**Hepatic acinus (of Rappaport):**

* A pathological liver lobule. Its diamond in shape with short axis (between two portal triads) and a long axis (between two central veins) . It divides the hepatocytes into three zones (see slide 10 ) :
1. zone one : the closest to the triads
2. zone two : in between one and three
3. zone three : closest to the central vein

We have already discussed the medical condition related to the liver, for example: in ischemic heart disease where we have less oxygenated blood, the most cells that are affected are the cells in zone 3 because they are already the farthest from oxygenated blood so **necrosis** occurs in zone 3(centrilobular necrosis) meaning it's in the central of the classical lobule or (cardiac necrosis) because the source of the problem is from the heart but affected the liver.

You can see in these area large fat droplets which are accumulations of fat as a sign of the necrosis of the hepatocytes in this region.

Refer to (slide 11) that has drawing of a hepatocytes showing the:

* **sinus ( hepatic sinusoid )**
* **preisinusoidal space of disse** : which is a space occupied by the micro villa of the the hepatocytes .
* **Bile canaliculus** : between two hepatocytes ( because the hepatocytes are responsible for bile secretion ) , all of the bile canaliculus meet and join together to end up in the branch bile duct which is located within the triad .
* **sinusoidal lining cells** : that lines the sinusoid and can be endothelial cells or kupffer cells (kupffer cells are distinguished from endothelial by it's the nucleus, it is big and bulging towards the lumen and they are a special type of microphages lining the hepatic sinusoid )

In (slide 12 – green arrow) we can see centrilobular necrosis where there is fat accumulations around the central vein specifically zone 3 .

 In (slide 17- blue arrow) we can see the triad and the bile duct which are cuboidal cells with many nuclei.

We can also see a thick walled vessel (yellow arrow) which is a branch from the hepatic artery and another thin walled (red arrow) vessel which is a branch from the portal vein and there are also lymphatic vessels (green arrow) which isn’t considered as part of the triad but it is in the same area of the portal triads and are smaller than the portal vein.

In (Slide 19 – red arrow) is an example of a kupffer cell which is found as part of the wall of the hepatic sinusoid but it has a bigger nucleus and bulging towards the lumen of the sinusoid.

**Note**: the hepatocytes staining color is different according to its function (some hepatocytes are for detoxification, storage of glucagon, etc.)

In (slide 20 ) we see a electron microscopic image of a hepatocyte showing the round nucleus of the hepatocyte in addition the hepatocyte contains all kinds of organelles that are in a normal cell so we have smooth ER , rough ER ,free ribosomes ,peroxisomes , lysosomes , and mitochondria , fat droplets ,glucagon , and granules because it’s a multi-functional cell in addition its involved in protein synthesis .

If we find a space between two hepatocytes then it's the bile canaliculus where bile is secreted.

In (slide 21) we can see fat droplet which contain fat.

**The gallbladder:**

* It’s the place of storage and concentrating of bile.
* Gallbladder is lined by simple columnar epithelium.

In (slide 23) we see that on the surface there are mucosal folds (folds of the mucosa) which consist of epithelium with a core of lamina propria.

 \***Note the gallbladder doesn’t have muscularis mucosa or submucosa \***

As a result of not having these two layers we have directly under the lamina propria the muscularis externa then we have serosa or adventitia in the outer part.

\***Note** **the gallbladder is covered by serosa except the site of attachment with the liver where its adventitia.** \*

In (slide 24 ) within the lamina propria we can see invaginations called crypts or diverticula but if invaginations are deeper than the lamina propria in the muscularis externa or adventitia/serosa it’s called rokitansky aschoff sinuses (slide 25 ).

 \***Note** In cases of rokitansky aschoff sinuses the chance of having gall stones is high \*

Mucosal folds are evaginations while crypts or rokitansky aschoff sinuses are invaginations.

**The pancreas:**

In (slide 27) we see a histological section in the pancreas its similar to the completely serous glands (parotid gland) but the only difference is the presence of islet of langerhans and the rest is similar to the parotid gland in having serous acini which is formed by serous cells which have round nucleus that is basely located making it basophilic in that area and the apical part containing zymogen granules which are acidophilic and other characteristics of the serous cells of the parotid that we have already discussed in previous lectures are also found in pancreatic acinar cells.

The secretions of the pancreas are digestive enzymes and are secreted by the acinar cells of the pancreas.

In (slide 28) we see a structure called pacinian corpuscle and they function as mechanical receptors.

We can also see the islets of langerhans which are highly cellular which means they have many nuclei.

In (slide 29) there is a drawing of the pancreatic acinar which consists of acinar cells and you can notice it has the same characteristics as the serous cells.

\***Note** The intercalated ducts in the parotid glands don’t reach the lumen of the acinus but here they do reach the lumen (**centroacinar cell** which is part of the intercalated duct that reached lumen). \*

So the intercalated duct has a part of it is in the acinus and part of it isn’t …the part which is in the acinus cell is called **centroacinar cell**.

The cells of the intercalated duct (All of them whether outside or inside the lumen) function is to secret fluids rich in sodium and bicarbonate because its secretion is going to be delivered to the duodenum. The duodenum receives the acidic chyme from the stomach so secretions for intercalated duct cells helps in the neutralization of this chyme so it has a similar function to Brunners gland which has a mucous rich with bicarbonate which helps in decreasing the acidity of chyme.

In (slide 31) we can see acinar cells which have round nucleus basely located and has zymogen granules in the apical part in the middle(red arrow) we have a pale stained cell this is thecentroacinar cell .

The duct system in the pancreas is simple the intercalated ducts lead to interlobular collecting ducts (which are similar to the minor collecting ducts) and then to main pancreatic collecting duct. They don’t contain striated and major collecting ducts

In (slide 32) we can also see centroacinar cell pal stained in comparison to the acinar cell .

In (slide 33-34) we see the islets of langerhans (some of them have an endocrine function secreting three hormones: insulin, glucagon, and somatostatin.).

Using H&E stains we can’t differentiate between the different types of cells in the islets we need special stains

Types of islets cells:

1. Alpha cells(A cells) : secret glucagon
2. Beta cells (B cells): secret insulin
3. Delta cells(D cells) : secret somatostatin

 The stains used are (don’t memorize their names):

1. **Grimelius silver stain (slide 35)** which shows alpha cells that are located at the peripheries of the islet.
2. **Gomori’s chrome alum hematoxylin & phloxine stain (slide 36 )** which shows alpha cells staining pink (peripheral ) and the blue cells show both beta and delta cells which are scattered .
3. **Mallory-Azan stain (slide 37)** which stain every cell in a certain color the alpha cells in red ( mainly periphery ) , delta cells are stained light blue( scattered but not at the peripheries) the majority of cell types are the beta cells which are stained in light brown or orange ( scattered but not at the peripheries).

**\*\*\*\* This is the last lecture included in the midterm exam ☺ \*\*\*\***



P.S :Dr.Firas mentioned that there will be NO midterm LAB exam , only the theory material will be included &the exam will be out of 40 marks ..
- The final exam will cover both the lab and the theory, and it will be divided as 30 marks for the lab , 30 marks for the theory ..