





Location

- Upper right quadrant
- Four lobes made up of hepatocytes
- phagocytic cells

Blood supply

- One major vein portal vein
- One major artery hepatic

4 Hepatic Portal System















































- The central veins lead to sublobular veins, which reach collecting veins, hepatic veins, and finally the inferior vena cava. The venous outflow of the liver has no regard to the organization of the lobules.

- The liver sinusoids are shown in higher magnification in the bottom left. They are dilated, capillary-like vessels lined by fenestrated, discontinuous epithelium (labeled "e"). Interspersed among the endothelial cells are **Kupffer cells** (labeled "k"), which are fixed macrophages within the hepatic tissue. They have distinct cytoplasm that may enter the sinusoidal lumen and function like other macrophages within the body. They also break down damaged red blood cell hemoglobin.

- In the bottom middle panel, there are many spaces between the hepatocytes and sinusoidal epithelial cells marked by arrowheads. They are referred to the **space of Disse** where exchange between hepatocytes and blood flow takes



- The liver lobules can be defined in 3 ways:

- 1) **Classic lobule** – centered around the central vein with the portal triads at each corner. Shown below on the left, the classic lobule may not always be hexagonal in shape.

- 2) **Portal lobule** (not shown) – centered on the portal triad, based on bile secretion, and approximately triangular in shape.

- 3) **Liver acinus of Rappaport** – this is the most functionally important classification. Shown below on the right, the acinus is roughly oval in shape with 2 central veins and 2 portal triads on opposite ends. Based on the blood flow within hepatic tissue, the acinus is divided into 3 zones. Cells in different zones are specialized for different activity. Zone 1 cells, being closest to the portal triads and hence most oxygenated blood, have the most drug-metabolizing enzymatic activity. Following that same reasoning, zone 3 hepatocytes near the central veins are most susceptible to ischemia.



- As mentioned earlier, the liver has both endocrine and exocrine functions. The various proteins that hepatocytes secrete enter the bloodstream via the liver sinusoids. The liver also secretes bile in the conventional exocrine fashion.

- The hepatocytes secrete bile into sealed extracellular spaces called **bile canaliculi**. The typical "chicken-wire" appearance is more easily visualized with silver stain.

















LIVER

Stained with haematoxylin and eosin

- 1 hepatic artery
- 2 portal vien
- 3 bile duct
- 4 hepatocytes
- 1, 2, 3 portal tract



LIVER

- Stained with haematoxylin and eosin
- 1 hepatic artery
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- 3 bile duct
- 1, 2, 3 portal tract



LIVER

- Stained with haematoxylin and eosin
- 4 hepatocytes
- 5 terminal hepatic (centrilobular) venule

LIVER

- Stained with haematoxylin and eosin
- 4 hepatocytes
- 5 terminal hepatic (centrilobular) venule
- 6 hepatic sinusoid



LIVER

Stained with haematoxylin and eosin

- 1 capsule
- 2 liver parenchyma



LIVER

- Stained with haematoxylin and eosin
- 1 capsule
- 2 liver parenchyma
- 4 hepatocytes

PANCREAS

Stained with haematoxylin and eosir

- 1 glandular acinus
- 2 islet of Langerhans
- 3 main duct
- 4 interlobular duct
- 5 interlobular connective tissue septa



PANCREAS

Stained with haematoxylin and eosin 1 - acinus

- 2 islet of Langerhans
- 3 interlobular connective tissue septa
- 4 intralobular duct
- 5 interlobular duct

PANCREAS

Stained with haematoxylin and eosin 1 - acinus

- 2 islet of Langerhans
- 3 interlobular connective tissue septa
- 4 blood vessels



PANCREAS

Stained with haematoxylin and eosin

- 1 acinus
- 2 islet of Langerhans
- 3 intralobular duct
- 4 interlobular connective tissue septa



Gallbladder



14

15

8

































Pancreas

- Gland with both exocrine and endocrine functions
- □ 6-10 inch in length
- □ 60-100 gram in weight
- □ Location: retro-peritoneum^{*}, 2nd lumbar vertebral level
- Extends in an oblique, transverse position
- Parts of pancreas: head, neck, body and tail

Head of Pancreas

- Includes uncinate process
- \Box Flattened structure, 2 3 cm thick
- Attached to the 2nd and 3rd portions of duodenum on the right
- □ Emerges into neck on the left
- □ Border b/w head & neck is determined by GDA insertion
- SPDA and IPDA anastamose b/w the duodenum and the rt. lateral border

Neck of Pancreas 2.5 cm in length Straddles SMV and PV Antero-superior surface supports the pylorus Superior mesenteric vessels emerge from the inferior border Posteriorly, SMV and splenic vein confluence to form portal vein Posteriorly, mostly no branches to pancreas





















 Arteriessmall branches from the splenic
 superior pancreaticoduodenal - from the gastroduodenal
 inferior pancreaticoduodenal - from the superior mesenteric

•Veinssplenic vein to portal vein •superior mesenteric vein which then becomes the portal vein



Endocrine

- Islets of Langerhans (Pancreatic Islets) highly vascularized epitheloid tissue
- □ alpha, beta, delta, cells in periphery, beta cells also in center.
- □ light staining, globular, with thin CT capsule surrounding it.
- Pyramid shaped cells facing central lumen,
- □ Secretions go to large vacular network of capillaries just outside the islets,
- Excretes into intercalated duct, lined by low cuboidal epithelium
- □ Alpha cells glucagon inc amount of glucose in blood
- Beta cells insulin dec a

Organization of the exocrine pancreas

The pancreas is a compound acinar gland that is composed of acini and ducts.

- The pancreatic acini are the secretory units of the exocrine tissue.
- Acinar cells are highly specialized for the synthesis and secretion of zymogens, and display a distinct polarity.
- Within the acinus lie the centroacinar cells. They are joined to the acinar cells by tight junctions.
- The centroacinar cells form the beginning of the intercalated ducts.
- The intercalated ducts join with intralobular ducts that in turn connect to interlobular (extralobular) ducts.
- □ The centroacinar cells and the cells lining the intercalated, intralobular and interlobular ducts are responsible for the production of the bicarbonate-rich fluid.
- The interlobular ducts drain into the main pancreatic duct. The main pancreatic duct runs through the tissue from tail to head to collect the secretory product of the pancreas from all its branches. It merges with the common bile duct to form the hepatopancreatic ampulla that connects with the duodenum.

Exocrine:

- **D** Tubuloacinar glands manily composed of serous secretory units
- Secretions proteolytic enzymes
- Proteolytic Endo-peptidases: trypsinogen, chemotrypsinogen
- Exopeptidases: procarboxypeptidases, proaminopeptidases, alpha amylases, lipases nucleolytic enzymes
- □ Has hormonal/ neural control regulation: Secretin inc. fluid secretion, CCK pro enzyme secretion Chyme of stomach and duodenum stimulate enteroendocrine cells to secrete CCk and Secretin → causes pancreas to secrete
- Forms most of pancreas, has tightly packed serous acini circular gland, small circular lumen, darkly stained. zymogen cells arranged in lobule fashion
- Lobules seperated by thin intralobular, and interlobular CT septa have blood vessels, interlobular ducts, pacinian corpsucles
- Decinian corpsucle concentric circles, lighter than surrounding acini, is a sensory receptor













-Once again, most of the pancreas contains **exocrine acini**. Pancreatic enzymes are very diverse, including extremely efficient proteases, lipases, and amylases.

- Separate acini are shown in the left. The pancreatic **acinar** or **secretory cells** are polarized, meaning the **basal** portions are filled with **basophilic rough ER**. The **apical** regions are filled with **zymogen granules** that contain many stored pro-enzymes.

- **Centroacinar cells**, with paler staining, can be seen in the middle of some acini and mark the beginning of the duct system (marked "A" in the middle panel). They converge at "B" to form **intercalated ducts**, marked as "C". The intercalated duct cells may be hard to identify, but they actively pump water and bicarbonate into the duct lumen. Intercalated ducts empty into interlobular ducts, marked as "small duct" in the bottom right, which lead to the main pancreatic duct.

