

HISTOPHYSIOLOGICAL PECULIARITIES OF THE LIVER

Kamoldinova R.A.

Andijan State Medical Institute, Uzbekistan

Annotation : This article presents information about the salinity , function and physiological peculiarities of the liver, the organ that performs the most important functions in the body . Using this article, Students of a medical educational institution can have a wide range of visions.

Key words : liver, blood , body , methobolism , digestive system.

The liver is a major metabolic organ only found in vertebrate animals, which performs many essential biological functions such as detoxification of the organism, and the synthesis of proteins and biochemicals necessary for digestion and growth.^{[2][3][4]} In humans, it is located in the right upper quadrant of the abdomen, below the diaphragm and mostly shielded by the lower right rib cage. Its other metabolic roles include carbohydrate metabolism, the production of hormones, conversion and storage of nutrients such as glucose and glycogen, and the decomposition of red blood cells.^[4]

The liver is also an accessory digestive organ that produces bile, an alkaline fluid containing cholesterol and bile acids, which emulsifies and aids the breakdown of dietary fat. The gallbladder, a small hollow pouch that sits just under the right lobe of liver, stores and concentrates the bile produced by the liver, which is later excreted to the duodenum to help with digestion.^[5] The liver's highly specialized tissue, consisting mostly of hepatocytes, regulates a wide variety of high-volume biochemical reactions, including the synthesis and breakdown of small and complex organic molecules, many of which are necessary for normal vital functions.^[6] Estimates regarding the organ's total number of functions vary, but is generally cited as being around 500.^[7]

It is not known how to compensate for the absence of liver function in the long term, although liver dialysis techniques can be used in the short term. Artificial livers have not been developed to promote long-term replacement in the absence of the liver. As of 2018,^[8] liver transplantation is the only option for complete liver failure.

The liver is the largest solid organ in the body. It carries out over 500 tasks and plays an essential role in digestion. Its roles include detoxification, protein synthesis, and producing digestive enzymes. The roles of the liver include detoxification, protein synthesis, and the production of chemicals that help digest food. It is part of the digestive system.

This article will cover the main roles of the liver, how the liver regenerates, what happens when the liver does not function correctly, and how to keep the liver healthy.

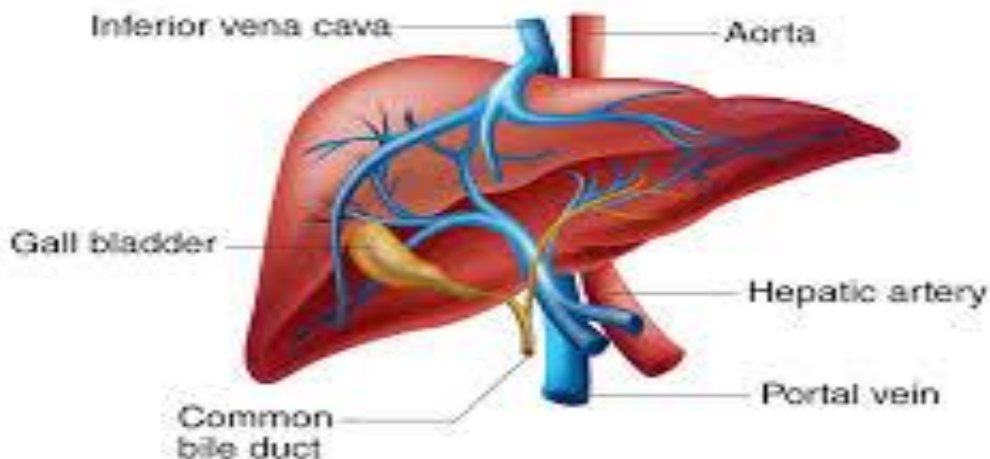
A person's liver is in the upper right section of the abdomen and sits below the diaphragm. It typically weighs around 3 pounds Trusted Source, but this can vary between people. The skin is the only organ heavier and larger than the liver.

1. [^] Elias, H.; Bengelsdorf, H. (1 July 1952). "The Structure of the Liver in Vertebrates". *Cells Tissues Organs*. **14** (4): 297–337. doi:10.1159/000140715. PMID 14943381.
2. [^] Abdel-Misih, Sherif R.Z.; Bloomston, Mark (2010). "Liver Anatomy". *Surgical Clinics of North America*. **90** (4): 643–653. doi:10.1016/j.suc.2010.04.017. PMC 4038911. PMID 20637938.
3. [^] Jump up to: ^a ^b ^c "Anatomy and physiology of the liver – Canadian Cancer Society". Cancer.ca. Archived from the original on 2015-06-26. Retrieved 2015-06-26.

The liver is roughly triangular and consists of two lobes: a larger right lobe and a smaller left lobe. The falciform ligament separates the lobes. This ligament is a band of tissue that keeps the liver anchored to the diaphragm.

HUMAN LIVER

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A layer of fibrous tissue called Glisson's capsule covers the outside of the liver. The peritoneum, a membrane that forms the lining of the abdominal cavity, then covers this.

This helps hold the liver in place and protects it from physical damage. Blood vessels

Unlike most organs, the liver has two major sources of blood. The portal vein brings in nutrient-rich blood from the digestive system, and the hepatic artery carries oxygenated blood from the heart. The blood vessels divide into small capillaries, with each ending in a lobule. Lobules are the functional units of the liver and consist of millions of cells called hepatocytes.

Three hepatic veins remove blood from the liver.

Functions

The liver is a gland that has many functions in the body. It is difficult to give a precise number, but it may have more than 500 distinct roles.

The major functions of the liver include:

- **Bile production:** Bile helps the small intestine break down and absorb fats. Trusted Source, cholesterol, and some vitamins. Bile consists of bile salts, cholesterol, bilirubin, electrolytes, and water.

- Absorbing and metabolizing bilirubin: The breakdown of hemoglobin forms bilirubin. The liver or bone marrow stores iron released from hemoglobin, which makes the next generation of blood cells.
- Supporting blood clots: Vitamin K is necessary to create coagulants that help clot the blood. Bile is essential for vitamin K absorption and forms in the liver. The liver must produce enough bile to make clotting factors.
- Fat metabolism: Bile breaks down fats and makes them easier to digest.
- Metabolizing carbohydrates: The liver stores carbohydrates. The body can break down stored carbohydrates in the liver, known as glycogen, into glucose. Glucose, or sugar, is released into the bloodstream to regulate blood sugar levels and for a quick burst of energy.
- Vitamin and mineral storage: The liver stores fat-soluble vitamins, known as vitamins A, D, E, K, and B12. It keeps significant amounts of these vitamins stored. The liver stores iron from hemoglobin in the form of ferritin, ready to make new red blood cells. The liver also stores and releases copper.
- Helps metabolize proteins: Bile helps break down proteins for digestion.
- Filters the blood: The liver filters and removes compounds from the body, including hormones, such as estrogen and aldosterone, and compounds from outside the body, including alcohol and other drugs.
- Immunological function: The liver is part of the mononuclear phagocyte system. Cells involved in immune activity, Kupffer cells, are found in high numbers in the liver. These cells destroy disease-causing viruses, bacteria, or other microorganisms that might enter the liver through the gut.
- Production of albumin: Albumin is the most common protein in blood serum. It transports fatty acids and steroid hormones to help support the correct pressure and prevent the leaking of blood vessels.
- Synthesis of angiotensinogen: This hormone raises blood pressure by narrowing the blood vessels when alerted by production of an enzyme called renin in the kidneys.

Regeneration

Because of the importance of the liver and its functions, evolution has ensured that it can regrow rapidly as long as it is kept healthy. All vertebrates, from fish to humans, have the ability to regrow the liver.

The liver is the only visceral organ that can regenerate. It can regenerate completely, as long as a minimum of about 25% of the tissue remains. The liver can regrow to its previous size and ability without any loss of function during the growth process.

Removal of two-thirds of the liver in mice causes the remaining liver tissue to regrow to its original size and restore function within 7–10 days. In humans, the process takes slightly longer, but regeneration can still occur in 8–15 days. Researchers suggest surgical

removal of the right or left lobe of the liver results in complete restoration of the liver mass after 3 months Trusted Source, while maximum cellular activity happens 7 to 10 days after the procedure.

Over the following few weeks, the new liver tissue becomes indistinguishable from the original tissue.

A number of compounds are responsible for liver regeneration, including growth factors and cytokines. Some of the most important compounds in the process appear to be but are not limited to:

- hepatocyte growth factor
- insulin
- transforming growth factor-alpha
- epidermal growth factor
- interleukin-6
- norepinephrine

Diseases

An organ as complex as the liver can experience a range of problems. A healthy liver functions very efficiently. However, the consequences can be dangerous or even fatal in a diseased or malfunctioning liver.

Examples of liver disease include:

- Fascioliasis: The parasitic invasion of a worm, known as a liver fluke Trusted Source, causes this condition. The liver fluke can lie dormant in the liver for months or even years. Fascioliasis is a tropical disease.
- Cirrhosis: This sees scar tissue replace liver cells in a process known as fibrosis. Toxins, alcohol, and hepatitis are some of the many factors that cause this condition. Eventually, fibrosis can lead to liver failure because the functionality of liver cells becomes destroyed.
- Hepatitis: Hepatitis is the name given to a general infection of the liver, and viruses, toxins, or an autoimmune response can cause it. An inflamed liver characterizes this condition. In many cases, the liver can heal itself, but liver failure can occur in serious cases.
- Alcoholic liver disease: Drinking too much alcohol over long periods can cause liver damage.
- Primary sclerosing cholangitis (PSC): PSC is a serious inflammatory disease of the bile ducts that results in their destruction. There is currently no cure, and the cause is unknown.
- Fatty liver disease: This usually occurs alongside obesity or the harmful use of alcohol. In fatty liver disease, vacuoles of fat build up in the liver cells. Nonalcoholic fatty liver disease occurs when alcohol use is not the cause.

- Gilbert's syndrome: This is a genetic disorder affecting 4—16% Trusted Source of the population. In Gilbert's syndrome, the body does not fully break down bilirubin. Mild jaundice can occur, but the disorder is harmless.
- Liver cancer: The most common types of liver cancer are hepatocellular carcinoma and cholangiocarcinoma Trusted Source. The leading causes are alcohol and hepatitis. It is the sixth most common form of cancer globally and the third Trusted Source most frequent cause of cancer death around the world.

Health

Below are some recommendations from the American Liver Foundation to help keep the liver working as it should:

- Diet: As the liver is responsible for digesting fats, consuming too many can overwork the organ and disturb it from other tasks. This also has links to Trusted Source fatty liver disease.
- Moderate alcohol ingestion: Avoid consuming more than two drinks at a time. Drinking too much alcohol causes cirrhosis of the liver over time.
- Avoiding illicit substances: Illicit substances can overload the liver with toxins. Avoiding these substances can allow the liver to perform its necessary functions without impediment.
- Caution when mixing medications: Some prescription drugs and natural remedies can interact negatively. Mixing drugs with alcohol puts significant pressure on the liver.
- Protection against airborne chemicals: Airborne chemicals can cause liver damage. When painting or using strong cleaning or gardening chemicals, the area should be well ventilated, and people should wear a mask.
- Travel and vaccinations: Vaccination is essential if a person travels to an area where hepatitis A or B might be a concern. Malaria grows and multiplies in the liver, and yellow fever can lead to liver failure.
- Safe sex: There is no vaccination for hepatitis C. Safe sex practices can help prevent the disease.
- Avoid exposure to blood and germs: Receive medical attention if exposed to the blood of another person.

Despite its ability to regenerate, the liver depends on being healthy to do so. Lifestyle choices and dietary measures, the liver can help protect the liver in most cases.

References:

4. Nosek, Thomas M. "[Section 6/6ch2/s6ch2_30](#)". Essentials of Human Physiology. Archived from [the original](#) on 2016-03-24.
5. [^] Elias, H.; Bengelsdorf, H. (1 July 1952). "The Structure of the Liver in Vertebrates". *Cells Tissues Organs*. **14** (4): 297–337. [doi:10.1159/000140715](#). [PMID 14943381](#).

6. [^] Abdel-Misih, Sherif R.Z.; Bloomston, Mark (2010). "[Liver Anatomy](#)". Surgical Clinics of North America. **90** (4): 643–653. [doi:10.1016/j.suc.2010.04.017](#). [PMC 4038911](#). [PMID 20637938](#).
7. [^] [Jump up to:^{a b c} "Anatomy and physiology of the liver – Canadian Cancer Society"](#). Cancer.ca. Archived from [the original](#) on 2015-06-26. Retrieved 2015-06-26.
8. [^] [Jump up to:^{a b} Tortora, Gerard J.; Derrickson, Bryan H. \(2008\). Principles of Anatomy and Physiology \(12th ed.\). John Wiley & Sons. p. 945. ISBN 978-0-470-08471-7.](#)
9. [^] Maton, Anthea; Jean Hopkins; Charles William McLaughlin; Susan Johnson; Maryanna Quon Warner; David LaHart; Jill D. Wright (1993). [Human Biology and Health](#). Englewood Cliffs, New Jersey, USA: Prentice Hall. [ISBN 978-0-13-981176-0](#). [OCLC 32308337](#).
10. [^] Zakim, David; Boyer, Thomas D. (2002). Hepatology: A Textbook of Liver Disease (4th ed.). [ISBN 9780721690513](#).
11. [^] [Jump up to:^{a b} Liver Anatomy at eMedicine](#)
12. [^] Cotran, Ramzi S.; Kumar, Vinay; Fausto, Nelson; Nelso Fausto; Robbins, Stanley L.; Abbas, Abul K. (2005). [Robbins and Cotran pathologic basis of disease](#) (7th ed.). St. Louis, MO: Elsevier Saunders. p. 878. [ISBN 978-0-7216-0187-8](#).
13. [^] ["Enlarged liver"](#). [Mayo Clinic](#). Archived from the original on 2017-03-21. Retrieved 2017-03-29.
14. [^] Molina, D. Kimberley; DiMaio, Vincent J.M. (2012). "Normal Organ Weights in Men". The American Journal of Forensic Medicine and Pathology. **33** (4): 368–372. [doi:10.1097/PAF.0b013e31823d29ad](#). [ISSN 0195-7910](#). [PMID 22182984](#). [S2CID 32174574](#).