

Fundamentals of fluids detection and secretions



— Bile composed and liver enzyme

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The liver

The liver is a major organ only found in vertebrates which performs many essential biological functions such as detoxification of the organism, and the synthesis of proteins and biochemical necessary for digestion and growth. In humans, it is located in the right upper quadrant of the abdomen, below the diaphragm. Its other roles in metabolism include the regulation of glycogen storage, decomposition of red blood cells, and the production of hormones.

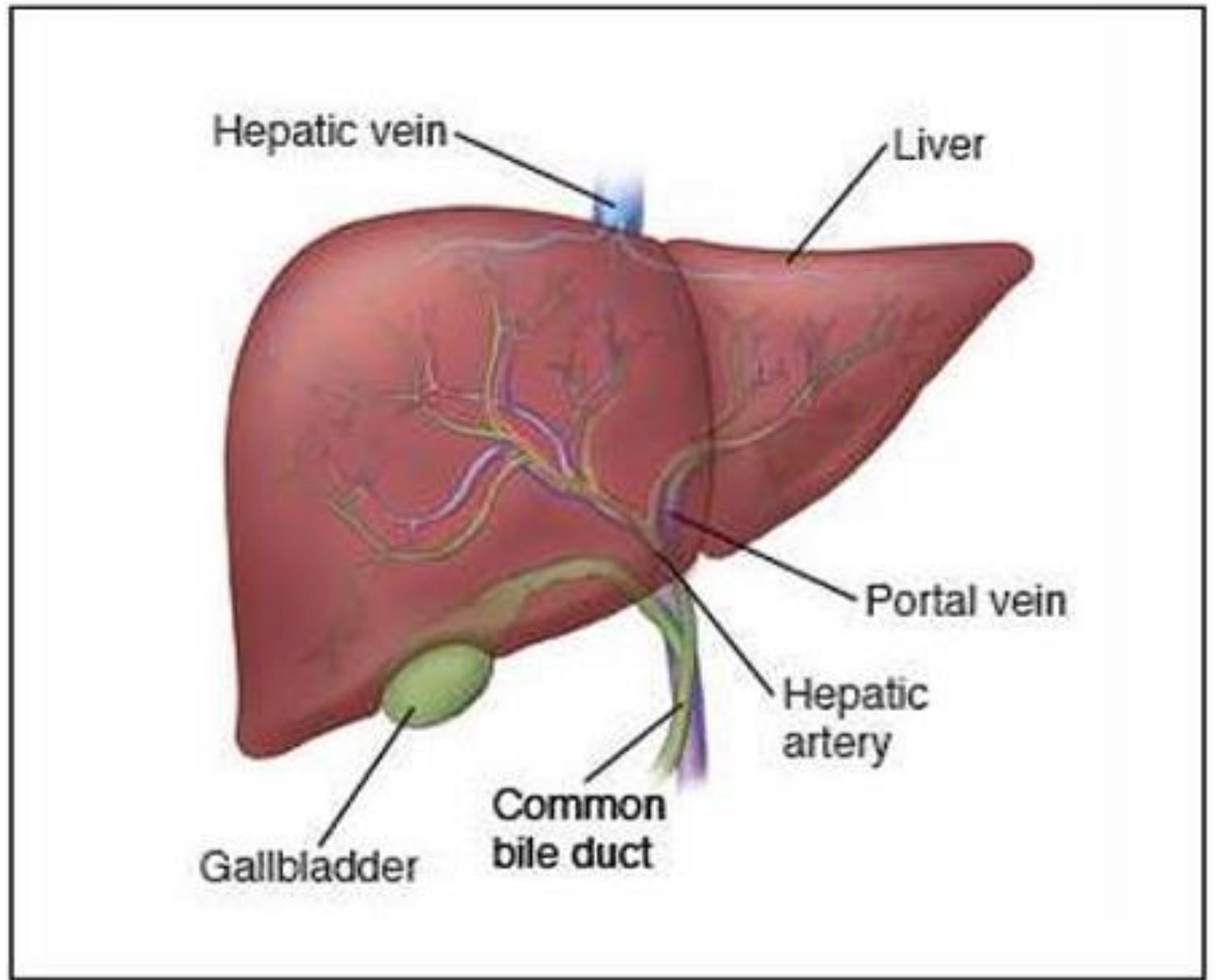


Figure (1): The liver

Major Metabolic functions of the Liver

1. Synthetic Function: which includes plasma protein (Albumin, Globulins), Cholesterol, Triglycerides and Lipoproteins.
2. . Detoxification and excretion: involves removal Ammonia to urea (Urea Cycle), Bilirubin, Cholesterol, Drug metabolites.
3. Storage Function: Which includes Vitamins A, D, E, K and B12
4. production of bile salts: this helps in digestion

Types of Normal Liver Enzymes

There are several types of liver enzymes, including the following:

1. Aspartate Aminotransferase (AST) :

It is an enzyme that aids in the metabolism of amino acids and is found primarily in many organs of the body, such as the liver, brain, muscles, pancreas, heart, kidneys, and lungs. If any damage occurs to these organs, the enzyme will be released into the blood, increasing its concentration above normal levels. Therefore, a higher than normal concentration does not necessarily indicate a liver problem.

2. Alanine Aminotransferase (ALT):

This enzyme converts proteins into energy and is primarily concentrated in the liver. Therefore, any increase in this enzyme indicates liver damage, whether mild or severe.

3. Gamma-glutamyl transferase (GGT):

It is an enzyme produced in the liver and is mainly concentrated in the blood.

4. Alkaline phosphatase (ALP):

This enzyme is found primarily in the liver and bones and aids in protein breakdown.

What is Bile ?

Bile is an alkaline digestive fluid produced by liver cells (hepatocytes) and stored in the gallbladder. It is released into the duodenum (the first part of the small intestine) to aid in digestion and absorption of fats.

Where is bile stored?

After your liver makes the bile, it's released through your bile ducts into your gallbladder for storage. You can think of your gallbladder as a little storage tank next to your liver, holding bile until it's needed. Your gallbladder typically holds about 30 to 80 milliliters.

Functions of Bile :

1. Emulsifies fats to make them easier to digest by pancreatic lipase.
2. Facilitates absorption of fats and fat-soluble vitamins (A, D, E, and K).
3. Excretes waste products such as bilirubin, excess cholesterol, and toxins.
4. Neutralizes gastric acid in the duodenum through its alkaline bicarbonate content.
5. Stimulates intestinal motility and helps maintain digestive flow.

Components of Bile:

Bile is made up of many different compounds, including:

- Cholesterol.
- Bile salts (bile acids)
- Water.
- Phospholipids (complex fats that contain phosphorus).
- Bilirubin.
- Body salts (like potassium and sodium).
- Copper and other metals.

Bile salts, or bile acids, are the most important component of bile. They help break down fats during digestion

The Importance of Bile and Liver Enzymes in Forensic Science

1.They are used as vital tools in detecting toxins, drugs, and their metabolites within the body.

2. Bile is an important alternative sample for postmortem blood analysis, due to its stable chemical composition.

3.Liver enzymes (such as ALT, AST, ALP, GGT) are indicators of the integrity of liver cells and their sensitivity to toxic substances.

4.Elevated or decreased liver enzymes are used as evidence of the type of liver damage (cellular damage, cholestasis, alcohol or drug poisoning).

5. Bile and enzyme tests help assess the health and functional status of the liver before death.

Any questions?

*Thank
You*