HISTOLOGY OF LYMPHOID TISSUE

Introduction

Lymphoid tissue, which forms the basis of the body's immune system is organized into diffuse and follicular lymphoid tissue. The main cell of the tissue Lymphoid is the lymphocyte, which is responsible for the functioning of the system immune system. Although morphologically identical, small lymphocytes can to be differentiated according to their function into two categories: B lymphocytes, which in Mammals probably undergo their maturation in the bone marrow (in the bursa of Fabricius in birds), and T lymphocytes, which undergo their maturation in the thymus.

B lymphocytes have the ability to transform into plasma cells, capable of produce circulating antibodies specific to an antigen. The antibodies, once Released, they bind to the antigen and inactivate it. Furthermore, the binding of the antibody to The antigen can stimulate phagocytosis (opsonization) or cause activation of the complement, leading to neutrophil chemotaxis, and sometimes lysis of the invasive agent.

T lymphocytes do not produce antibodies, but they are the origin of the cellular immune response. It is the T lymphocyte response that participates to the phenomena of transplant rejection. Several subgroups of T and B lymphocytes exist as memory cells, effector T cells, and T cells killers, whose nature is discussed in numerous histological works. When The T lymphocyte is activated by an antigen; it releases cytokines, which are substances that activate macrophages, attracting them to the site of antigenic invasion and increase their phagocytic capabilities. Frequently, T lymphocytes cooperate in the action of B lymphocytes.

1. HISTOLOGY OF THE SPLEEN

The spleen is the largest of the lymphoid organs, and with the exception of the glands hemales (related to blood circulation) it is the only organ specialized in blood filtration.

The spleen, like the lymph nodes, has a collagenous framework.
inside of which is suspended a reticulin mesh.
It is surrounded by a capsule, itself covered by a serous membrane, the peritoneum. Numerous trabeculae pass from the capsule into the interior of the organ.

At one point on the surface of the spleen there is a deep notch, **the hilum** where the Blood vessels enter and exit.
The **splenic parenchyma or pulp** is of 2 distinct types:

- White pulp : 7% lymphoid tissue that surrounds and follows the arteries. By At intervals it thickens into ovoid masses, **the splenic modules** or **corpuscles of Malpighi.** .

- The red pulp : 79% is abundant, often forms strands, **the cords of Billroth** in contact with numerous red blood cells. They are formed from a tissue of structure very rich in blood cells, lymphocytes and plasma cells.

The structure of the spleen and the relationship between red and white pulp depend on the arrangement and distribution of blood vessels.
The arteries are closely linked to the white pulp and blood vessels.
terminals (sinuses and veins) to the red pulp. The venous sinuses are numerous lacunar, dilated, anastomosed, and perforated venous capillaries.
The trabeculae delimit numerous compartments or lobules within the

missed.

A lobule is approximately 1 mm in diameter and is bordered by several trabeculae, each The lobule is supplied by a central artery and drained by veins that run in the trabeculae to exit the lobule. The lobulation is not very distinct because the lobules are not completely delimited by trabeculae.

Vascularization

To understand the organization of the spleen, one must know its vascularization. The splenic artery enters through the hilum and divides into trabecular arteries which distribute via the bays. Upon exiting the bays, the vessels enter the parenchyma where they are surrounded by a lymphoid sheath and sometimes follicles lymphoid vessels; these vessels are the central arteries. The central arteries penetrate

in the red pulp where they lose their lymphoid sheaths and divide into numerous straight vessels called **penicillate arteries.**

These small vessels have 3 regions: **the pulp arterioles,** the **sleeve arterioles** and **terminal capillaries.** It is not known for certain if The terminal arterial capillaries drain directly into the sinusoids (closed circulation) or if they flow into the red pulp strands (open circulation). The sinusoids are drained by the pulp veins, which converge in the trabecular veins and join the splenic vein

2. HISTOLOGY OF THE LYMPHATIC LYMPH NODE

2.1 General Structure

The lymph node is a lymphoid organ with a reticular structure located on the path of the lymphatic flow. This mass of lymphoid tissue is surrounded by a capsule of connective tissue.

Each lymph node is a small, bean-shaped organ (1 to 25mm in diameter) possessing a notched hilum. The lymph nodes are whitish in color when fresh When stained with hematoxylin and eosin, a section appears as a mass of tissue violet surrounded by a capsule of connective tissue. The capsule gives off trabeculae at starting from various points on its convex surface towards the center of the ganglion and a set branched trabeculae extend inwards towards the notched surface of the

The hilum. The ganglion is made up of 2 parts:

- One peripheral, dense, strongly colored area: cortical zone or cortex characterized by the presence of lymphoid nodules.
- the other central pale and lacunar-appearing area: this is the medullary zone in in which the lymphoid tissue is arranged in the form of anastomotic cords irregular.

2.2 Histological structure

2.2.1 The framework

The capsule is a compact envelope made up of tightly packed bundles of fibers Collagen can also be found in the capsule, a loose network of elastic fibers, especially along its inner surface as well as some smooth muscle fibers. At the level of the

At the hilum, the capsule thickens considerably, with dense trabeculae of collagen fibers. project inwards from each ganglion, thus dividing the cortex into a certain number of incomplete compartments.

In the medulla, the trabeculae branch extensively and eventually merge with the connective tissue of the hilum. The **capsule, the hilum, and the trabeculae** These form **the collagen framework of the lymph node.** Inside this framework, there is a mesh of reticulin fibers, enclosing reticular cells and Fixed macrophages. The spaces within the endoplasmic reticulum form **sinuses lymphatic vessels,** through which lymph filters; these sinuses contain cells free.

2.2.2 The cortex

The cortex is located at the periphery of the organ, limited externally by the capsule and beyond, by adipose tissue. It is very rich in lymphoid tissue. lymphoid follicles are organized here into relatively circumscribed clusters. **Lymphoid follicles** are rounded in shape and are distributed in a single layer In the cortex, they are separated from the septa or capsule by the sinuses, pathways of lymph flow in the cortex.

There is only one follicle, or at most two in the region between two septa. The follicle is vascularized by an arteriole that penetrates it through its deep zone; this is to say the one that is closest to the medulla. It quickly gives some capillaries that lead to the superficial zone of the follicle or to the parts lateral. These capillaries anastomose at the periphery with other capillaries. In The venous drainage process begins deep within the cortex, heading towards the medullary.

Follicles can be composed of small lymphocytes, which are called then the primary follicles, either carrying in their center a more cellular zone clear, so-called Flimming germinal center, surrounded by a peripheral ring of small lymphocytes: these are the secondary follicles.

The follicles possess a network of reticular tissue identical to that of the sinuses in which house numerous lymphocytes. If germinal centers exist, they appear as clear areas with fewer and more cells

spaced only at the periphery of the follicle, sometimes at the mitotic stage, possessing a basophilic cytoplasm.

3. HISTOLOGY OF THE THYMUS

The thymus is a bilobed lymphoid organ located in the mediastinum above
of the large blood vessels of the heart; its main functions are the production, the
maturation and destruction of T lymphocytes. The thin connective tissue of the capsule
It sends septa across the organ, which it divides incompletely into lobules.
The thymus, unlike the previous lymphoid organs, is derived from the endodermis.
primary, and is secondarily invaded by lymphocytes.
Furthermore, the thymus does not possess lymphoid follicles; it is divided into a
outer cortex composed of reticular epithelial cells, macrophages and
small T lymphocytes (thymocytes), and in an inner medulla less marked by
the dyes, composed of reticular epithelial cells, large lymphocytes and
of thymic corpuscles (of Hassall). Blood vessels reach the medulla
through the connective tissue partitions, which they leave at the cortico- junction
medulla, where they send capillary loops to the cortex. These capillaries are
of the continuous type and are surrounded by reticular epithelial cells that isolate them
Cortical lymphocytes thus form the blood-thymic barrier. The vessels
Blood cells from the medullary plexus have no particular characteristics and do not present any
of the blood-thymic barrier.
The thymus is drained by venules located in the medulla which also receive
blood from the cortical capillaries. The reticular epithelial cells form a
A specialized barrier between the cortex and the medulla, preventing the leakage of substances
from the medulla to the cortex. The thymus reaches its maximum development just
after birth; it involutes after puberty and then becomes infiltrated with adipose tissue.
However, even in adults, the thymus retains its ability to form
lymphocytes.

SUMMARY AND COMPARISON OF LYMPHOID ORGANS

LYMPH NODE

The lymph node is composed of a cortex and a medulla.
The cortex contains lymphatic follicles that may possess centers
germinal, marginal sinus and sinuses located along the trabeculae. The medulla
is formed of cords, sinuses, and trabeculae. The capsule and trabeculae are
composed of dense connective tissue containing smooth muscle fibers
scattered throughout the first. The lymph node filters the lymph, a product of
New lymphocytes possess phagocytic capabilities, removing impurities
of the lymph. It is also involved in immunological reactions.

MISSED

The spleen is composed of red pulp and white pulp, not a cortex.
and a medullary plexus. The red pulp contains all types of blood cells and
venous sinuses. The white pulp surrounds the arteries and thickens in places.
follicles that lack a germinal center in adult humans. The spleen is capable
of phagocytosis. It forms new lymphocytes and plasma cells and it
It influences the metabolism and distribution of red blood cells. Finally, it
plays a role in the immunological response.

TONSIL

The tonsil is a mass of lymphoid tissue embedded in the wall of the throat.
is covered by a stratified squamous epithelium that extends into the
Organ substance, constituting pits or crypts. Lymphatic follicles
Those equipped with germinal centers are grouped around the crypts. There are no sinuses.
The amygdala produces lymphocytes.

THYMUS

The thymus is divided into a cortical part and a medullary part and consists of
mainly epithelial cells and lymphocytes (thymocytes).
The medulla contains thymic corpuscles. The cortex is made up of a
dense mass of thymocytes and epithelial cells.

The thymus produces lymphocytes and probably a humoral substance capable to stimulate the formation of lymphocytes in other lymphoid organs. It is to This fact is responsible for the establishment and regulation of immunological reactions.