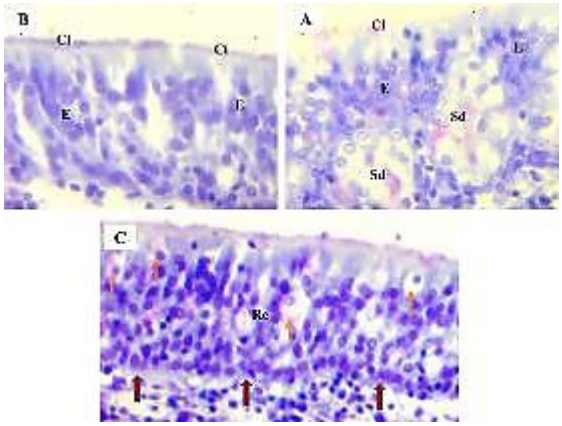

Figure 16. Histological sections of the tonsillar epithelium of sheep **A** and goats **B, C** showing the heterochromia of the pseudo-stratified columnar epithelium **E**, secretory unit ducts **Sd,** cilia **Ci,** and lymphoepithelial cells (orange arrow) as well as the protrusion of the basement membrane bulging (red arrow), Toluidine blue, X400.

Conclusions

This study combines X-ray techniques, integrated histological studies, and a histochemical study of the entire structure of the pharyngeal tonsil. The results of the X-ray study shows that the pharyngeal tonsils of adult local sheep and goats are located in the posterior part of the nasopharynx caudal to the vomer bone in sheep and extend upwards towards the nasal septum in goats. Whereas the results of the histological and histochemical study, show the presence of two types of reticular and non-reticular epithelium, and they have been interspersed with crypts of greater length in sheep compared to goats. What is more, it is possible to notice the appearance of primary and secondary follicles with large diameters in the tonsils of sheep and smaller diameters in the pharyngeal tonsils of goats, while the glandular tissue represented by secretory units and their ducts give a positive result by using PAS/AB2.5 in the pharyngeal tonsils of adult local sheep and goats.

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Conflict of Interests

The authors declare that there is no conflict of interest regarding the publication of this work.

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