

Practice 2: Liver biology

Morphology experiment center

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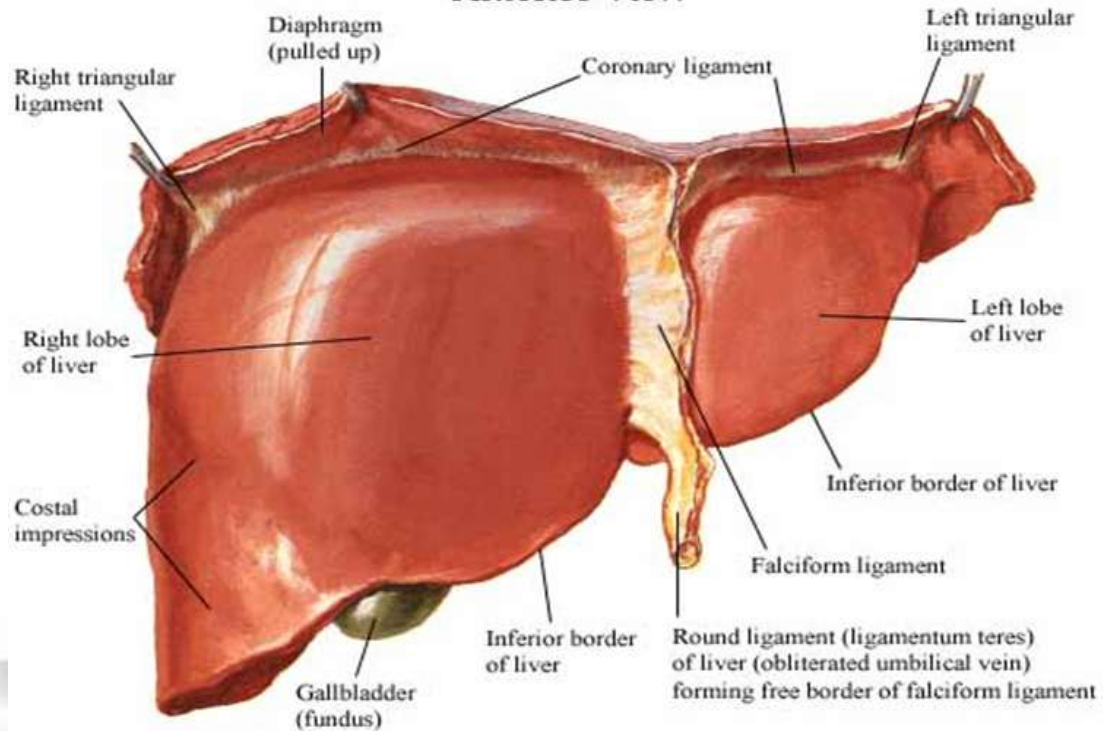
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Review

Surfaces and Bed of Liver

Anterior View



Liver is the maximal parenchymatous organ in abdomen (adult liver about 1.5% of the body weight), which has important physiologic function.



an in-situ photograph



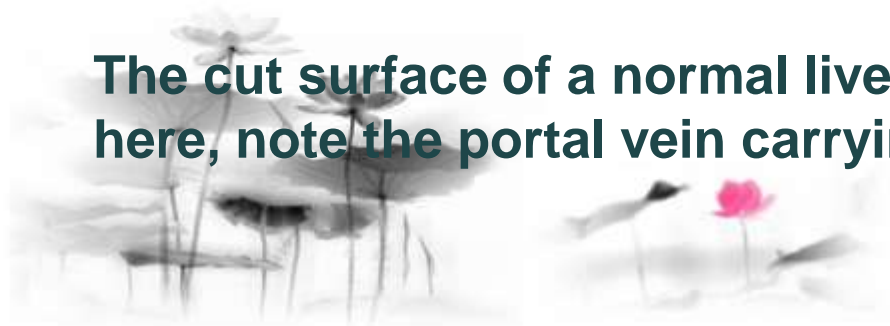
This is an in-situ photograph of the chest and abdominal contents. As can be seen, the liver is the largest parenchymal organ, lying just below the diaphragm.

The right lobe is larger than the left lobe. The falciform ligament is the rough dividing line between the two lobes.

cut surface

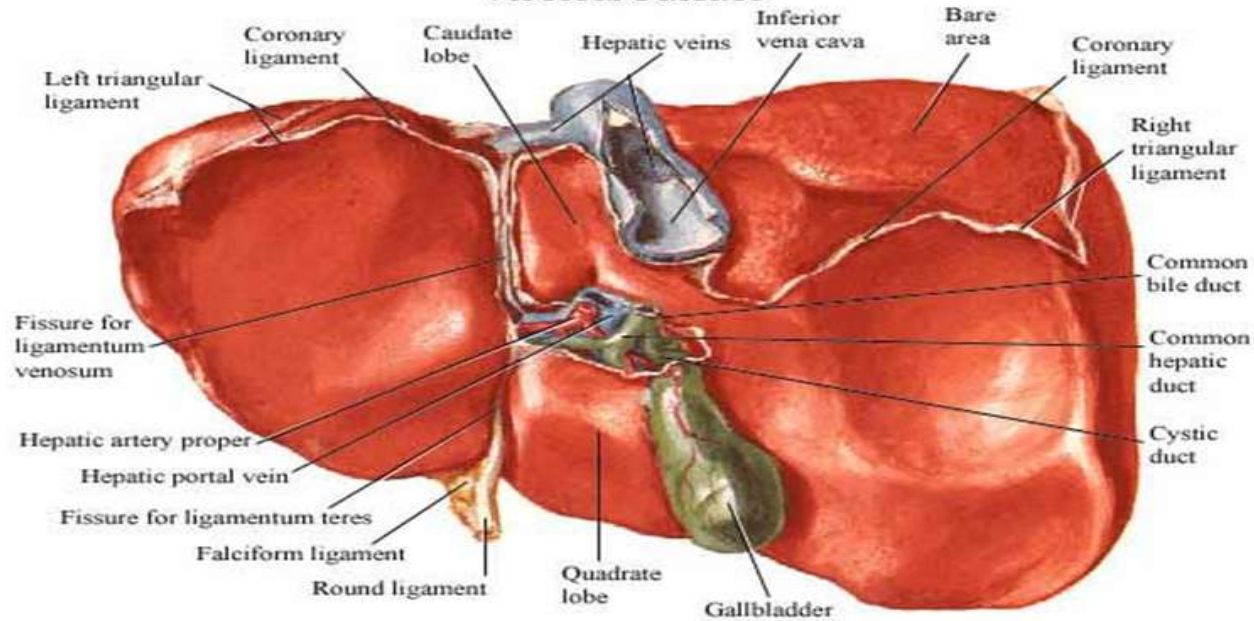


The cut surface of a normal liver has a brown color. Near the hilum here, note the portal vein carrying blood to the liver.



Surfaces and Bed of Liver

Visceral Surface

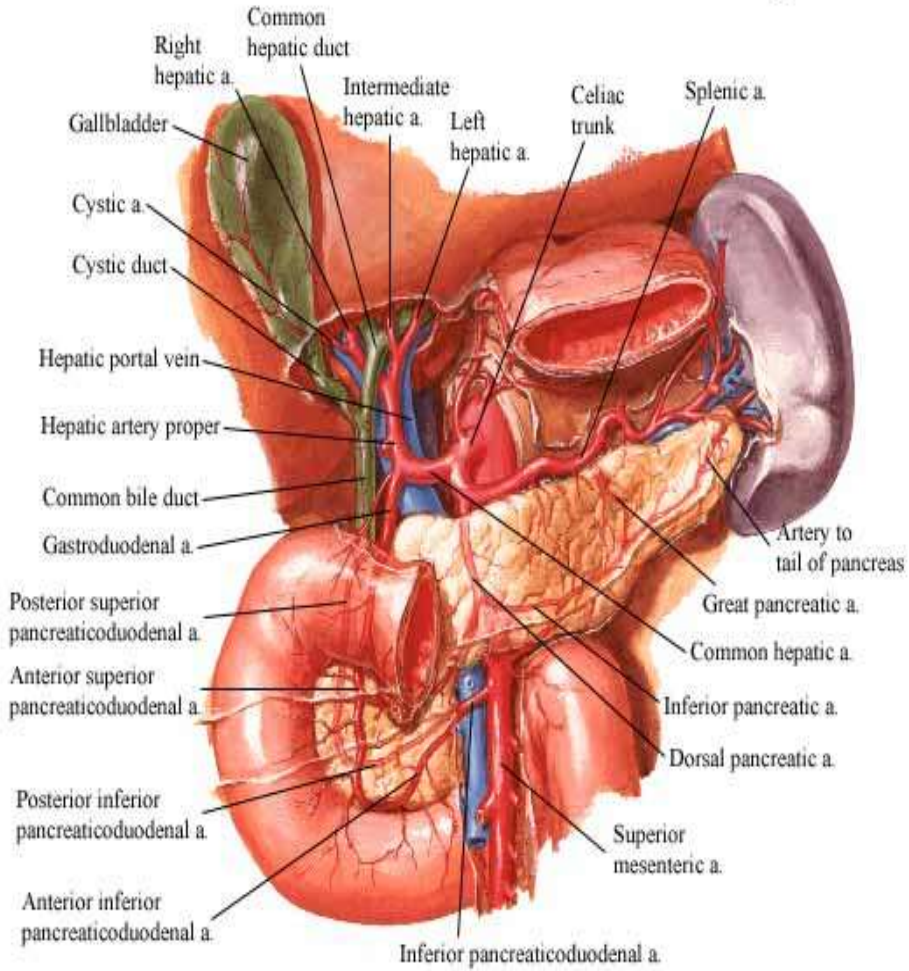


Anatomical lobes: Note the inferior vena cava, gallbladder, ligamentum teres, and porta hepatis form an “H” shape on the visceral surface. It divides the liver into 4 anatomical lobes based on outer appearance – the right, left, caudate, and quadrate lobes.

These are based on the distribution of the hepatic arteries, portal vein, and hepatic bile duct.



Arteries of Liver, Pancreas, Duodenum and Spleen

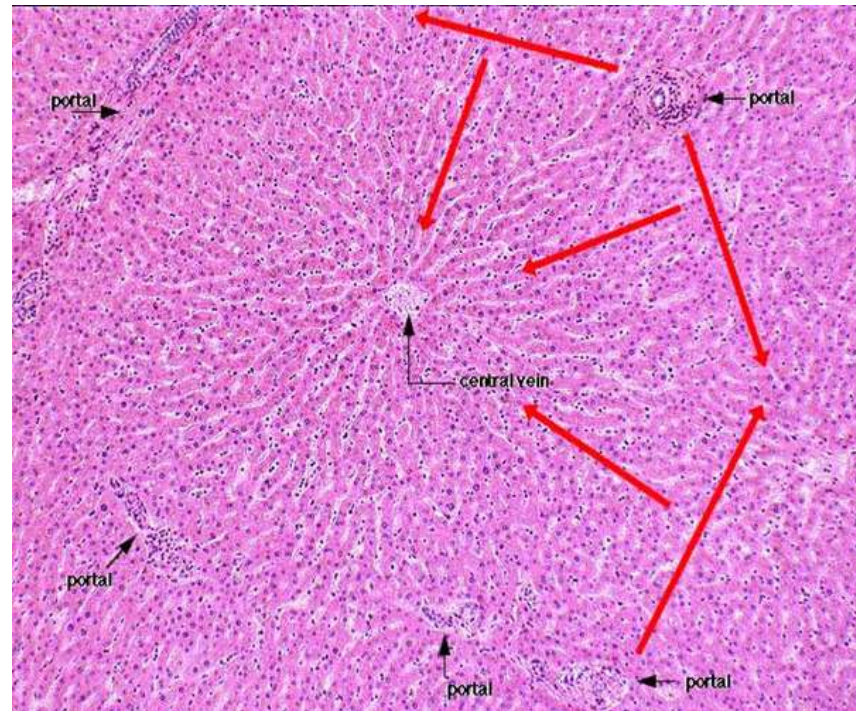
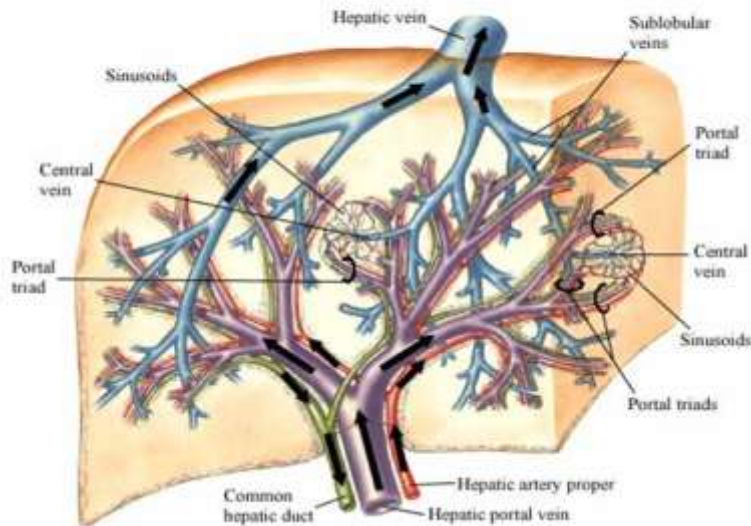


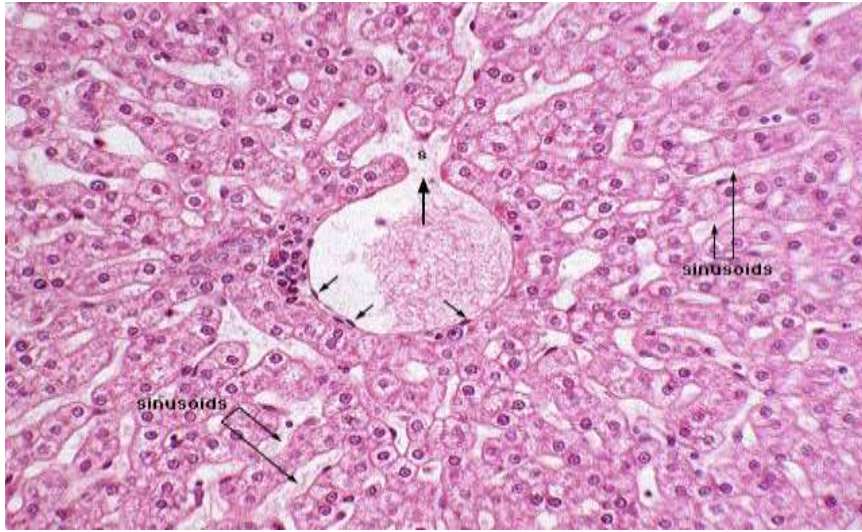
-The liver play important roles in digestion via the production and storage of bile. The liver is also the major organ for metabolism and detoxification.

-The liver receive blood supply from the celiac trunk. One main branch is the common hepatic artery, leading to the hepatic artery proper that branches into left and right hepatic arteries to supply the liver. The right hepatic artery gives off the cystic artery to supply the gallbladder.

The liver is made up of hepatic lobule and portal area. The hepatic lobule is the basic structure of the liver function unit, which is consisted of central vein, liver cells cord, liver blood sinus, space of Disse and bilecanaliculus.

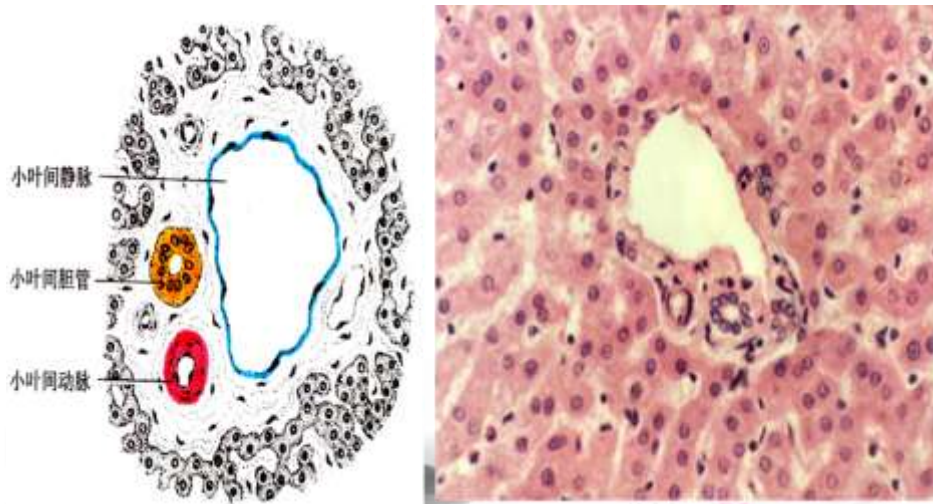
Intrahepatic Vascular and Duct Systems
Schema

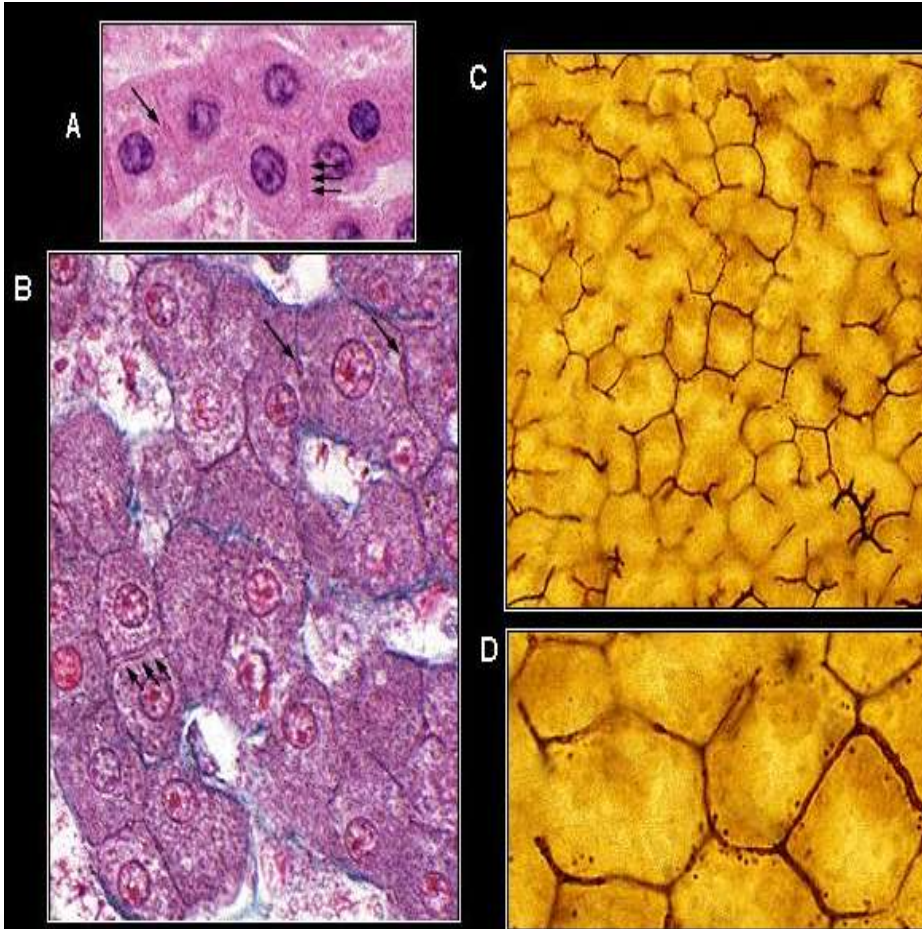




- Portal area is not typical, but still can find out the interlobular artery, interlobular vein and interlobular bile duct in Interlobular connective tissue of portal area.

-The liver is divided into many hepatic lobules. Inflow to the liver involves hepatic arteries, which bring oxygenated blood to hepatic tissue, and portal veins, which bring nutrients and other compounds absorbed by the GI tract to be processed and/or stored in the liver. Outflow also involves two routes – hepatic veins which drain into the inferior vena cava and the common hepatic duct which joins the cystic duct and empties bile into the duodenum.





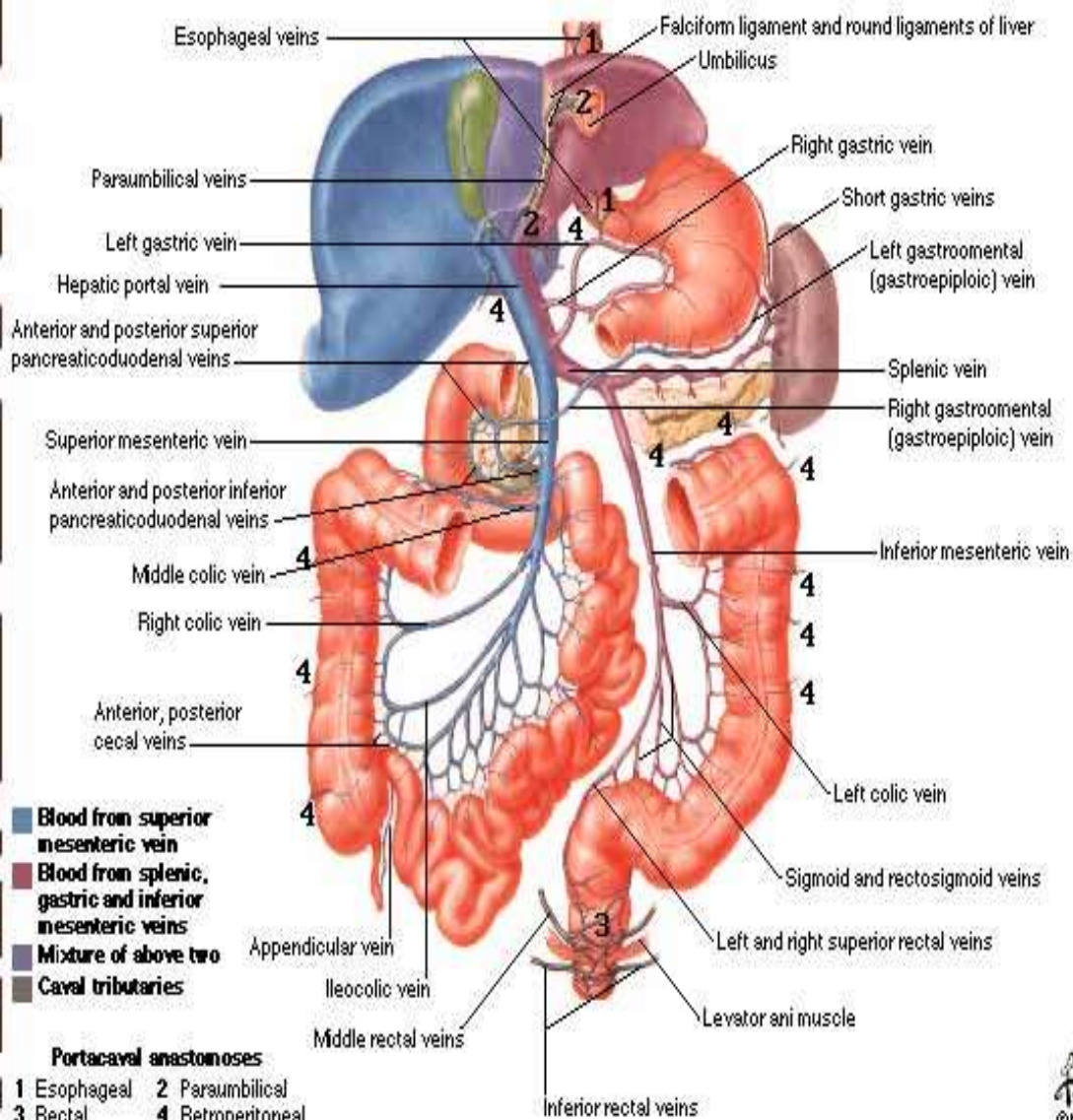
- As mentioned before, the liver has both endocrine and exocrine functions. The various proteins that hepatocytes secrete enter the bloodstream via the liver sinusoids. The liver also secretes bile in the conventional exocrine fashion.

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



Hepatic Portal Vein Tributaries

Portocaval Anastomoses



-Liver involves oxygenated blood via hepatic arteries and absorbed nutrients and compounds from gastrointestinal tract via the hepatic portal veins.

- All venous drainage from the GI tract enters the portal system back to the liver.

-The overall order is as following:
 arteries → capillaries → veins → portal vein → hepatic sinusoids → veins → vena cava → heart.

-There are 4 sites of portocaval anastomoses:

- 1) esophageal veins
- 2) paraumbilical veins
- 3) rectal veins
- 4) retroperitoneal veins

Purpose

- * 1. To be familiar with carbon tetrachloride poisoning replication hepatocyte.
- * 2. To master the normal liver morphological changes under the influence of processing carbon tetrachloride poisoning — hepatocyte swelling (ballooning degeneration).



Materials

- ✿ **1. Animals :** 30 mice, divided into 10 groups.
- ✿ **2. Equipment:** Cage, common scales, 1 ml syringe, scalpel, forceps, dissecting forceps , series instruments of making slice and reagents and equipment.
- ✿ **3. Drugs :** 5% carbon tetrachloride oil, olive oil.



Method

- ❁ 1. Each group has two mice as the experimental group, subcutaneous injection of 5% carbon tetrachloride oil solution of 0.1 ml / 10 g weight; The other mice for the control group, subcutaneous injection an equal amount of olive oil.
- ❁ 2. After 48 hours, open the abdominal cavity and take out of the liver tissue (mice liver is composed of four leaf) fixed in 10% neutral formaldehyde.
- ❁ 3. Conventional paraffin embedding and slices, HE stain.



Observation

* 1. Gross observation

You will find the liver volume increase, glisson capsule tight, liver edge smooth. After an incision the sections bulge, its edge evaginable, pale color, cloudy lacklustre, it's look like putting into boiling water, which was called hydropic degeneration.



正常组



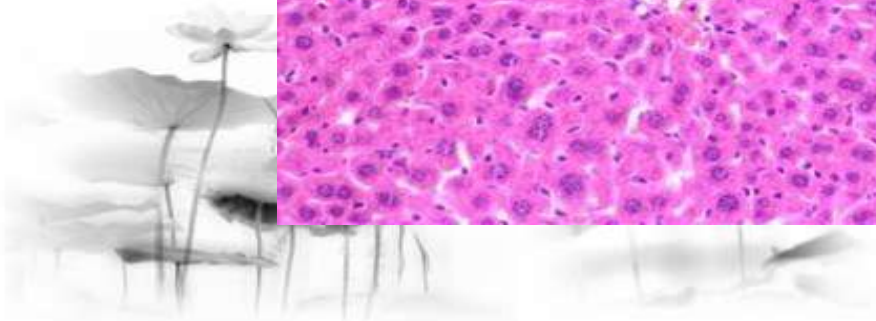
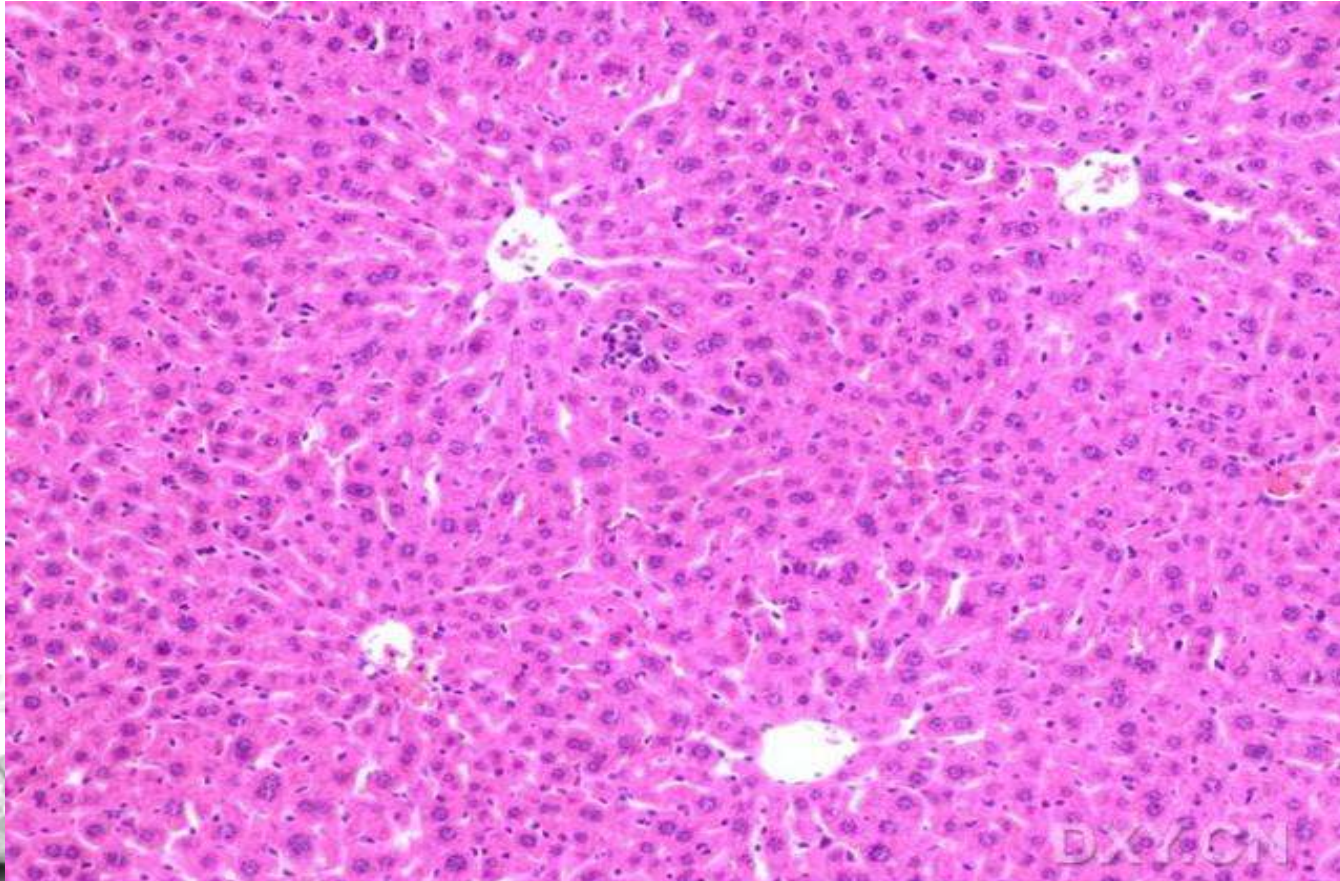
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2. Microscope observation

- ✿ We will see the diffuse liver cell increase in size and become round, many red stained particles appear in swollen cells, diffuse in the cytoplasm. This is swollen mitochondria and endoplasmic reticulum were performed under the light microscopy. Severe edema, characterized by liver cell volume are increased significantly, abnormal cytoplasmic loose and bright, look like a balloon, called the ballooning degeneration. Such lesions form also tend to occur in viral hepatitis. The control group showed normal structure of liver cells and staining.

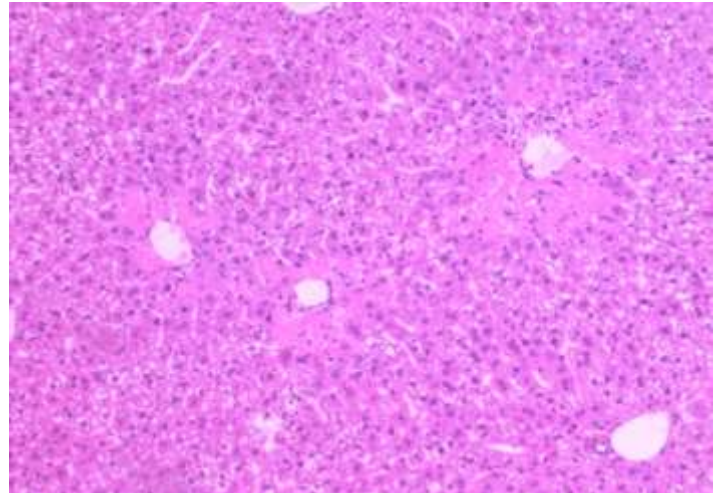
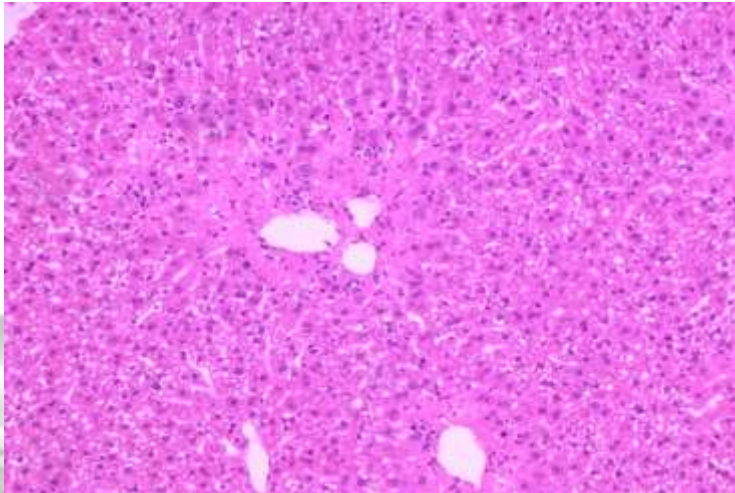
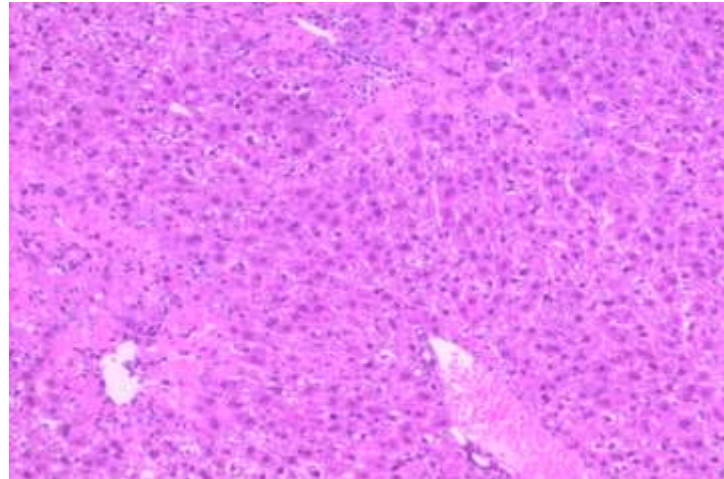
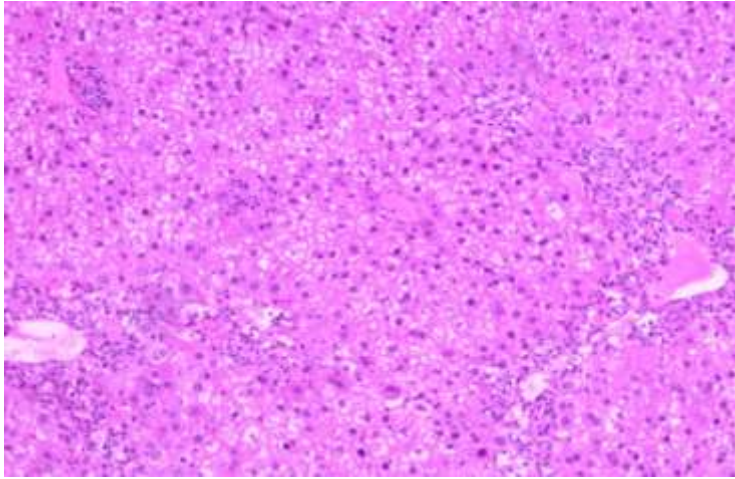


Control

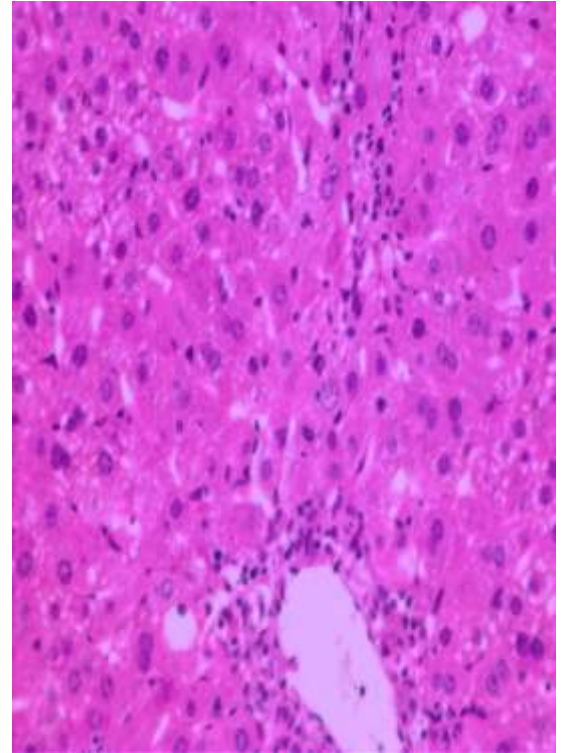
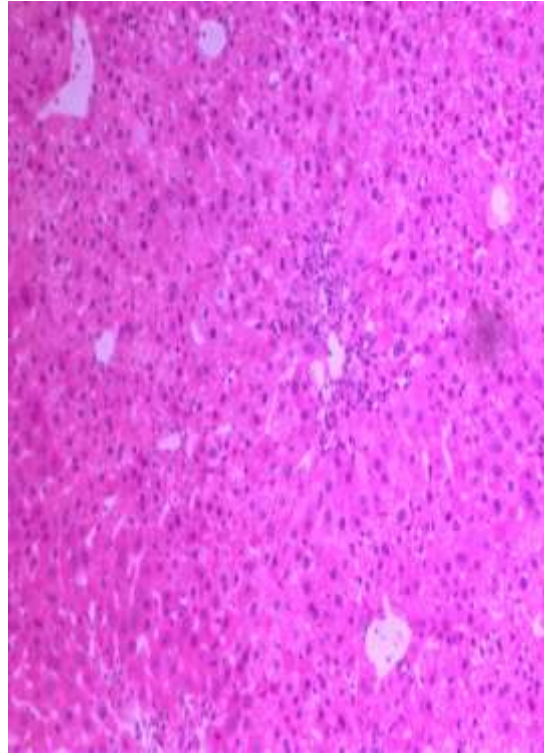
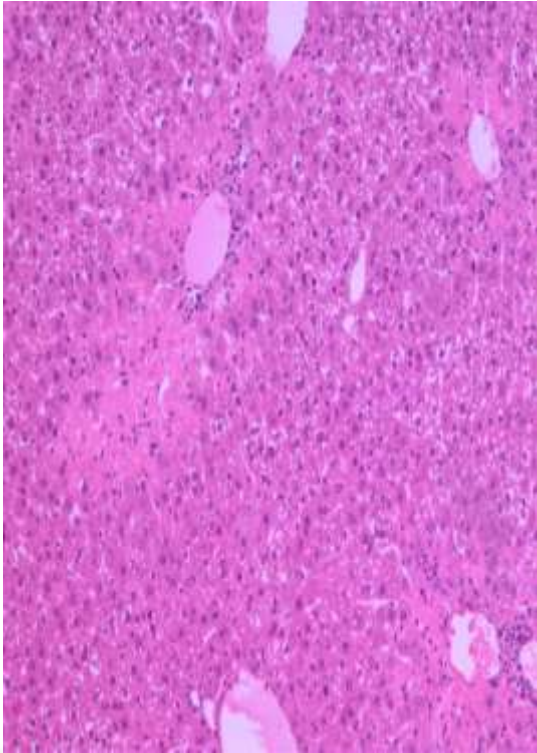


DXACON

Model



model



Pathological mechanism

- ❁ Carbon tetrachloride as a kind of chemical drugs, when entering the human body, it can produce trichloromethane free radical with high toxicity CCl_3 , and Cl . through the metabolism of the liver, then destroying the structure of the cell membrane, leading to increased membrane permeability, Na/k ion pump dysfunction, intracellular sodium ions increased, water increased liver cell swelling (ballooning degeneration).



Thinking and Discussion

- ✿ 1. In the interaction between teachers and students, to discuss carbon tetrachloride can enter the body through what way and how to cause liver disease? How does that impact on liver function about morphologic changes of liver?
- ✿ 2. Combined with the study of this experiment, with the help of multimedia courseware, gross specimen and tissue slice, observation and discussion the pathogenesis of liver diseases, morphological changes and possible clinical manifestations.



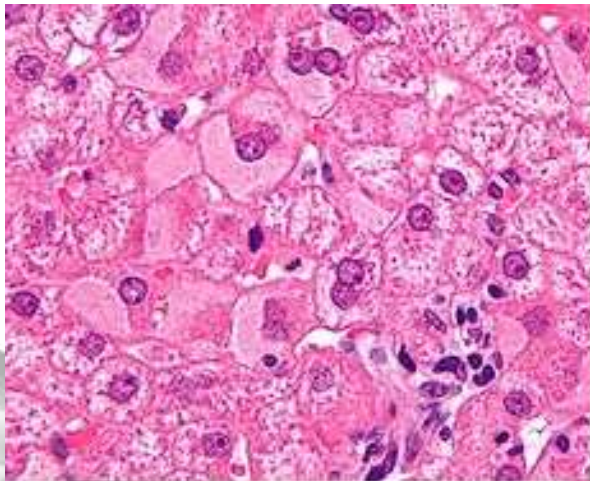
Experiment report

- ✿ 1. The drawing to compare the structure of the normal liver tissue and swelling of the liver cells.
- ✿ 2. Describe the morphological features about swelling of the liver cells.
- ✿ 3. A brief introduction the mechanism about ballooning degeneration of liver cell.



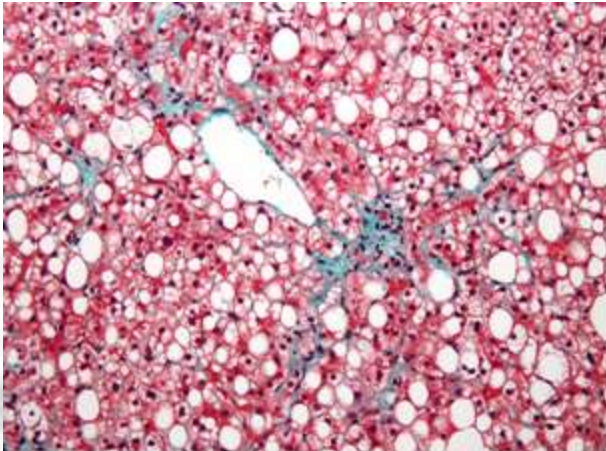
Reviews

1 Viral hepatitis is liver inflammation due to a viral infection. It may present in acute (recent infection, relatively rapid onset) or chronic forms. The most common causes of viral hepatitis are the five unrelated hepatotropic viruses Hepatitis A, Hepatitis B, Hepatitis C, Hepatitis D, and Hepatitis E.



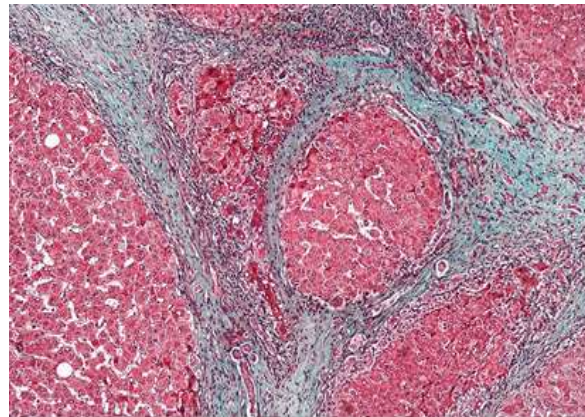
Micrograph showing ground glass hepatocytes, which are seen in chronic hepatitis B, and represent accumulations of viral antigen in the endoplasmic reticulum. H&E stain

2 Fatty liver, Accumulation of fat may also be accompanied by a progressive inflammation of the liver (hepatitis), called steatohepatitis. By considering the contribution by alcohol, fatty liver may be termed alcoholic steatosis or nonalcoholic fatty liver disease (NAFLD), and the more severe forms as alcoholic steatohepatitis (part of alcoholic liver disease) and Non-alcoholic steatohepatitis (NASH).



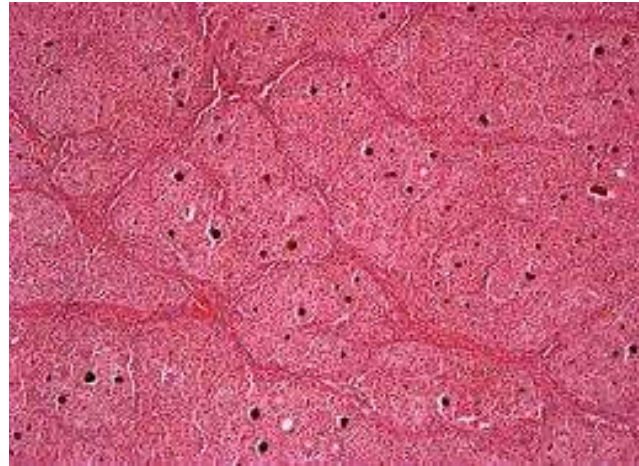
Micrograph showing a fatty liver (macrovesicular steatosis), as seen in non-alcoholic fatty liver disease. Trichrome stain.

3 Cirrhosis is a consequence of chronic liver disease characterized by replacement of liver tissue by fibrosis, scar tissue and regenerative nodules, leading to loss of liver function. Cirrhosis is most commonly caused by alcoholism, hepatitis B and hepatitis C, and fatty liver disease, but has many other possible causes.



The abdomen of a person with cirrhosis showing massive ascites and caput medusae. Micrograph showing cirrhosis. Trichrome stain

4 Liver cancer or hepatic cancer Liver tumors are discovered on medical imaging equipment or present themselves symptomatically as an abdominal mass, abdominal pain, jaundice, nausea or liver dysfunction. Liver cancers should not be confused with liver metastases, which are cancers that originate from organs elsewhere in the body and migrate to the liver.



carcinoma hepatocellulare

Thank You!

