

Your Liver—It is Amazing and Essential

The liver performs more than 500 functions! It is as essential as your heart and lungs. Your liver is located on your right side just under the ribs and, in adults, weighs about 2 to 3 pounds.

Aids in digestion. The liver helps break down food and convert it into energy. It:

- Produces bile which is required for food digestion and absorption of vitamins.
- Produces cholesterol which is essential for health of your cells and to produce many hormones.
- Produces triglycerides which are a form of energy for your cells.
- Stores glucose (the body's main source of fuel) as glycogen and releases it when needed.
- Produces blood proteins, including albumin, that help to keep fluid from leaking out of the blood and accumulating in tissues (ascites).
- Helps regulate the levels of lipids (fats) in the blood.

Helps blood clot. The liver produces many proteins that are essential for blood clotting. Insufficient quantities of even one of the proteins can slow down the clotting process.

Stores vitamins and minerals. The liver takes up and then stores iron, copper, and fat-soluble vitamins such as vitamins A, B12, D, E, and folate until the body needs them.

Breaks down toxins (including alcohol, medicines and chemicals). It:

- Detoxifies alcohol, but it is also damaged by alcohol and strained as it works to detoxify the alcohol.
- Modifies or breaks down prescription, over the counter, and street drugs. Some drugs become active only after the liver modifies them. Some drugs are toxic to the liver- combinations can be worse. Impurities in street drugs may severely damage the liver.
- Detoxifies the chemicals that you breathe in, swallow or absorb through the skin. Households

and workplaces contain many chemicals including cleaning products and insect killers.

Breaks down the body's waste products. It:

- Converts ammonia (produced when proteins break down) to urea which is then excreted from the body.
- Modifies bilirubin (released when the body destroys old red blood cells) so that it is excreted through the digestive system. The yellow skin or eyes (jaundice) sometimes seen with hepatitis occurs when bilirubin builds up in the body.
- Metabolizes hormones- regulating the levels of certain hormones, particularly sex hormones like testosterone or estrogen, circulating in the body.

Helps fight infections. White blood cells frequently attack bacteria and other particles in the liver.

Many people have liver damage and don't know it. The liver is tough and, even when damaged, can perform the functions essential for life. However, if the liver is continuously injured or inflamed, it can't repair itself. See other items in this tool kit to learn more about the terms used here, about liver damage, and ways to prevent it!



Taking Care of Your Liver

If you have viral hepatitis, your liver is stressed. It is important to take extra care to reduce additional stress, inflammation, or damage to your liver. You can help maintain your liver's health with the following actions:

- ◆ Talk with a doctor about your need for hepatitis A and hepatitis B vaccinations.
- ◆ Never share:
 - drug paraphernalia/works (needles, syringes, cookers, cotton, water, snorting straws)
 - toothbrushes, razors, manicure implements, and other items that could have blood on them, even if you can't see it.
- ◆ Stop drinking alcohol. Alcohol significantly increases the risk of developing cirrhosis and liver cancer. If you can't stop drinking, cut back and seek help.
- ◆ Find a doctor who understands viral hepatitis. Gastroenterologists (GI), hepatologists, infectious disease and some primary care physicians may manage viral hepatitis.
- ◆ Get regular health check-ups. Remember to keep the rest of your body healthy!
- ◆ Eat a balanced diet of fresh vegetables, fruits, beans, whole grains, and lean meats.
- ◆ Cut down on foods with high salt, sugar or fat content.
- ◆ Drink plenty of water to flush toxins from your body. It also helps with side effects of hepatitis treatment.
- ◆ Get regular exercise and try to reduce stress in your life.
- ◆ Be cautious about over-the-counter medications. Talk to pharmacists or your doctor.
- ◆ Avoid high doses of vitamins. Talk to pharmacists or your doctor.
- ◆ Talk with your healthcare provider or pharmacist before using herbs and complementary or alternative therapies. They can interact with other drugs you take.
- ◆ Avoid herbs that are known to be toxic to the liver: peppermint, mistletoe, yerba tea, saffras, germander, chaparral, skull cap, nutmeg, valerian, Jin Bu Juan, comfrey (bush tea), pennyroyal, and tansy ragwortsenna.
- ◆ Don't take iron supplements, unless your healthcare provider prescribes them. Too much iron can be hard on the liver.

Liver Damage

Many people with liver damage have NO symptoms

The liver is hardworking and resilient. But it can be damaged. Sudden damage can come from an acute (recent or sudden) infection or exposure to toxins. The damage can also build up slowly over time from continued exposure to viruses, parasites, alcohol, or toxins. When symptoms of liver disease appear, they are signs that the liver is not performing one or more of its functions.



Viral hepatitis may cause liver damage. At this time we can't explain why some people develop more damage than others. The damage results from constant inflammation in the liver as the body tries to fight off the virus. The inflammation may cause liver scarring - called fibrosis. Over time, areas of fibrosis can start to connect with one another (bridging fibrosis). This fibrosis may start to impact the liver's function. When the scarring

becomes extensive, it is called cirrhosis. The scar tissue impedes blood flow through the liver. Liver cells die as they are deprived of oxygen and nutrients. Blockage can increase pressure in the blood vessels around the liver and cause bleeding.

The best way to evaluate liver damage is by liver biopsy. During a biopsy, a needle is inserted into the liver and small pieces of tissues are removed and then examined under a microscope. The images depict what liver tissue looks like with increasing levels of scarring, or fibrosis.

Another liver disease, liver cancer, called hepatocellular carcinoma (HCC) can result from infection with hepatitis viruses. Learn what you can do to help keep your liver healthy.

Early symptoms may include:

Nausea, vomiting, fatigue (tiredness), and weight loss.

Later symptoms may include:

Jaundice. Yellowing of skin and eyes and dark urine.

Blood clots slowly. It can take a long time for bleeding to stop. This can be life threatening!

Confusion. If waste products, like ammonia, build up it may cause confusion (encephalopathy).

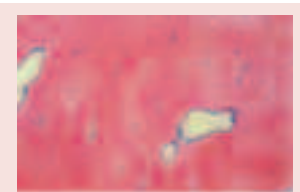
Skin changes. Itching, spider veins, red palms and face.

Decreased red blood cells. This (anemia) can make you feel very, very tired. This can be life threatening!

Bleeding in the stomach or throat. Scar tissue in the liver can block blood flow. Pressure builds up and blood vessels can break. This is life threatening!

Fluid in abdomen. Fluid (ascites) may build up around your middle or in legs and arms.

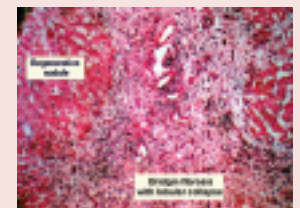
High blood sugar and hormone imbalances. Level of glucose (sugar) in the blood may be poorly regulated. Levels of hormones can be off, affecting essential functions, fertility, and menstruation.



Normal liver cells



Fibrosis



Cirrhosis

Blood Tests of Liver Function

Healthcare providers frequently order blood tests called 'Liver Panel', 'Liver Function Tests', or 'Enzyme Tests'. These tests are indirect measures of the liver's health. Meaning that they measure things associated with the liver, not the liver itself. We use these tests because examining the liver directly requires removing small pieces of the liver (liver biopsy). Liver biopsy is an invasive procedure recommended only if a doctor suspects damage.



Albumin - is a protein made by the liver. Low levels of albumin in the blood could indicate that the liver is not functioning properly. The serum albumin concentration is usually normal until significant liver damage is present.

PT - time, prothrombin time (clotting studies)- Prothrombin time is how long it takes blood to clot. The liver produces many of the factors needed for blood clotting and if the prothrombin time increases, it may indicate liver damage. Many drugs and medicines can effect PT time.

Bilirubin is a yellow pigment released when red blood cells break down. Some liver diseases can cause elevated bilirubin. Other medical conditions can lead to elevated bilirubin.

Platelet count - Platelets are small blood cells that help blood clot. Sometimes the number of platelets drop, indicating liver damage.

If the test results fall out of the expected range, providers may repeat the tests to see if levels have improved. If liver damage is suspected, they will likely order even more tests, including tests for hepatitis viruses, a liver ultrasound, and perhaps a liver biopsy. If you have hepatitis, doctors will follow these and other lab tests closely.

We have not listed 'normal' ranges because each laboratory uses different 'normal' indicators and providers have different interpretations of 'normal' levels. It is best to discuss laboratory results with a healthcare provider.

Laboratories provide the blood test results with 'reference' or 'normal' levels. You will see that 'reference' values differ for men and women and may change with age. Some medications, foods, alcohol, and chemical exposures can influence the results. For these reasons, doctors sometimes recommend repeating the tests.

Liver Panel tests usually include:

ALT - (alanine aminotransferase) is an enzyme produced in liver cells (hepatocytes). ALT levels may increase with liver inflammation or damage. Elevated ALT may result from high amounts of fat in the liver, some drugs/medications, alcohol, hepatitis viruses, and other liver diseases.

AST - (aspartate aminotransferase) is an enzyme found in many tissues. AST levels may be elevated when there is inflammation in the liver or another organ.

AP - (alkaline phosphatase) is an enzyme that may be elevated with many types of liver disease. An elevation in this enzyme can suggest bile duct problems. AP may be elevated in other diseases, like some bone disorders.

GT - (gamma glutamyl transpeptidase) is an enzyme often elevated in those with liver disease, including fatty liver disease. It is also elevated in people who frequently use alcohol, are exposed to toxic substances, or frequently consume large amounts of Aspartame (an artificial sweetener).

We recommend that you keep copies of your lab results so you can monitor your liver functions!



Liver Biopsy

Why are liver biopsies done?

Liver biopsies allow doctors to get a look at liver tissue. This is the best way to gauge the health of the liver. Blood tests help to identify potential problems, but examining the liver tissue directly helps doctors identify the reason for unexplained liver problems and determine the best course of treatment for liver diseases. While a biopsy provides a wealth of information about the liver, it is an invasive procedure so it is usually performed only when there is reason to believe that there is a problem with the liver.

What is a liver biopsy?

In a liver biopsy, a doctor uses a long needle to remove very small pieces of the liver. The liver tissue is sent to a laboratory for testing. In the lab, the tissue is cut into very thin pieces, attached to a small glass slides, and examined under a microscope. The tissue may be treated with various chemicals to help identify problems with the liver tissue.

What happens during a liver biopsy?

Since some patients with liver damage have problems with blood clotting, doctors usually do blood tests to check clotting before the procedure. Patients on medications to prevent blood clots (like coumadin) may have to adjust their medicines before the biopsy.

A liver biopsy is typically an outpatient procedure, meaning a patient goes to a clinic or hospital for a few hours, rather than overnight. Sometimes doctors give patients a sedative to help them relax during the procedure, but it is not usually necessary. The patient is asked to lie still on the back or left side while the doctor locates the liver and determines where to do the biopsy. Some doctors use an ultrasound to help them find the best spot.

The small area where the needle will be inserted is cleaned and a local anesthetic (a substance that makes the area numb) is injected. The doctor then inserts a thin long needle (designed to obtain small samples from the liver) through the skin. The doctor then asks the patient to hold his/her breath and the biopsy needle is inserted and

removed from the liver. It takes only a few seconds. The needle, with the piece of liver, is sent to the laboratory for examination.

Most patients have little or no pain, just a sense of pressure when the needle is inserted. A few patients report some pain that goes away when the needle is removed. Occasionally, patients report a lingering discomfort.

After the biopsy, patients rest at the doctor's office for a couple of hours (patients with blood clotting problems may be asked to stay for several hours). The staff checks the pulse and blood pressure and make sure that there is no bleeding. There is no long recovery period, though patients should limit physical activity for a few days.

What about complications?

Liver biopsies are quick and usually no problems result. However, it is an invasive procedure and complications can occur. Complications are rare, but if they do occur, they may include infection, internal bleeding, nicking other organs with the needle, and leaking of bile from the liver or gallbladder. These complications can usually be handled quickly and successfully.

When are results available?

Examination of the liver tissue in the laboratory takes a few days. The lab will send a report to your doctor. The doctor will review the results and call or schedule an appointment to discuss the results.

How frequently are biopsies done?

Most people only need one biopsy. If a patient and doctor want to monitor the health of the liver, including liver transplants, more biopsies may be done.

To watch a biopsy-video check out:
www.hepatitis-c.de/bilder/leberbio.rm

