

THE LIVER AND GALL BLADDER  
Modified from Ron Kennedy, MD by PBMD

Purpose

This information is meant to assist you in placing the liver and its gallbladder in your awareness, so that you know you have them and so that you can live your life in a way that supports the health of these organs. It must be clear that the liver is "vital," i.e., necessary for life. You would die without your liver in a matter of days.

Consult a diagram of the liver and gallbladder to locate the structures on the diagram mentioned in this discussion.

The liver is derived embryologically from the gastrointestinal tract, budding off that part of the GI tract which will become the first section of the small bowel, in the first three months of pregnancy. The liver is located in the right upper quadrant (quarter) of the abdomen directly below the diaphragm. It is the second largest organ in the human body.

Unlike any other organ, the liver has a dual blood supply, one arterial and the other venous. The arterial blood supply comes from the hepatic artery which is a branch off of the abdominal part of the aorta (the great vessel coming from the heart) and brings fresh, oxygenated blood. The other blood supply comes into the liver bringing venous blood from the small and large intestines, the pancreas and the spleen. This is called the hepatic portal system - portal meaning gateway.

Having absorbed the essential elements of digestion, this portal blood coming directly from the digestive tract requires immediate attention and processing. Not only is it rich in nutrients, which needs to be stored or processed in the liver, it also is rich in toxic material derived from the digestive process. It may also have a load of toxins usually present in the colon of a person eating a typical Western diet, or one with dysbiosis (see on site).

Blood leaving the liver is collected in the hepatic vein, going to the inferior vena cava thence to the right side of the heart for a trip through the lungs to collect oxygen.

The liver is divided into hundreds of thousands of lobules, each one a storage and detoxification plant. Each lobule receives a dual blood supply, just like the liver as a whole: from the digestive tract (the portal system) and the hepatic artery. Each one drains into the hepatic vein. Each cell in the liver makes direct contact via capillaries with all three of these systems: portal vein, hepatic artery and hepatic vein. The first two deliver nutrients and fresh blood respectively. The hepatic vein collects deoxygenated blood, along with processed nutrients, and goes back to the heart.

There is a second drainage system (besides the hepatic vein) to which each liver cell has direct access. This is called the "canalicular system." Each canaliculus (little canal) drains into progressively larger ducts and culminates in the hepatic duct, which combines with the duct coming from the gallbladder to form the common bile duct. The common bile duct empties, in turn, into the duodenum. Most fat soluble waste products formed by the liver exit the body through this system, and the rest, water soluble, is shunted via the venous then the general blood stream to the kidneys, where it is excreted in the urine.

Notice on your diagram of the liver, the position of the gallbladder and the bile duct. The gallbladder is a small sac, about the size of a golf ball, attached to the inferior surface of the liver. It stores the bile: a mixture of emulsifying agents, which are useful in the breakdown of fats for digestion by lipase from the pancreas. The gallbladder empties its contents through the common bile duct into the duodenum in response to the presence of fatty substances in that organ. There it emulsifies the fat into small globules, making it easier for lipase, from the pancreas, to make contact and digest fats.

About 1.4 liters of blood pass through the liver every minute and, at any time, the liver contains ten percent of the blood volume of the entire body. The liver is capable of storing large quantities of glucose as glycogen, a starchy substance made of glucose molecules which allows the controlled release of

glucose into the circulatory system on an as needed basis. The conversion of glycogen to glucose is controlled by the presence of insulin from the Islets of Langerhans in the pancreas.

It is this substance — glycogen — which endurance athletes try to build a large store of by eating lots of starchy foods the day before a contest. The liver also is responsible for storage of iron, copper, vitamins A, D and K and a large number of B vitamins. It also produces albumin, the major protein found in the blood, as well as prothrombin, fibrogen and heparin, all extremely important to the normal clotting and healing of wounds.

Amino acids of digested proteins are deaminated (removal of nitrogen) in the liver. Although many feel the Nitrogen is then made available for metabolism in the body as a whole, this may not be true. There is evidence to show that a great deal of our body structure comes from the nitrogen in the air we breathe. Nitrogen is the predominate gas in the air at 78% while there is only 21% at best and usually less! The liver also synthesizes cholesterol, which is necessary for construction and maintenance of cell walls and for the synthesis of many hormones, and the stroma of red blood cells. The liver can, to some degree, balance the proportion of carbohydrates, proteins and fats and make up for disproportionate intake in this way. This is achieved by the liver's ability to both break these substances down and reassemble them into different forms: fat to protein, protein to carbohydrate, carbohydrate to fat, carbohydrate to protein, etc..

Certain white blood cells (phagocytes), when they are in the liver, remove foreign substances and destroy bacteria in the general circulation. Drugs are detoxified in the liver, and cholesterol is excreted through the bile, which flows through the bile duct into the intestine. Also, hemoglobin breakdown — a natural outcome of the wear and tear on red blood cells — is accomplished in the liver and excreted as "bilirubin."

Naturally, all this metabolic activity produces a lot of heat, and together with the heart and skeletal muscles, the liver has a major role in maintaining normal body temperature, under prompting by thyroid hormone.

Because the liver has so much reserve capacity, it is possible to live with up to ninety percent of your liver function destroyed. However, when that line is crossed, deterioration of general health is rapid. Furthermore, you cannot enjoy all the vitality which is possible for you with less than 100% of your normal liver function.

The health of the liver is a reflection of the health of the rest of the body. There are do's and don'ts regarding the liver. Do enjoy a diet balanced in carbohydrates, proteins and fats; do achieve and maintain your ideal body weight; do not expose yourself to toxic chemicals such as alcohol. The most important thing you can do for the health and vitality of your liver is be aware that it exists; be aware of the jobs it does, and appreciate it. This will lead naturally to the desire to maintain excellent general health and therefore a very healthy liver.

#### Diseases of the Liver

The major diseases of the liver are cirrhosis and hepatitis. Cirrhosis is a scarring process combined with an attempt at regeneration. Liver cells can regenerate themselves but do a poor job of it, architecturally speaking. Regeneration of liver cells follows fatty degeneration caused by any prolonged toxic insult to the liver, the most common being ingestion of alcohol, but particularly obvious toxins as carbon tetrachloride and mushroom toxins, prescription drugs and thousands of petrochemicals. Prevention lies in avoiding breathing, contact or ingestion of those substances which damage the liver.

Hepatitis is caused by invasion of the liver tissues by an infectious agent, sometimes by bacteria but most commonly a virus. Viral hepatitis, of three or more kinds, are serious, often life-threatening diseases. They are transmitted by fecal contamination of anything entering the body and through dirty needles, and blood transfusion. People who inject street drugs run a high risk of hepatitis and AIDS. While AIDS gets all the publicity, hepatitis kills many more people. Prevention begins with the understanding that health is life; avoiding that which damages the liver is maintaining health.

### Gall Bladder Disease

The major diseases of the gallbladder are called "cholecystitis" (gallbladder inflammation) and cholelithiasis (gallbladder stones). These diseases are much more common in people who are overweight, in people over forty and especially in fertile women. However, the most important factor in gallbladder disease often is overlooked — food sensitivity. A gallbladder attack, with or without stones present, is often a manifestation of allergy. This should never be overlooked, and it should always be suspected. Many people have had unnecessary gallbladder surgery because the doctor was not informed of this aspect of gallbladder problems. You should remember it. (See section on food allergy / sensitivities)