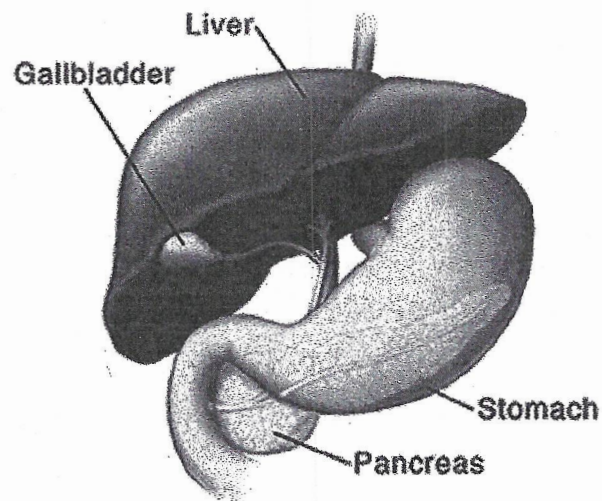


# Your Marvelous Busy Liver!



Written by Anne Engen and Lynda Nyseth  
2024

With a little help from  
Larry Liver, Gabby Gallbladder  
And Peter Pancreas

Teachers, slow your speech so the class can absorb what you are saying.

Stand if you have a backbone? Good, only animals with backbones have a liver.  
But where is your liver?

Raise your right hand, now slowly run your hand down your right side. Your liver fits perfectly atop your stomach and is shaped like a maroon football. It's the heaviest organ in your body.

Your average liver weighs about 3.3 pounds.

***The liver of a blue whale can weigh as much as \_\_\_\_\_ pounds?***

(Have the class write down a guess, then share. Answer is 1,980 pounds)

***Who had the closest guess.***

***Your liver is a multitasker that can carry out more than \_\_\_\_\_ important tasks.***

Here is a hint, more than all your fingers and toes.

(Have the class write down their guess), then share their answers.

The answer is 500 tasks.

Does this answer surprise you?

Let's take a few minutes to complete a quiz and word game before we get into our lesson. (Allow 5 minutes for the quiz and word game.)

Let's see all that we can learn about our liver with the help of our new friends: Larry Liver, Gabby Gallbladder and Peter Pancreas.

**Gabby Gallbladder:** WOW! 500 tasks, that's a lot. Larry what are some of these tasks?

**Larry Liver:** Your liver is the largest internal organ in your body and is also a gland because it secretes hormones and other chemicals.

Your liver produces bile, a fluid that helps neutralizes stomach acid so it can digest fats and carry away waste.

Your liver processes the medicine you take into a form your body can use.

It converts food into nutrients, stores vitamins and minerals.

Your liver cleans and filters all of the blood in your body, removing toxins, bacteria and cellular waste. Your liver breaks down poisonous substances such as alcohol and drugs and **never sends you a bill.**

**Peter Pancreas:** I have a part in helping control levels of blood sugar. After a meal, your liver works with your pancreas to control your levels of blood sugar.

**Leader:** Your maroon liver consists of 4 lobes. Those lobes have 8 sections which have thousands of little busy lobes. Did you know you are walking around with a chemical factory inside you?

**Your liver processes about \_\_\_\_\_ gallons of blood every day. What's your guess?**  
(250 gallons)

Most of the cholesterol in your body is made by your liver from saturated fats in foods you have eaten, such as red meats and whole-milk products. (Ice Cream & cheese etc.)

**Problem signs:**

1. **Stubborn weight gain:** If you find yourself eating healthy and exercising, yet still gaining weight this could be a problem with your liver. When your liver is overworked, your metabolism can slow down. This can lead to stubborn extra pounds, especially in your abdomen.
2. **Fatigue:** When your liver becomes sluggish, it can make you feel tired. Your liver is in charge of filtering out harmful toxins from your body. When your liver is overworked, it becomes *less effective* at removing those toxins. **This can lead to toxin buildup and feeling tired often.**
3. **Skin that itches:** Many people don't associate itchy skin with liver function. **But itchy skin can be a sign of liver damage.** Some scientists believe this happens due to accumulation of bile salts. To make matters worse, there is often no visible rash associated with the itching. And the itching sensations tend to continue even after scratching. Obviously, this can be very uncomfortable and disrupt your sleep.
4. **Feeling Confused:** This goes back to the toxin buildup that can occur if your liver is overworked. Too many toxins **negatively affect your brain health**, leading to feelings of confusion.
5. **Swelling or Pain in the Upper Belly:** Your liver is found in the upper right quadrant of your abdomen. Swelling or pain in that area can be a sign of liver damage. If you're dealing with swelling or pain in your upper belly often, **make sure you get checked out by your doctor.**

**5 Food Tips to Boost Your Liver Health and Why It's Crucial**

Your liver plays a vital role in your overall health and well-being. As I said before the liver is responsible for over 500 life-sustaining functions every single day. When your liver becomes sluggish or overworked, that can have disastrous consequences on your health. Here are 5 quick food tips you can start doing today to boost your liver health. These can also help you trim your waistline and promote a healthy weight.

1. **Ditch the refined carbs.** Instead, go for more whole grains and gluten-free bread. For pasta lovers, veggie or legume-based pasta are healthier options.
2. **Minimize intake of sugar and artificial sweeteners as much as possible.** These are like poison to your liver.
3. **Eat more fruits, veggies and fermented foods. Vegetables are good sources of fiber. Fruits are rich in prebiotics. Fermented foods are great sources of probiotics.**
4. **Keep meat consumption to 2 or 3 servings of lean, grass-fed meat per week.**

5. **Eat wild-caught fatty fish 2 to 3 times per week and more pasture-raised eggs.** While these food tips are a great start to boosting your liver health, they may not be enough. Depending on your situation, food may not even be the best way to improve your liver health.

**LIVER DISEASES** is a term that refers to a number of conditions that can damage your liver. It could be viruses, drugs, too much alcohol, inherited diseases, hepatitis A, B, or C, or fatty liver disease and cirrhosis. The Alphabet Hepatitis is explained this way.

Hepatitis **A** is found in feces of infected people.

Hepatitis **B** is a virus causing inflammation of the liver, the scarring called cirrhosis. A hepatitis B lifetime vaccination is required for all American children. Hepatitis B is more likely to be transmitted through sexual activity, it's more infectious than HIV.

Hepatitis **C** is transmitted through contact with an infected person's blood, such as can happen with drug users, or getting body piercings. It's rarely transmitted sexually, but more likely to become chronic. It progresses slowly for many years before causing liver damage. The virus used to be spread through blood transfusions, but for thirty-three years donor blood has been screened for hepatitis C.

There is a hepatitis **E**, but extremely rare in our country. If you visit a country with poor sanitation systems make sure to drink bottled water and avoid ice cubes.

A healthy liver is essential to your overall health. But, let's zoom in on fatty liver disease. Doctors don't know exactly why some people have fat buildup in their liver even if they are not heavy alcohol drinkers. Nearly 1 in 4 people who have excess fat in their livers will go on to develop a serious disease known as NASH – nonalcoholic Hepatitis. Fatty liver disease is common among people of Hispanic descent.

**Liver Cancer.** Rarely do cancers originate in your liver, but about one third of all cancers spread to the liver. The outcome is poor. Liver cancer is twice as common in men than women.

Ever heard of Wilson's Disease? You have to inherit this recessive gene. What happens is you have excessive amounts of copper building up in your liver or brain because your liver cannot release this copper. This mineral is in many foods and is essential to our bodies in small amounts. If you have Wilson's Disease your liver **keeps** the copper and over time it produces tremors in your arms and hands, damages your kidneys, brain and eyes. A doctor can diagnosis this disease, treat you with zinc which blocks the absorption of copper.

Let's move on because you need to meet your liver's neighbors to understand how they all work together to keep you happy and healthy. As I said before the liver is located in the upper right-hand portion of the abdominal cavity, beneath the diaphragm and on top of the stomach, right kidney and intestines.

Under your **liver** is your **gallbladder**, a very small pear-shaped muscular sac-like organ that rests against the lower right lobe of your liver to absorb water and store bile. Your **pancreas** is a long soft, irregular gland that hides just below the lower part of your stomach. It produces enzymes that move through the pancreatic duct to break down fats, proteins and carbs.

The liver, gallbladder and pancreas are not considered organs of the digestive system, **but** they enable your body to use nutrients for energy. They are mighty good neighbors!

Remember bile is a liquid created in the liver to neutralize stomach acid and break down fats. Bile ducts are small channels that carry bile from your liver to your gallbladder.

You might have noticed people whose skin has turned a shade yellow green and the whites of their eyes are yellow. They have jaundice that results from excess bilirubin (pronounced billy rumen) in their blood. Jaundice occurs as a result of liver hepatitis diseases or blockage of a bile duct or a medication.

Let's follow this jaundice color wheel.

*Bilirubin is a **yellow** pigment by-product  
of aging **red** blood cells*

*Too much yellow pigment discolors the eyes and skin.*

*I know you artists are thinking, yellow plus red makes orange, but not this time.*

Normally how it works, the **liver** filters the dead red blood cells from the bloodstream and sends them down the bile ducts to the gallbladder. From there the dead blood cells flow into your **small intestine** where most of it is eaten by bacteria.

**Larry Liver:** We have learned a lot about the functions of the liver. So, let's review and learn a few other things. We have talked about the location of the liver, gallbladder and pancreas. The liver is shaped like a cone, maroon or dark reddish-brown organ that weighs about 3 pounds. It holds about 1 pint (13%) of the body's blood supply at any given moment. It consists of 2 main lobes. Both are made up of 8 segments that consist of 1,000 lobules (small lobes). These lobules are connected to small ducts (tubes) that connect with larger ducts to transport the bile made by the liver cells to the gallbladder. The liver regulates most chemical levels in the blood and excretes a product called bile. This helps carry away waste products from the liver.

Other functions:

- Production of certain proteins for blood plasma.
- Production of cholesterol and special proteins to help carry fats through the body.
- Conversion of excess glucose into glycogen for storage (glycogen can later be converted back to glucose for energy) and to balance and make glucose as needed.
- Regulation of blood levels of amino acids, which form the building blocks of proteins.
- Processing of hemoglobin for use of its iron content (the liver stores iron).
- Conversion of poisonous ammonia to urea (urea is an end product of protein metabolism and is excreted in the urine)
- Clearing the blood of drugs and other poisonous substances.
- Regulating blood clotting.
- Resisting infections by making immune factors and removing bacteria from the bloodstream.
- Clearance of bilirubin, also from red blood cells. If there is an accumulation of bilirubin, the skin and eyes turn yellow.

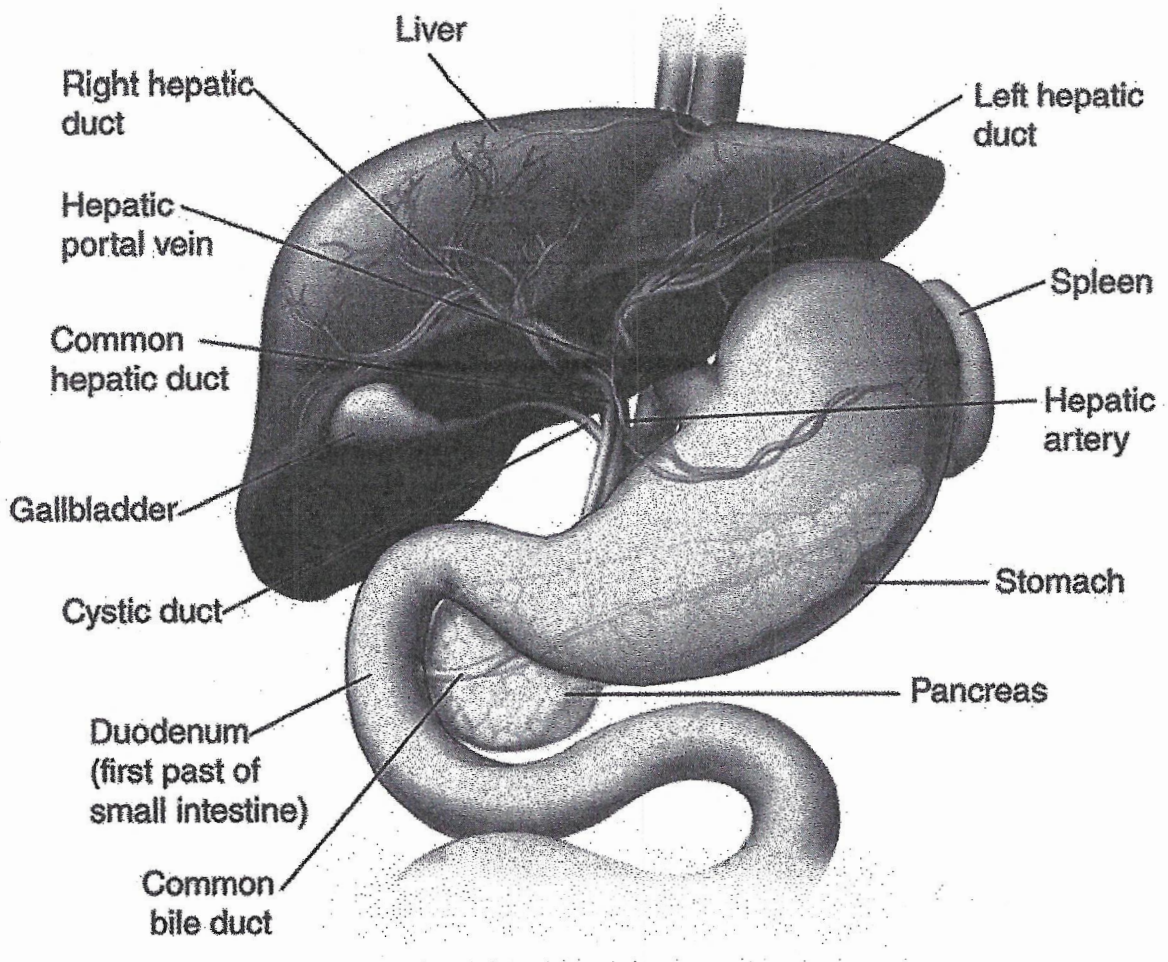
**Gabby and Peter:** Oh, there is another amazing factor that the liver is capable of and that is **It can regenerate!**

**Leader:**

### **LIVER TRANSPLANTS**

Your liver is the only organ with the ability to regenerate. If you lost  $\frac{3}{4}$  of your liver in a terrible accident your liver could grow back within a few weeks.

The liver was one of first organs to be transplanted and is the second most transplanted organ in the world. (kidneys are in first place). A liver transplant is a lifesaving gift. Get approved for a transplant. If you don't have a living donor willing to share with you, get on the national waiting list. The state where it's the easiest to get a liver transplant is Florida – which has more deceased donors. Life expectancy after a transplant is more than 10 years, as many as 20 years or more.



**Teacher:** Let's see how you did on your quiz and word puzzle.

## References for the Liver Lesson

My Amazing Body Machine by Robert Winston

Human Anatomy for Kids by Kristie Wagner

American Medical Association – Family Medical Guide

National Library of Medicine

John Hopkins Medicine

Internet Search “Healthy Liver”

Scroll down and you will see:

<https://renewyourliver.com>

under that will be the article **“Warning signs of Damaged Liver”**

(If you just type in that web site you get information on pills, so I just clicked on the article.)



### Healthy Liver Quiz

1. The average liver weighs about \_\_\_\_\_ pounds.
2. The liver carries out more than \_\_\_\_\_ tasks.
3. Your liver is the: smallest or largest internal organ in your body.
4. Which are the functions of the liver:
  - a. Removes toxins and alcohol and other drugs from the blood
  - b. Filters all the blood in our body
  - c. Removes bacteria and cellular waste
  - d. Never sends you a bill
  - e. All of the above
5. The liver processes about \_\_\_\_\_ gallons of blood every day.
6. Bilirubin is a yellow pigment by-product of aging white blood cells. T or F
7. About one third of all cancers spread to the liver. T or F
8. Hepatitis B is a virus causing inflammation of the liver, the scarring is called cirrhosis. T or F
9. A Hepatitis B lifetime vaccination is required for all American children. T or F
10. Under the liver the gallbladder, a very small peanut shaped muscular sac-like organ absorbs water and stores bile. T or F
11. The pancreas hides just below the lower part of your stomach, it produces enzymes that break down fats, proteins and carbs. T or F
12. Your liver is the only organ with the ability to regenerate. T or F
13. The liver was one of the first organs to be transplanted and is the second most transplanted organ in the world. Which organ takes first place?
  - a. Kidney
  - b. Heart
  - c. Knee
14. Wilson's Disease, caused by an inherited recessive gene. You have an excessive amount of copper building up in your liver or brain because your liver cannot release this copper. Your liver keeps the copper and it can cause:
  - a. Tremors in your arms and hands
  - b. Damage to your kidneys, brain and eyes
  - c. When diagnosis this disease can be treated with zinc which blocks the absorption of copper
  - d. All of the above
15. People whose skin has turned a shade of yellow green and the whites of their eyes are yellow, have jaundice which is the result of excess bilirubin. T or F

How many words can you make from the letters in "HEALTHY LIVER". Using the letter only as often as it appears in the words, healthy liver, you can have two "H's", two "L's", two "E's", but only one "A", "T", etc. in each word. See if you can make at least five words for each letter.

"H"

- 1.
- 2.
- 3.
- 4.
- 5.

"Y"

- 1.
- 2.
- 3.
- 4.
- 5.

"E"

- 1.
- 2.
- 3.
- 4.
- 5.

"I"

- 1.
- 2.
- 3.
- 4.
- 5.

"A"

- 1.
- 2.
- 3.
- 4.
- 5.

"V"

- 1.
- 2.
- 3.
- 4.
- 5.

"L"

- 1.
- 2.
- 3.
- 4.
- 5.

"R"

- 1.
- 2.
- 3.
- 4.
- 5.

"T"

- 1.
- 2.
- 3.
- 4.
- 5.

### Healthy Liver Quiz

1. The average liver weighs about 3.3 pounds. (pg.2)
2. The liver carries out more than 500 tasks. (pg.2)
3. Your liver is the: smallest or largest internal organ in your body. (Largest pg.2)
4. Which are the functions of the liver:
  - a. Removes toxins and alcohol and other drugs from the blood
  - b. Filters all the blood in our body
  - c. Removes bacteria and cellular waste
  - d. Never sends you a bill
  - e. All of the above ("e" pg.2)
5. The liver processes about 250 gallons of blood every day. (pg.3)
6. Bilirubin is a yellow pigment by-product of aging white blood cells. T or F (F, red blood cells (pg.5))
7. About one third of all cancers spread to the liver. T or F (T,pg.4)
8. Hepatitis B is a virus causing inflammation of the liver, the scarring is called cirrhosis. T or F (T, pg.4)
9. A Hepatitis B lifetime vaccination is required for all American children. T or F (T, pg.4)
10. Under the liver the gallbladder, a very small peanut shaped muscular sac-like organ absorbs water and stores bile. T or F (T, pg.5)
11. The pancreas hides just below the lower part of your stomach, it produces enzymes that break down fats, proteins and carbs. T or F (T, pg.5)
12. Your liver is the only organ with the ability to regenerate. T or F (T, pg.6)
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  - c. When diagnosis this disease can be treated with zinc which blocks the absorption of copper
  - d. All of the above ("d", pg.5)
15. People whose skin has turned a shade of yellow green and the whites of their eyes are yellow, have jaundice which is the result of excess bilirubin. T or F (T, pg.5)

Examples, you may find others.

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"H"

1. heart
2. health
3. heal
4. hive
5. have

"E"

1. early
2. ear
3. earth
4. eel
5. eat

"A"

1. all
2. air
3. are
4. art
5. alert

"L"

1. live
2. lite
3. lively
4. liver
5. late

"T"

1. tall
2. tell
3. teal
4. they
5. three

"Y"

1. yea
2. year
3. yet
4. yell
5. yelt (young sow female pig)

"I"

1. ivy
2. ill
3. ire
4. irate
5. iver (yew tree)

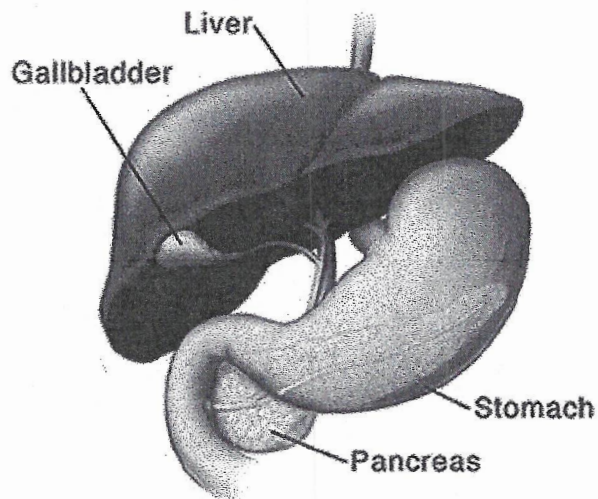
"V"

1. very
2. vary
3. real
4. vile
5. viral

"R"

1. rate
2. rathe (persons action, prompt)
3. real
4. really
5. relive

# **Your Marvelous Busy Liver!**



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**With a little help from  
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And Peter Pancreas**

Your Marvelous Busy Liver!  
Members lesson

Stand if you have a backbone? Good, only animals with backbones have a liver. But where is your liver? Raise your right hand, now slowly run your hand down your right side. Your liver fits perfectly atop your stomach and is shaped like a maroon football. It's the heaviest organ in your body.

Your average liver weighs about 3.3 pounds.

*The liver of a blue whale can weigh as much as \_\_\_\_\_ pounds?*

(Answer is 1,980 pounds)

*Your liver is a multitasker that can carry out more than \_\_\_\_\_ important tasks.*

Here is a hint, more than all your fingers and toes.

The answer is 500 tasks.

Does this answer surprise you?

Let's see all that we can learn about our liver with the help of our new friends: Larry Liver, Gabby Gallbladder and Peter Pancreas.

**Gabby Gallbladder:** WOW! 500 tasks, that's a lot. Larry what are some of these tasks?

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**Problem signs:**

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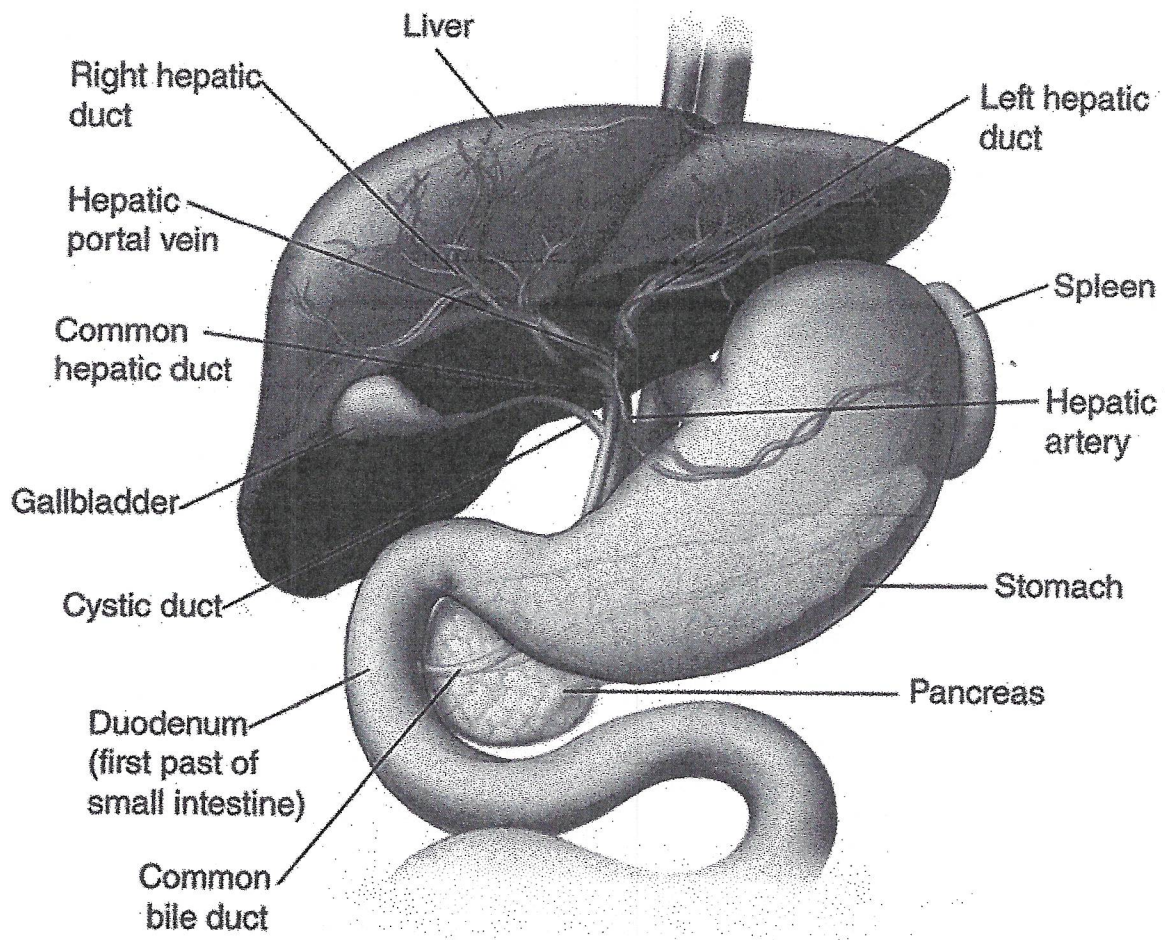
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## References

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  - b. Filters all the blood in our body
  - c. Removes bacteria and cellular waste
  - d. Never sends you a bill
  - e. All of the above
5. The liver processes about \_\_\_\_\_ gallons of blood every day.
6. Bilirubin is a yellow pigment by-product of aging white blood cells. T or F
7. About one third of all cancers spread to the liver. T or F
8. Hepatitis B is a virus causing inflammation of the liver, the scarring is called cirrhosis. T or F
9. A Hepatitis B lifetime vaccination is required for all American children. T or F
10. Under the liver the gallbladder, a very small peanut shaped muscular sac-like organ absorbs water and stores bile. T or F
11. The pancreas hides just below the lower part of your stomach, it produces enzymes that break down fats, proteins and carbs. T or F
12. Your liver is the only organ with the ability to regenerate. T or F
13. The liver was one of the first organs to be transplanted and is the second most transplanted organ in the world. Which organ takes first place?
  - a. Kidney
  - b. Heart
  - c. Knee
14. Wilson's Disease, caused by an inherited recessive gene. You have an excessive amount of copper building up in your liver or brain because your liver cannot release this copper. Your liver keeps the copper and it can cause:
  - a. Tremors in your arms and hands
  - b. Damage to your kidneys, brain and eyes
  - c. When diagnosis this disease can be treated with zinc which blocks the absorption of copper
  - d. All of the above
15. People whose skin has turned a shade of yellow green and the whites of their eyes are yellow, have jaundice which is the result of excess bilirubin. T or F

How many words can you make from the letters in "HEALTHY LIVER". Using the letter only as often as it appears in the words, healthy liver, you can have two "H's", two "L's", two "E's", but only one "A", "T", etc. in each word. See if you can make at least five words for each letter.

"H"

- 1.
- 2.
- 3.
- 4.
- 5.

"E"

- 1.
- 2.
- 3.
- 4.
- 5.

"A"

- 1.
- 2.
- 3.
- 4.
- 5.

"L"

- 1.
- 2.
- 3.
- 4.
- 5.

"T"

- 1.
- 2.
- 3.
- 4.
- 5.

"Y"

- 1.
- 2.
- 3.
- 4.
- 5.

"I"

- 1.
- 2.
- 3.
- 4.
- 5.

"V"

- 1.
- 2.
- 3.
- 4.
- 5.

"R"

- 1.
- 2.
- 3.
- 4.
- 5.

# Larry Liver

**Gabby**

**Gallbladder**



**Peter**

**Pancreas**

