Ministry of Higher Education
& Scientific Research
Al-Muthanna University
Faculty of Pharmacy

وزارة التعليم العالي والبحث العلمي
جامعة المثنى
كلية الصيدلة

First stage

Faculty of Pharmacy

Al-Muthanna University

Second semester of 2023-2024 academic years

Theory Histology

Lec. (4)

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Digestive System part two

Liver :

The liver is the second – largest organ of the body and the largest gland.

***Structure of liver*:**

A- Capsule

The liver is covered by a thin fibrous C.T capsule ***(Glisson's capsule)*** sends septa into the substance of the liver to subdivided the parenchyma into lobules.

Lobules

The basic structural component of the liver is the **liver cell** , or **hepatocyte** . The epithelial cells are grouped in interconnected plates. The liver lobule (structure units of liver) is formed of a polygonal mass of tissue, with portal spaces **(portal triad)** at the periphery of the lobules , contain ***C.T*** . , ***bile ducts , lymphatic , nerves , and portal vein , hepatic vessels venule*** and ***arteriole*** . The human liver contains three to six portal spaces per lobule.

- In the center of lobule contain vein called the **central vein** or **centrolobular vein**.
- The hepatocytes in the liver lobules are radially disposed and arranged like the bricks of a wall. These cellular plates are directed from the periphery of lobule to the central vein and anastomose freely, forming a labyrinthine & spongy like structure.

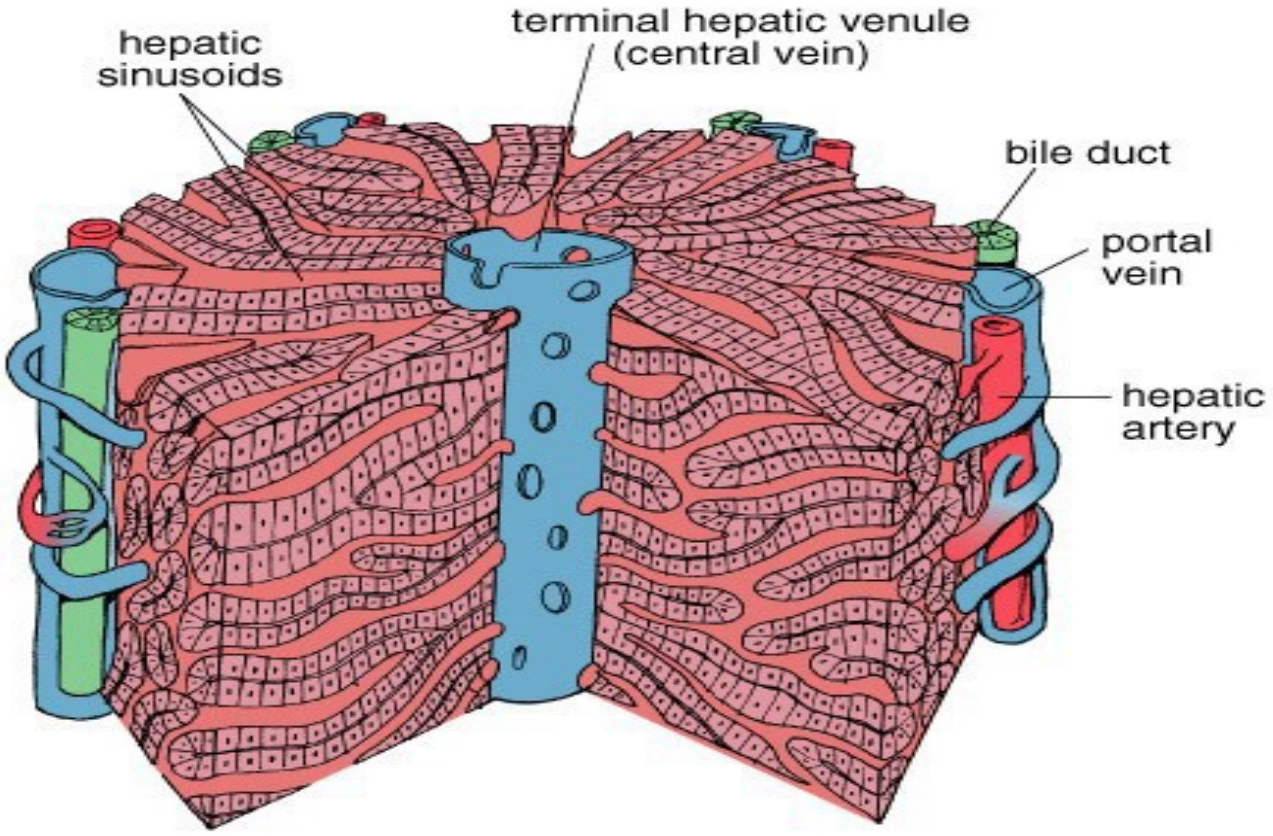


Figure 17.3. **Diagram of a "classic" liver lobule.**

- Liver Sinusoids :

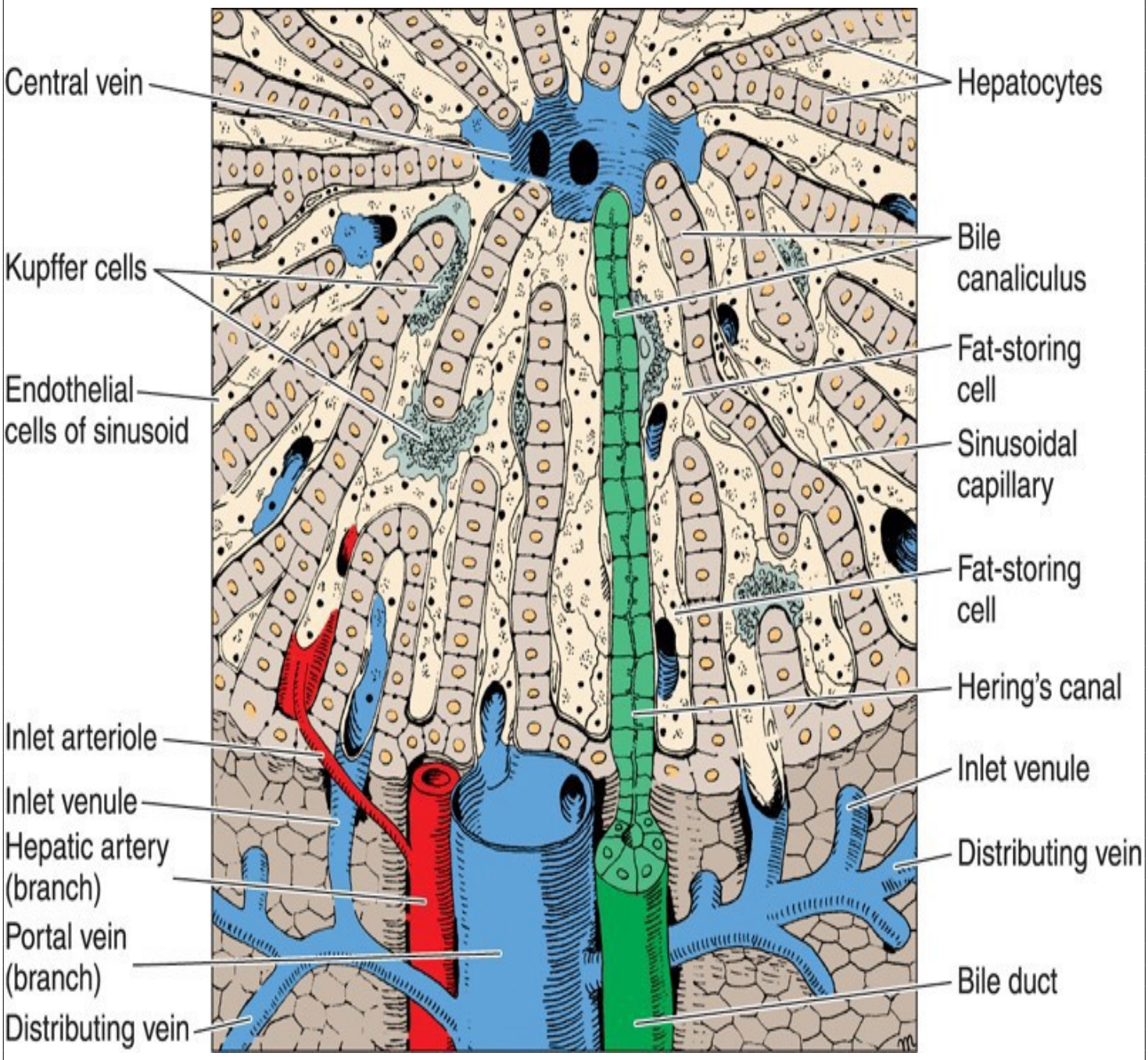
The space between the hepatocytes contains fenestrated endothelial cells and discontinuous basal lamina capillaries ***(Sinusoidal capillaries)*** contain macrophages known as ***kupffer cells***.

Hepatocytes:

It's polyhedral cell, with six or more surfaces, has one or two large rounded nuclei.

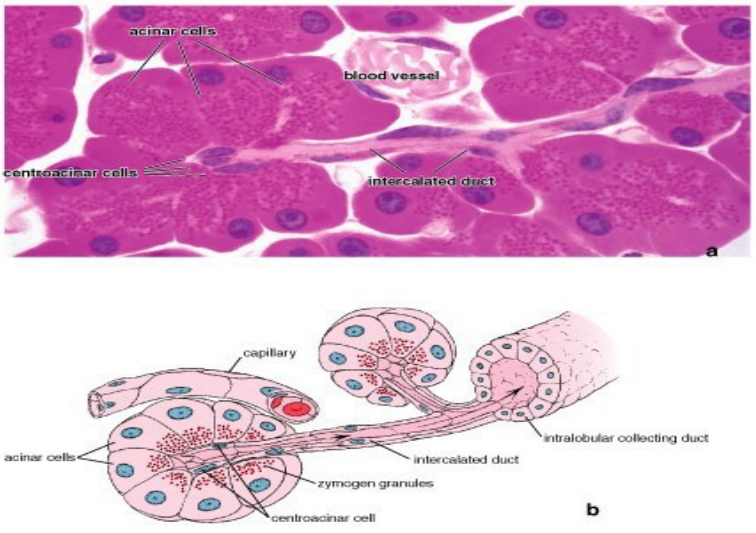
perisinusoidal space

There are very narrow subendothelial space known as the ***space of Disse*** separates the endothelial cells from the hepatocytes by a thin discontinuous basal lamina. In the space of Disse, **fat – storing cells** also called ***Ito's cells***, with small lipid droplets contain vitamin A



Gallbladder :
The gallbladder is a hollow, pear – shaped organ attached to the lower surface of the liver.
The Gallbladder consist of :
1- Mucosa: The empty gallbladder has numerous deep mucosal folds**.**
A- Epithelium is simple columnar epithelium
B- Lamina propria is particularly rich in fenestrated capillaries and small and present mucous glands near the cystic duct are responsible for the production of most of the mucus present in bile .
The wall of the gallbladder lacks a muscularis mucosae and submucosa.
C- Muscularis externa : It has numerous collagen and elastic fibers among the bundles of smooth muscle cells are somewhat randomly oriented .
D- Adventitia and serosa
Pancreas
It is elongated gland covers by a thin capsule of ***loose C.T.*** and sends septa into it, separating the pancreatic lobules.
- The pancrease is a mixed exocrine – endocrine glands that produces digestive enzymes and hormones.
The exocrine portion of the pancreas is a gland are formed by several *serous cells* **(aciner cells)**, surrounding a very small lumen. The acini are surrounded by a basal lamina that is supported by sheath of reticular fibers. The acinar cells has spherical nucleus and characterized by distinct basophilia in the basal cytoplasm and acidophilic zymogen granules in the apical cytoplasm, and typical protein- secreting cells .

- The secretion is transported by excretory ducts in the exocrine pancrease start from the center of individual acini as **centroacinar cells** to **intercalated ducts** to **interlobular ducts** to **main pancreatic duct** which join by **main bile duct** which open into the duodenum at the **hepatopancreatic ampulla**.
The endocrine portion : The endocrine components of pancrease appear as rounded clusters of cells embedded within the exocrine pancreatic tissue known as **islets of Langerhans**, each islet surrounded by a fine capsule of reticular fibers and separating it from the adjacent pancreatic tissue . Each islet consist of polygonal or rounded cells , arranged in cords separated by a network of blood capillaries essential for the secretory process .
- ***Islets of Langerhans*** : composed many types of cells :
1- Alpha cells : The population about 20 % of islet's cells produce hormone ***glucagon*** , which accelerating the conversion of glycogen , amino acids , fatty acids in the liver cells to glucose .
2- Beta cells : The population about 70 % of islet's cells produce the hormone ***insulin*** , which accelerating conversion of glucose into glycogen in liver cells .
3- Delta cells : It is about 5 % cell which decrease and inhibits secretory activities of both alpha and beta cells
4- Pancreatic polypeptide cells (PP) : It's produce the hormone ***pancreatic polypeptide*** , which inhibits production of pancreatic enzymes and alkaline secretions



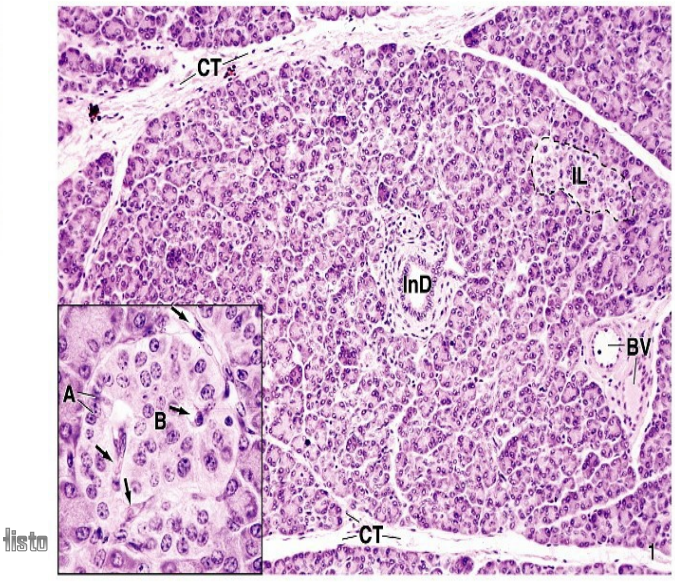


Figure 17.20. **Photomicrograph (X860) and diagram of a pancreatic acinus and its duct system.**

Salivary glands :

The salivary glands produce about 1200 ml of saliva a day their secretions into the mouth via large excretory ducts .

The major salivary glands are surrounded by a capsule of dense connective tissue , rich in collagen fibers , the parenchyma of the glands consist of secretory end pieces & a branching duct system arranged in lobules , separated by septa of connective tissue originating from the capsule . The secretory end pieces present two types of secretory portions is followed by a duct system which conduct the saliva to the oral cavity .

- Acini are of three types :-

1. ***Serous acini*** which contain serous cells & are generally spherical .

2. ***Mucous acini*** which contain only mucous cells and are more tubular & have a cap of serous cells known as serous demilunes .

3. ***Mixed acini*** which contain both serous & mucous cells .

The cells of Salivary gland acini :

1. ***Serous cells*** are pyramidal in shape. The serous cells are easily distinguished from mucous cells by their rounded nuclei and basophilic cytoplasm .

2. ***Mucous cells*** are cuboidal to columnar in shape , the nuclei are oval and pressed toward the bases of the cells.

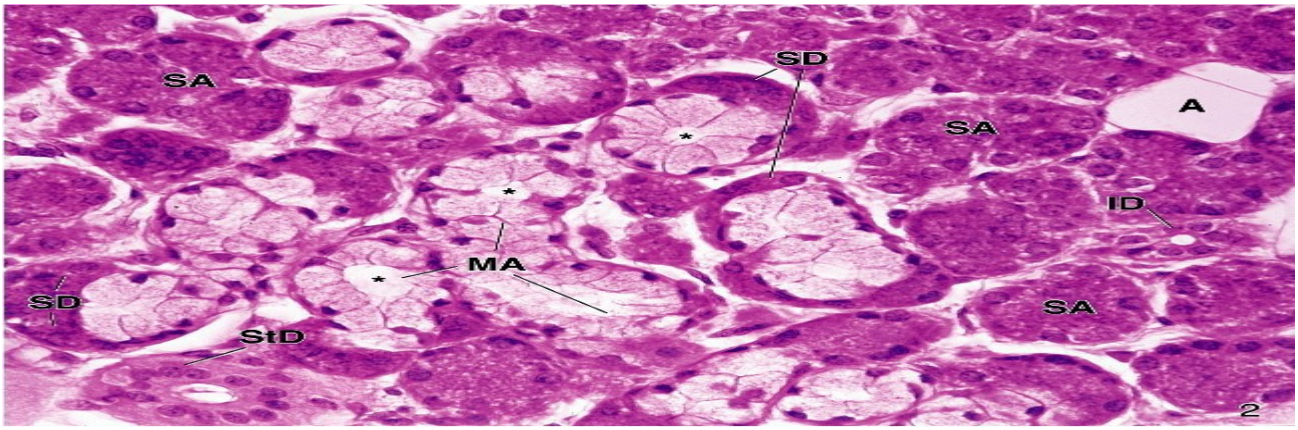
3. ***Myoepithelial cells*** are spindle shape exhibit characteristics of smooth muscle cells including contractility which accelerates the secretion of saliva and prevention of the end piece destination during secretion due to the intraluminal pressure .

Major types of Salivary glands :-

1. ***Parotid gland :*** It is a purely serous gland whose capsule sends septa containing adipose cells , divided the gland into lobes and lobules , serous acini which composed of serous cells. The serous acini surrounded by myoepithelial cells and numerous intercalated ducts , **striated ducts** are large & conspicuous .

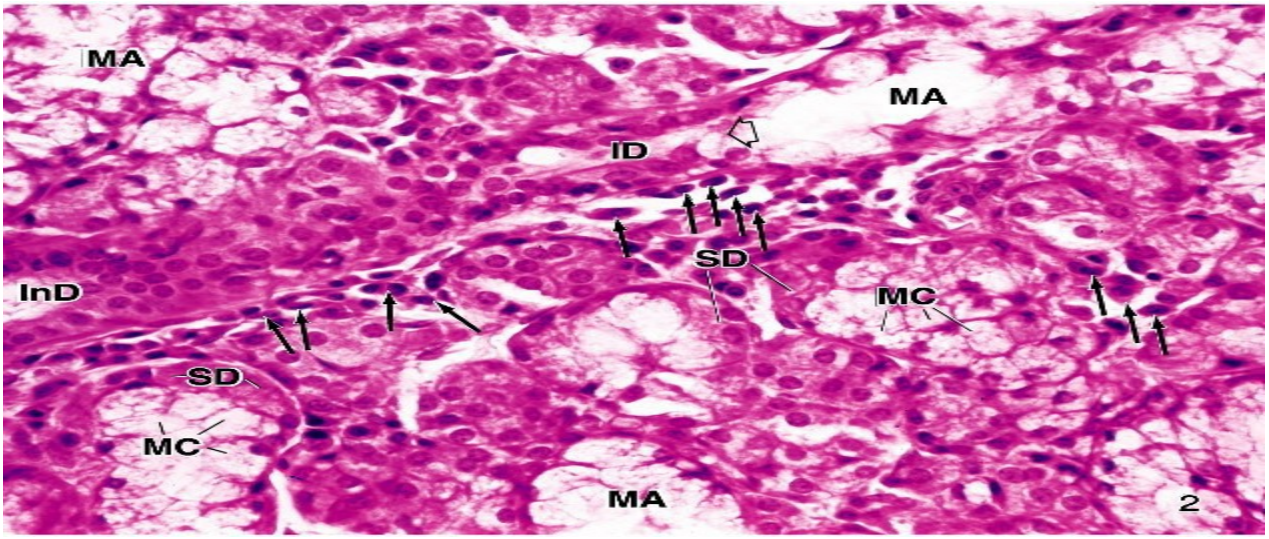
ED:excretory duct \\AC:adipose cell \\ID:intercalated duct \\ S: striations of duct cell A:acinus \\ StD:striated duct \\AL:acinar lumen\\CT:connective tissue\\PC:plasma cells

2. ***Submandibular glands*** **:** It is gland is mostly serous and contain mucous units which capped by serous demilunes.



ED:excretory duct \\A:adipose cell \\ID:intercalated duct \\MA:mucous acini \\SA:serous acini \\SD:serous Demilune StD:striated duct 9

3. **Sublingual glands** : It is a gland mostly mucous acini capped by serous demilunes and surrounded by myoepithelial cells .



SD:serous demilune\\MA:mucous acinus\\\\MC:mucous cells\\ ID:intercalated duct\\InD:intralobular duct \\ arrows:plasma cells\\ arrowhead: mucous acinus joining intercalated duct