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SPECIALISTS**
State of the Art Care, In the Heart of the State

Liver Disease

What is the liver and what does it do?

The liver is a remarkable and complex organ located in the very front of the abdomen, behind the diaphragm. The liver is responsible for metabolism and storage of nutrients, processing toxins and drugs, synthesizing proteins and other compounds, and forming and secreting bile to aid in digestion. The portal vein is a blood vessel that brings absorbed digested nutrients from the intestines to the liver for further processing and storage. Blood percolates through the liver before entering into the body as a whole.

- *Bile* is a greenish substance secreted into the small intestine via the gall bladder and bile ducts that contains compounds that aid in digestion of fats; certain drugs or toxins may also be excreted this way
- *Albumin* is the major blood protein made by the liver that helps with a wide array of functions in the body
- *Coagulation factors* are proteins made in the liver that work with platelets and blood vessels to help the blood to clot

What types of liver disease occur in dogs and cats?

Cats commonly get at least four different liver conditions: hepatic lipidosis, infectious cholangiohepatitis, immune-mediated cholangiohepatitis, and hepatic lymphoma. Lymphoma is a cancer that can be seen in both high-grade (aggressive and rapidly progressive) and low-grade (insidious and slowly progressive). Although other liver cancers can occur in cats, they are less common. Immune-mediated cholangiohepatitis is a condition wherein the immune system attacks the liver and associated structures; it can be associated with *inflammatory bowel disease* and *pancreatitis* in certain cats. Infectious cholangiohepatitis usually results from ascending infection from the intestines. Hepatic lipidosis is a fatty liver change that is typically a secondary phenomenon (dealt with in a separate information article).

Dogs can also get a number of liver diseases. The most common canine liver disease is chronic active hepatitis, which is typically considered an immune-mediated condition. Ascending bacterial cholangiohepatitis can be seen in dogs just as in cats. Viral liver disease is exceedingly rare since vaccination for this disease was instituted. Microvascular dysplasia and porto-systemic shunts are diseases in which blood travels in abnormal patterns through and around the liver, altering the ability of the liver to perform all of its normal functions. Tumors of the liver are relatively common in dogs as they age. Many are benign or slow to metastasize, although more aggressive cancer is also seen. Vacuolar hepatopathy is a



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secondary condition in dog that causes increased liver enzymes. It is commonly associated with endocrine diseases, such as Cushing's disease (*hyperadrenocorticism*).

Both cats and dogs can experience toxic events from drugs, plants, fungi, metals (i.e. copper) and other compounds.

- *Inflammatory bowel disease* is a condition involving abnormal immune reaction in the intestines (see other information sheet)
- *Pancreatitis* is inflammation or infection of the pancreas (see other information sheet)
- *Hyperadrenocorticism (Cushing's disease)* is a condition in which the body makes too much cortisol, a normal hormone (see other information sheet)

What clinical signs does liver disease cause?

Liver disease may cause many or no clinical signs. In the early stages, liver disease may present with only labwork abnormalities. As greater amounts of liver tissue are affected, more clinical signs may develop.

Common signs include:

- Lethargy
- Jaundice
- Diarrhea
- Dark urine
- Anorexia
- Vomiting

Less common clinical signs include:

- Ascites
- Hepatic encephalopathy
- Melena

- *Anorexia* is a total loss of appetite
- *Jaundice* is the yellow coloration that develops in the tissues from the increase in bilirubin occurring in liver disease
- *Ascites* is the build-up of fluid in the abdomen associated with low albumin levels in liver failure and/or increased pressure in the portal system
- *Hepatic encephalopathy* is the neurological changes that occur with liver failure as the liver becomes less able to remove toxins, drugs and metabolites from the blood. Dullness, lethargy, seizures, and blindness are the most common clinical signs observed.
- *Melena* is dark tarry stool created by digested blood from internal bleeding



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What laboratory changes does liver disease cause?

Liver typically causes many changes on laboratory tests. Ultimately, laboratory tests are required to help confirm the diagnosis of liver disease and provide prognostic information.

Common laboratory changes include:

- Increased bile acids
- Elevated liver enzymes
- Increased bilirubin

Less common laboratory changes include:

- Low albumin
- Low cholesterol
- Coagulation abnormalities
- Low urea nitrogen (BUN)
- Low blood glucose

- ❁ *Albumin, cholesterol, BUN and blood glucose are all synthetic markers, compounds normally made by the liver; they can decline in liver failure*
- ❁ *The liver normally makes factors that help to clot the blood; coagulation abnormalities are problems clotting blood that results from deficiencies in vitamin K or liver failure*
- ❁ *Bile acids are compounds that normally do not enter the systemic blood supply, but rather circulate between the liver, intestines, and portal vein; the systemic levels increase in certain patients because of the liver dysfunction*

What testing is recommended for patients with liver disease?

There are three main goals in evaluating patients with liver disease. First, the diagnosis and type of liver disease must be confirmed; secondly, prognostic and complicating factors must be evaluated; and finally, other underlying conditions must be ruled-out.

Patients evaluated for liver disease may need the following tests:

- Chemistry profile
- Complete Blood Count (CBC)
- Urinalysis
- Chest radiographs
- Coagulation testing
- Abdominal ultrasound
- Liver aspirate or biopsy
- Infectious disease testing



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- *Abdominal ultrasound* is a non-invasive test that uses sound waves to create images of internal organs and structures; this is performed to look for a shunt and to evaluate for underlying disease
- *Liver aspirate* or *biopsy* is the only way to diagnose the specific type of liver disease present.
- *Chest radiographs* (or x-rays) are performed to evaluate for underlying disease
- Depending on what other conditions may be identified, other tests may be recommended

If needed, how are samples collected from the liver?

Samples can be collected from the liver via aspirate or biopsy. An aspirate is typically performed without anesthesia while biopsy always requires anesthesia. Aspirates involve passing a small needle into the liver (using ultrasound-guidance) and removing a few cells. Although there is a slight risk for bleeding, it is minimal. This is not a biopsy, but can be useful for diagnosing certain tumors/cancers and hepatic lipidosis in cats. Except in these unique instances it does not generally provide information about the type of liver disease present.

There are three common ways to attain a liver biopsy. There are advantages and disadvantages to all of the options. The least invasive method for collection of a liver biopsy is with *ultrasound guidance*. In this method, the ultrasound is used to guide a small biopsy needle into the liver. A very small (1-3 mm) incision is made in the skin for this procedure and there is minimal post-operative pain. Unfortunately, the biopsy sample is rather small and can be inadequate for a definitive diagnosis in many cases (which would require additional biopsy samples to be taken). Additionally, this method carries the highest risk for uncontrolled bleeding. *Laparotomy-assisted* or open surgical biopsies allow for excellent biopsy samples with minimal bleeding risk (because it is easily observed and controlled). The liver can also be visualized completely. This is clearly very invasive, however, and causes the highest post-operative pain. Surgery is often elected in cases where other organs need to be biopsied or masses removed. Finally, *laparoscopy* can be used to collect biopsies. In this technique, scopes and biopsy instruments are passed through small ports placed into the abdomen. The incisions are relatively small (about 1 cm) and post-operative pain is minimal compared to surgery. The biopsy sample is comparable to surgical biopsies and the bleeding risk is minimal. Additionally, the liver can be well visualized with the scope. *Laparoscopy is the preferred method for collecting liver biopsies in most cases.*

The specifics of your case will be discussed along with the options for liver aspirate or biopsy, if required.



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What complications can arise in patients with liver disease?

There are a number of complications that can develop in patients with liver disease. All of them are associated with progressive and severe disease. The primary complications include ascites, encephalopathy, and coagulation abnormalities (excessive bleeding or blood clot formation). In advanced disease, anorexia and vomiting can also complicate therapy. Although all of these complications are poor prognostic indicators, they can be treated medically and may improve with treatment of the underlying liver disease. Cirrhosis is the end stage of most liver diseases. This is an end-stage scarring in the liver. Although therapy may be available to prevent further scarring, cirrhosis is irreversible.

What treatment options are available for liver disease?

Most liver diseases are treatable with a combination of medical therapies. Because there are so many forms of liver disease, and treatment options vary widely, it is difficult to generalize on what treatments will be used. However, most patients will be treated with a combination of anti-oxidants (vitamin E, S-Adenosylmethionine), special diets, and other medications. These other medications may include antibiotics, immunosuppressives, or chemotherapy. A specific treatment plan will be prescribed based on the patient's clinical history, laboratory results, and biopsy findings.

What sort of long-term monitoring is recommended for liver disease patients?

While some liver diseases are acute in nature and resolve with treatment (infections, for example), most liver diseases are chronic in terms of management and monitoring. Depending on the severity of the disease and medications prescribed, regular follow-up is often required. Most of the follow-up involves simple bloodwork. Most animals require initial rechecks within the first months, and then every 2-6 months, depending on the severity of the disease, medications prescribed, and clinical signs present.

What is the prognosis with liver disease?

The prognosis for patients with liver disease depends on the diagnosis, duration and severity of clinical signs, presence of complicating variables, and severity of lab and biopsy abnormalities. For patients with disease that is caught early, the prognosis is generally fair to excellent. For patients with more advanced disease and complications present, the prognosis is usually poor. The specifics of your case will be discussed at the time of your visit.