

# LIVER DISEASE

The liver is a large and complex organ and serves many important functions. It filters and metabolizes waste products, drugs and toxins from the blood stream. It helps to control blood sugar and fat levels. It recycles old red blood cells into components that are reused by the body to make new red blood cells. It also makes proteins called clotting factors that allow the blood to clot in response to a cut or other injury.

The liver is subject to damage by a wide variety of diseases. Viruses, bacterial infections, toxins, and several forms of cancer are a few of the possible causes of liver disease. Some diseases cause very sudden and severe liver damage, and others are slow and insidious. If the disease progresses slowly, symptoms of disease may not appear for many months, but the liver may be slowly destroyed. A normal liver has a lot of excess capacity. By the time signs appear in some slow moving diseases, 3/4 of the liver may already have been destroyed. On the other hand, many liver problems are mild or short lived, and the liver is very good at healing and regenerating itself once the cause of the disease is under control.

Symptoms of liver disease may include vomiting or diarrhea, abnormal bruising or bleeding due to lack of clotting factors, lack of appetite, depression, weight loss, dry skin, increased thirst, dark colored urine, and eventually jaundice - the yellow discoloration of the skin, gums and other tissues from the build up of toxic waste products in the blood. Since these symptoms tend to develop very late in the disease process, we always hope to catch problems in the early stages, before these signs appear. Routine blood screening helps us to do that, and liver disease is one of the primary reasons we do pre-anesthetic and senior pet blood testing.

In most forms of hepatitis, which means liver inflammation, blood testing reveals higher than normal levels of liver enzymes. Liver enzymes are present inside liver cells and help the liver do its many jobs. When liver cells are damaged or destroyed, these cells leak out their enzymes. The enzymes are picked up by the bloodstream and then show up on blood tests. Elevated liver enzyme levels tell us the liver is inflamed and cells are being damaged. They don't tell us why. Further testing is usually needed to determine how much damage has been done, how well the liver is actually functioning and what is causing the problem.

Additional blood testing usually includes bile acids levels. Bile acids are products of food metabolism. After an animal eats, the liver should process the bile acids found in food protein and excrete them. Bile acids are collected in the gall bladder and excreted into the intestine to then pass out of the body. If the liver can't function properly, bile acids are not excreted and build up in the body, eventually causing nausea and poor appetite. Bile acid levels tell us whether the liver can perform one of its major functions properly.

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Bilirubin levels are included in our chemistry panel tests. Bilirubin is the pigment in the hemoglobin that carries oxygen in red blood cells. The liver should recycle bilirubin, and when it can't, that, too, builds up to toxic levels and causes jaundice. Bile acid level is an earlier warning test of liver dysfunction. Liver disease is more severe if the bilirubin level is also high.

X-rays to look for swelling or tumors, ultrasound scanning and biopsies are further tests that may need to be done to diagnose liver diseases. If liver disease is diagnosed in your pet, both blood testing and perhaps some of these other tests will need to be repeated later on, to track the progress of the disease, or the recovery from it.

Most of the time, the liver diseases we see involve inflammation. Sometimes the degree of inflammation is mild and sometimes it is severe. If the pet has any other diseases that are damaging the liver, especially pancreatitis or dental disease, treating that disease usually allows the liver to heal as well. We will frequently treat for any other disease present and then retest the liver enzymes later.

If a poison or toxin is found to be the cause of problems, the damaging agent should be removed or eliminated if possible. Bedlington Terriers have a genetic disease in which they are unable to metabolize the mineral copper in their diet, and the copper builds up to toxic levels. Special diets and medication are needed for this disease. Valium is used occasionally in cats and can cause severe liver failure in some. Other medications that occasionally cause hepatitis are Rimadyl and other anti-inflammatory drugs. No one knows for sure why some pets will suffer terrible liver damage from routine medications that most animals handle with ease. In a similar way, some people end up getting liver transplants after having a glass of wine or a beer the same day they took acetaminophen (Tylenol). If pets are to be on anti-inflammatory medications long term, regular testing of liver enzymes is a good idea, to monitor for these occasional drug reactions that occur in some pets.

If no underlying disease is found that is causing the liver inflammation, and the liver inflammation is mild, we usually treat the pet for a few weeks with antibiotics and anti-inflammatory medications. Then we recheck the liver enzymes again to see if treatment has been effective. If problems are severe or persist, then more detective work may be needed to make a diagnosis and formulate a treatment plan. Treatment may last only a few weeks, or be needed for the rest of the pet's life.

A few diseases cause liver damage without very much inflammation. If your pet may have one of these three diseases, an extra page has been added at the end of this handout, and the appropriate section of that page will be marked for you.

How much diagnostic testing is done, and how soon, depends on the severity of the blood tests or symptoms, and also the wishes and pocketbook of the owner. It is difficult sometimes for us to give an accurate estimate of treatment or prognosis because there are so many degrees and causes of liver disease in pets. Good communication between the client and veterinarian, and careful, regular follow up care and recheck blood tests, are often vital to successful treatment.

Most pets with chronic liver disease are placed on special prescription diets to decrease stress on the liver. Because the liver has to handle protein waste products, these diets are low in protein, and the protein is highly digestible. Increased levels of fat and fatty acids help maintain weight and reduce skin problems. Medications may be needed as well.

Sudden liver failure, or worsening of a slowly progressive liver problem, is treated with IV fluids in the hospital, as well as medication for the cause of the problem and to

help the liver function better. Leptospirosis is a viral disease that sometimes causes kidney and liver disease. The dog will become suddenly and severely ill, with high fever, vomiting and often red colored urine. Other viruses, bacterial infections or poisons may also be a cause. The prognosis is always very guarded in severe liver failure, and many dogs and cats will not survive.

Your pet's liver disease, as far as we can tell at this time, is [ ] mild, [ ] moderate, [ ] severe.

A special diet is needed \_\_\_\_\_. Amount to feed per day \_\_\_\_\_.

Medication [ ] is, or [ ] is not, needed at this time \_\_\_\_\_.

We will need to retest your pet's blood again in: \_\_\_\_\_

Liver enzymes may be at normal levels, despite significant impairment of liver function, with several diseases. The three most common of these diseases are cirrhosis, portosystemic shunt and hepatic lipidosis.

\_\_\_\_\_ In cirrhosis, the liver is slowly damaged and eventually destroyed, and normal liver cells are replaced by scar tissue. In people this is commonly due to alcoholism, but in animals it is usually due to viruses or toxins. The scar tissue that forms in response to chronic inflammation has no liver enzymes, so even if the liver is almost totally scarred there will be no enzyme elevation seen on blood tests. The liver function eventually deteriorates enough to cause symptoms of liver disease, but enzyme elevations are usually absent. The liver usually will look small on an X-ray. An ultrasound scan or biopsy of the liver can also diagnose cirrhosis.

Treatment for cirrhosis in people is liver transplantation. Since this is not available for pets, cirrhosis is treated by minimizing the amount of work the liver has to do and supporting the pet as best we can. Special low protein diets and medication to help the liver process bile acids are prescribed. Sometimes the disease progresses despite all our efforts. Other pets survive several years with this disease.

\_\_\_\_\_ Hepatic lipidosis is a disease seen primarily in cats. This disease occurs when a cat, especially an overweight cat, stops eating for 2 or more days. The body starts to mobilize its fat stores in response to lack of eating. Large quantities of fats, or lipids, circulate in the bloodstream. The liver cannot keep up with processing the fat and turning it into the glucose sugar the body uses for fuel. The fats clog the liver and impair its function. The cat becomes ill with liver disease, and rapidly becomes jaundiced and nauseated. Whatever the problem was that caused the cat to stop eating in the first place then becomes worsened by liver failure. Because of this disease, it is very important to have a cat examined and treated very soon after a problem with eating is noticed.

Treatment is started for whatever problem caused the cat to stop eating in the first place, and the treatment for the liver disease is simply to get enough food into the cat to stop the mobilization of fat stores, so the liver can gradually return to normal. In severe cases this disease can be fatal, but most of the time syringe or tube feeding is used for as long as it takes for the liver to heal and the cat's appetite to come back, and the cat will eventually return to normal. Since cats are difficult to syringe feed, and it may be necessary to do this feeding for several months, we usually place an esophageal feeding tube into the cat's neck. This is a brief surgery to pass a tube into the esophagus through a small incision. Once sutured and bandaged in place, the tube is easy to maintain and feed soupy food through, with no pain on the part of the cat. Feeding through the tube takes only a few minutes two to four times a day.

\_\_\_\_\_ The last of these non-inflammatory diseases is a portosystemic shunt (PSS). This is a birth defect which routes one or more blood vessels around the liver instead of through it. Deprived of the blood supply it needs, the liver cannot grow to full size. The stunted liver that results is too small to function normally.

Since this is not an inflammatory process, liver enzymes included in standard screening blood tests will be normal, but these pets can have problems handling surgery and anesthesia. Sometimes they will also show odd behavior after eating, as ammonia, bile acids and other toxins flood their system because the liver cannot process them. Failure to gain weight normally, lethargy (not acting like a normal, playful puppy or kitten), and dry skin and haircoat are other signs of this disease.

Certain breeds are much more prone to liver shunts, including Yorkshire terriers, Maltese and miniature schnauzers. If your puppy or dog is of a susceptible breed, we will recommend including a bile acids level with pre-anesthetic blood testing, so we can avoid anesthetic drugs that have to be processed by the liver. Some animals may have normal bile acid levels when they are young but become abnormal later – the liver gradually shrinks with age. Thus we recommend bile acid screening for at-risk breeds even if previous testing was fine.

There are two types of shunts that can occur. If there is a single, large vein that bypasses the liver, that vessel can be closed off surgically, redirecting blood back into the liver. The surgery involves placement of an ameroid ring, a small device that gradually closes down around the blood vessel and squeezes it closed. Cats are more likely to have a single shunting blood vessel that is surgically fixable.

The other type of PSS is called microvascular dysplasia (MVD). In this form, there are many small blood vessels instead of one larger one. MVD is not correctable surgically. Instead, we use special diets to minimize stress on the liver and provide extra fat-soluble vitamins that are normally stored in the liver. If the bile acids level gets too high we also use a medication called ursodiol to bind with some of the bile acids so they can be processed more easily.

To distinguish between the two types of shunts, we use a blood test called Protein C. Pets must be fasted prior to drawing blood for this test. If the Protein C level indicates a single shunting vessel. We may go on to refer you to a specialist for ultrasound of the liver and surgery to place an ameroid ring. If surgery is successful, the pet will lead a normal and healthy life. If surgery is not done, the pet will probably not live a normal length of life, but how well he or she will do depends on the amount of blood supply the liver is receiving.