

Hepatic Lipidosis

“FATTY LIVER”

This handout was developed to assist cat owners whose pets have been diagnosed with fatty liver or for whom fatty liver is being considered as a possible complication of another problem. Briefly, lipidosis is considered as a cause or contributing cause of liver failure when a cat that was once overweight loses weight too quickly. Often the owner is not aware that such a thing is dangerous and is pleased to see the obese cat trimming down. By the time the cat actually stops eating and is clearly sick, the disease is well underway and will require more aggressive support to reverse. The good news is that there is a good recovery rate for this condition provided it has not progressed too far.

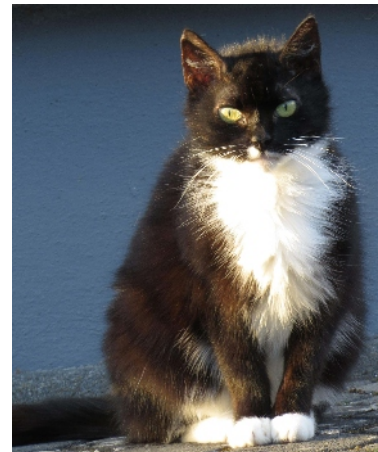
**UNEXPLAINED WEIGHT LOSS IS NEVER GOOD.
HAVE THE CAT EVALUATED BEFORE THE CAT BECOMES OVERTLY SICK.**

The average cat with lipidosis is middle-aged, was at one time obese but has lost at least 25% of its original body weight, has a poor appetite, and may have an obvious upset stomach (38% will have vomiting, diarrhea or constipation). Cats that are especially weak may have concurrent electrolyte imbalances or vitamin deficiencies from their liver disease.

THE CAT IN LIVER FAILURE

The cat in liver failure is jaundiced, frequently nauseated, will not eat and generally is an obviously ill animal. The jaundice (more clinically termed “icterus”) is often not noted by the pet owner but can be seen by carefully examining the whites of the eyes for yellow coloration. Sometimes the yellow color is not evident to the naked eye but is picked up as a blood test elevation in bilirubin, a yellow pigment normally kept in check by the liver. Alternatively, the urine of an icteric cat will look bright orange or even brown as bilirubin builds up.

If the bilirubin is not elevated on the blood test, liver disease may be picked up as an elevation in a blood test enzyme called “alkaline phosphatase,” abbreviated “ALP.” This enzyme should never be elevated in the cat under any normal circumstances though there are several forms of this enzyme and an elevation does not necessarily indicate liver disease. An ALP elevation is definitely suggestive of liver disease and requires follow up testing such as a “bile acids” liver function test. Other liver enzymes commonly monitored on routine blood panels are Alanine Aminotransferase (ALT) and Aspartate Aminotransferase (AST). These enzymes elevate relatively easily and are not as important in liver evaluation as ALP elevations but a substantial increase may also warrant follow up liver testing. In the event of hepatic lipidosis or “fatty liver” the elevation in ALP is often dramatic.



LIVER DISEASE VS. LIVER FAILURE

It is important to distinguish tests of liver damage (like enzymes) versus tests of liver function (like bile acids). The enzymes ALT and AST are normally held inside liver cells; when their presence is detected free in the bloodstream, this is an indicator of liver cell death. A liver can have damage without any decrease in its overall function.

A liver function test is different. In a liver function test, the liver is actually asked to do something (generally process a biochemical in a detectable way). In this way, we can see if the liver is actually in need of support and whether or not we have a good chance of getting a diagnosis through tissue sampling. Tissue sampling such as biopsy or needle aspirate is crucial to the diagnosis of liver disease. Without a tissue sample, all we can tell is whether or not the liver is in failure and specific therapy for a specific type of liver disease is not possible (though general support of the failing liver may still be possible.)

In lipidosis, there is frequently a bleeding tendency which can make harvesting a biopsy sample somewhat risky. If ultrasound is suggestive of lipidosis, it is generally safer to take a needle aspirate rather than a biopsy sample (which is a bigger bite of tissue). An aspirate showing fat infiltration is usually diagnostic especially when ultrasound shows the entire liver with a fatty texture.

A typical sequence in the diagnosis of this condition would be:

- Cat is obviously sick and sees the vet.
- Cat may show the yellow pigment changes typical of liver disease (70% of cats with lipidosis have jaundice.)
- Routine blood tests show marked ALP elevations.
- Bile acids are elevated (testing bile acids is not necessary if bilirubin is elevated).
- Ultrasound shows a disease process involving the liver in its entirety.
- A needle aspirate or tissue biopsy shows hepatic lipidosis.

“FATTY LIVER” (HEPATIC LIPIDOSIS)

**A fatty liver can develop in as soon as
2 weeks with an appetite reduction of 50-75%.**



The so-called “fatty liver” represents one of the most common causes of liver failure in the cat and it stems from the basic design of the cat. Cats evolved as predators of small birds and rodents, eating multiple small meals throughout the day. Their physiology is geared towards a completely carnivorous diet and with the presupposition that cats would live lean and never have the opportunity to develop extensive fat stores.

Of course this all changed when cats become domestic. The modern housecat has every opportunity to become overweight and while this may not be of disastrous consequence on a day to day basis, should the cat get sick or lost and stop eating, a very big problem erupts. The fat stores mobilize. Normally, in starvation, fat is moved from the body's storage depots to the liver for

processing into lipoproteins but the feline liver was never intended to handle huge amounts of mobilized fat. The liver becomes infiltrated with fat and fails. Complicating matters are the high dietary protein requirement that is unique to cats; protein malnutrition develops very fast when cats do not eat.

WHY WOULD THE CAT STOP EATING IN THE FIRST PLACE?

Initially there was an underlying cause of the decrease in food intake that started the cat down the slippery slope to lipidosis. If one is lucky, the underlying cause has resolved (such as the cat was lost/starved and has now been found). It is important to keep in mind that even though lipidosis usually carries a fair prognosis, in more than 90% of cases there is a second condition that requires attention, one with a prognosis that might not be so fair. Cornell University looked at 157 cats with lipidosis and looked at what conditions were primary. Here is a summary of what they found:

- 28% had inflammatory bowel disease
- 20% had a second type of liver disease (usually cholangiohepatitis)
- 14% had cancer
- 11% had pancreatitis
- 5% had social problems (new cat, new home, threatening other pet or person at home)
- 4% had some kind of respiratory disease
- 2% were diabetic

A lab test that might be helpful in determining underlying cause is the GGT (gamma-glutamyltranspeptidase) level. It is usually not elevated in lipidosis but would be elevated if there is an underlying additional liver disease or in the event of pancreatitis.

TREATMENT

The cornerstone of treatment for lipidosis involves aggressive nutritional support. (In other words, a high protein diet must get into the cat to reverse the metabolic starvation state.) If this is done carefully, the recovery rate approaches 90%.

GETTING THE FOOD IN

Generally, by the time a cat has gotten into trouble with hepatic lipidosis most owners have already tried tempting cats with assorted favorite foods and gotten no results. At the point where lipidosis has developed, the cat should not be given a choice about eating; there are several methods of providing food one may enlist.

Nasogastric Tube

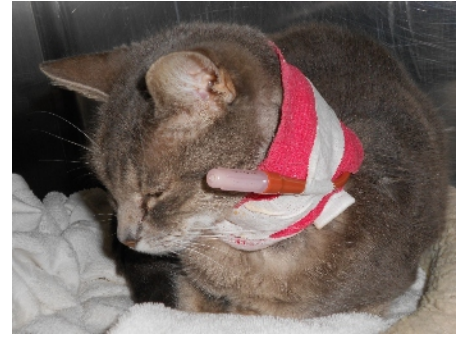
A feeding tube can be passed through the nose, down the esophagus, and sewn into place to allow feeding of a liquid diet. Placement of this kind of tube does not require anesthesia, and the tube is relatively easy to use. Some problems are associated with this type of feeding tube. For example, the tube can be dislodged by an errant paw, necessitating replacement; an Elizabethan Collar is necessary to protect the feeding tube. Further, only liquid diets can be fed through the tube due to its small diameter. The tube can also be pushed backward after a vomiting attempt so that it opens towards the mouth instead of the stomach.

All of these problems make the N-G tube the least popular of all the feeding tubes when it comes to long term use; however, often this form of feeding is used for the first few days as this is when bleeding risk is highest and the patient is least stable for anesthesia. One of the other tubes can be placed when the patient is more stable.



Esophagostomy / Pharyngostomy Tubes

The esophagostomy or pharyngostomy tube is easily placed with short-acting anesthesia and sewn in place creating a feeding tube that exits the side of the neck. A bandage or special padded collar is placed to hold the tube in position and keep it from catching on things though the tube is comfortable enough that an Elizabethan collar (plastic cone collar) is not necessary. The cat can be mobile with comfort and the diet can be slurried or blenderized as the tube is larger than the nasogastric feeding tube. The tube must stay in place for at least 2 weeks but can stay in place for many months if necessary. The presence of the tube does not interfere with eating normally when the cat recovers food interest.



Stomach Tube/PEG Tube

A gastrostomy tube is placed under anesthesia and protrudes from the side of the body. The tube connects directly into the stomach and similarly allows for blenderized food to be delivered. Placement is a bit more invasive than the Esophagostomy and requires special equipment but represents another way to feed the cat. A bandage covers the tube and the cat is generally comfortable; Elizabethan collar not necessary.

Force-Feeding

This method is generally discouraged as it can be so distasteful for the cat and can create "food aversion" where the cat no longer wishes to eat normally, even after recovery, because of bad association with the manipulations needed. That said, for some cats, force-feeding is non-stressful and easily performed and spares the expense of feeding tube placement.

To provide nutrients, one must understand how much of the food product should be fed daily and how much may be fed per meal. Food is generally canned and of a consistency like hamburger. Meatballs of approximately a one inch diameter are created with one's fingers and given to the cat in the same way one would give a pill. Be careful to give the cat enough time to fully swallow the first meatball before proceeding to the next one. An entire three-ounce can of cat food can be fed in this way. If struggling results or if the cat attempts to scratch, this feeding method may be too stressful. A great deal of food is spilled during this method and it should be performed on a surface that is easily cleaned. The cat may need a "bib" made of a paper towel or cloth to avoid food matting in the coat.

**BE SURE THE FOOD YOU ARE USING IS MADE FOR CATS.
HUMAN LIQUID DIETS MAY BE DEFICIENT IN SOME OF THE
SPECIFIC AMINO ENZYMES REQUIRED BY THE CAT FOR RECOVERY.**

A diet for a cat with lipidosis should be high protein/low carbohydrate. Ideally 35-45% of the diet's metabolizable energy should be present as protein to reverse the metabolic state of disease. Most feline recovery formulas will meet this requirement as will diets made for the management of feline diabetes. Your veterinarian will select an appropriate food based on how the food will be delivered to the cat as well as its nutritional composition.



RULES FOR NUTRITIONAL SUPPORT NO MATTER WHAT METHOD IS USED

- Know how much of the food should be fed per day
- The first day, only 1/3 - 1/2 of the day's calorie requirement should be provided.
- The second day only 2/3 or so of the full calorie requirement should be provided.
- Assisted feeding should be expected to continue 4 to 6 weeks.
- Feeding tubes, if used, should be cleared with warm water prior to food administration and cleared with water again afterwards.
- Food must be warmed before administration to a comfortable temperature. Food straight from the refrigerator can induce vomiting.
- Food should be administered fairly slowly. Rapid distention of the stomach can induce vomiting.
- Medication should not be administered through the feeding tube no matter how tempting it is to do so.
- If a feeding tube plugs or blocks, flushing with warm water usually will unplug the tube.

GENERAL LIVER SUPPORT

There are several general therapeutic treatments that are supportive to the liver that might be used.

- Ursodiol - assists bile flow and helps prevent absorption of toxic bile products from the intestinal tract.
- SAMe -an antioxidant that has shown promise in supporting the liver function.
- L-Carnitine - a supplement helpful in transporting fats.
- Taurine - this amino acid helps bind certain types of toxic bile acids for their removal from the body. It is usually deficient in cats that have not been eating properly and short term (7-10 days) supplementation is a good idea for cats with lipidosis.
- Antibiotics - keeps the harmful numbers of overgrowing bacteria in check within the intestine.
- Vitamin B-12 (cobalamine) - this vitamin readily depletes in chronic intestinal disease. Ideally a blood level of this vitamin would be checked before therapy but often, because it is inexpensive and safe to use, a course of injections or oral supplementation is included in therapy. As a general rule cats with lipidosis are deficient in all the B vitamins and a general supplement at twice the usual dose is a good idea.
- Vitamin K - most cats with hepatic lipidosis have abnormal blood clotting ability due to inability of the liver to recycle vitamin K dependent blood clotting factors.

Low red blood cell count is a common complication of lipidosis and may be caused by Vitamin K related bleeding/clotting issues, inadequate blood phosphorus leading to red blood cell rupture, or precipitation of abnormal hemoglobin within the red blood cell (Heinz body anemia). There is approximately a 1 in 4 chance that a lipidosis cat will need some kind of blood transfusion before leaving the hospital.

REFEEDING INJURY

When a patient has been in a starvation state for a while and then begins to eat, some serious metabolic problems may occur in the first few days as metabolism changes. When food is delivered, the pancreas releases insulin in an attempt to store the calories. Unfortunately, insulin also drives circulating potassium inside cells and cats with hepatic lipidosis are often depleted of potassium to start out with. This sudden drop in potassium can make a cat very weak (causing drooping neck, listlessness, urine retention / inability to urinate normally, heart muscle depression and more). Similarly, insulin will drive phosphate into cells in a similar way leaving the bloodstream depleted. Red blood cells will not have enough phosphate to maintain their own structure; they burst causing severe anemia.

If the blood phosphate level drops below 2.2 mg/dl, an IV supplement will be needed. After the phosphate level has started to rise, an oral supplement of phosphate (usually lactose-free cow's milk works well). Expect the cat to be monitored in the hospital for the first 3 days following initiation of nutritional support (and possibly longer).

Refeeding injury can be usually avoided by starting with half (or less) of the required amount of Calories at first and gradually working up to the full nutritional requirement over a few days. **Having a low blood potassium level at the time of the initial lipidosis diagnosis is associated with increased chance of death.**

IF THERE IS ONE LESSON TO LEARN FROM THIS ARTICLE, IT IS THIS:

**SURVIVAL AND RECOVERY FROM
HEPATIC LIPIDOSIS APPROACHES 90%
WITH NUTRITIONAL SUPPORT.
WITHOUT AGGRESSIVE NUTRITIONAL SUPPORT,
MOST CATS WILL DIE.**

Many people are reluctant to place or work with feeding tubes and want to try feeding the cat at home. There is no room for tentative treatment when it comes to this disease. Force-feeding at home can work but one must have a specific amount of food to feed and that amount must be successfully fed if the patient is to recover. Further, food aversion as described above is a real phenomenon which makes any sort of force-feeding the last choice in support. Feeding tubes are non-stressful, temporary, and highly recommended for treatment of this condition.

Cats that show a 50% drop in total bilirubin level within 7-10 days are statistically likely to survive.

Keep in mind that hepatic lipidosis rarely happens for no apparent reason. If an underlying cause is present, it must also be addressed.

Last revised: 10/18/2021



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