

Fatty Liver Disease

A cockatiel has been diagnosed as being overweight, and recently it has been noticed that when she last molted, some of the primary wing feathers and body contour feathers have taken on a more yellowish hue. When she recently broke a blood feather on her wing and her avian veterinarian pulled it out, she continued bleeding for quite a while from the empty follicle, causing alarm to both the owner and her avian vet. Because of the suspicion of a liver problem by the veterinarian, tests were taken and the cockatiel was diagnosed as suffering from hepatic lipidosis.

Fatty liver disease, fatty liver syndrome, hepatic lipidosis; these are all different terms used to describe a condition found in birds. What should you do if your bird has been diagnosed with this condition? What does it mean? What can be done to treat it? The diagnosis sounds scary and it can be.

Let's start by learning the basics about the liver. We've all seen chicken livers, so hopefully most of us can envision what a normal liver looks like. It is a large organ that has a smooth surface, several lobes and a deep mahogany color. The liver is a very interesting and complex organ that is involved in well over 40 biochemical reactions in the body.

The liver functions include bile production, (used in digestion), albumin production, carbohydrate storage, ketone body formation, detoxification of many drugs and toxins, manufactures plasma proteins, inactivates polypeptide hormones, urea formation and many important functions in the metabolism of fat. The liver also manufactures the proteins concerned with blood clotting. Certain liver cells also produce globulins, a group of proteins involved with the immune system. These are just the broad strokes when it comes to the liver and what it does for a body, avian or human. So, you can see that the liver is a very important organ that is necessary for the good health and well-being of birds and other animals.

The liver occupies a key position in the metabolism of carbohydrates (simple sugars, and starches such as rice, bread and potatoes, for example). The liver stores carbohydrates as glycogen. Glycogen can be formed from monosaccharides (simple sugars), from the glycerol of fat, and from amino acids that have been chemically changed (neoglycogenesis). Stored glycogen is then converted to glucose (glycogenolysis) as required by the animal to maintain blood glucose concentrations within an acceptable level. If blood glucose drops too low, it can result in seizures and damage to vital organ systems, or even death in extreme cases.

The glycogen stored in the liver is the only readily available reserve of glucose for maintaining blood sugar within a normal level. This is important as the stored glycogen can be mobilized and utilized for energy if the animal undergoes a period of time when food is not available. During times when an animal cannot or will not eat, the liver, under hormonal control, will start releasing the stored glycogen in the changed form of usable glucose.

The liver is also involved in the breakdown of ingested foods and body proteins. Amino acids (the components in proteins) are released by digestion of proteins in the gastrointestinal tract, which are then absorbed by the small intestine into a special blood vessel where they travel to the liver before entering the bloodstream.

The liver also protects the body against many different types of toxins, both those produced in the body and those toxic substances that an animal may be exposed to. Liver disease or damage, including the problems associated with hepatic lipidosis, may make a bird unduly susceptible to agents normally dealt with by the liver, and certain drugs must be given with caution or at a reduced dosage due to the compromised liver.

We can see that the liver is a very important organ and is responsible for many different functions in a bird. When a bird develops hepatic lipidosis, this means that the normal liver cells are gradually being filled with fat (actually large vacuoles of triglyceride fat). These abnormal cells can no longer function to perform the liver's work efficiently, and over time, the liver cells may be destroyed. As liver cells die, they are replaced with scar tissue or fibrous connective tissue. Over time, the liver function will be reduced and the bird will start showing signs of liver disease.



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Parrots suffering from hepatic lipidosis are typically obese. The species most commonly affected are the Amazon parrots, Quakers, budgerigars, cockatiels, lovebirds and Rose-breasted cockatoos. It seems that more females than males are affected and this may have something to do with hormonal activity in the reproductive hen. A diet high in seed tends to result in obese birds, so sedentary seed eaters are more likely to end up with fatty livers. Seed diets tend to be high in fat and low in the nutrients biotin, choline and methionine. Over-eating (consuming more calories than are expended daily) can also cause fatty-liver. Metabolic diseases (such as thyroid dysfunction, although poorly described and rarely diagnosed by specialized testing and diabetes mellitus) may also cause fatty liver problems. Toxin exposure (usually long-term) can also result hepatic lipidosis. Aflatoxins, found in some peanuts and other products, such as corn, can cause repeated insult to the liver, so if fed over time, these toxins may result in permanent liver damage or hepatic lipidosis. Hereditary factors may also play a role in liver dysfunction. Infectious diseases, such as *Chlamydophila psittaci*, and others that affect the liver, can cause chronic changes over time.

Hepatic lipidosis may also be diagnosed in juvenile parrots. This usually occurs in young hand-feeding birds that are either over-fed continually or hand-fed long after they should be weaned. Because hand-feeding formula is very calorie-dense, and babies tend to be quite sedentary, those extra calories tend to end up being stored as fat in the liver. This can be very dangerous and even life-threatening. I have seen this occur most often in cockatoos (they tend to beg even when satiated or not hungry) as it can be difficult to say no to offering them hand-feeding formula when they are begging. Inexperienced hand-feeders may not realize that their baby should be weaning, so they keep hand-feeding them.

What are the signs you will see if your bird has developed hepatic lipidosis? Overweight or obese birds are the most likely to be suffering from this condition. When the liver disease has progressed, and this is often a slow, on-going progression as the liver tissue is replaced with fat, the bird may suddenly appear ill, but in reality, it has been building up until the bird's organs can no longer compensate, and the bird shows clinical signs. The enlarged liver may cause difficulty with breathing as the organ compromises the body cavity space. The bird's abdomen may appear distended and sometimes the liver is actually visible under the skin below the keel. Birds with hepatic lipidosis may develop diarrhea and the droppings may take on a more greenish hue due to biliverdin being excreted. Many birds with hepatic lipidosis may have poor feather quality and in cockatiels, white feathers may take on a more yellowish color (this won't happen in white-faced cockatiels). In some birds, soft areas in the beak will occur, and in some cases, birds with liver disease will develop overgrown beaks and claws. In end-stage liver disease, toxins may build up in the bloodstream, resulting in central nervous system signs, such as disorientation or seizures. Because the liver is involved in producing clotting factors, some birds with liver disease will have bleeding tendencies and problems with normal clotting. A simple broken blood feather or venipuncture (inserting a needle into a vein to procure a blood sample for testing) may result in prolonged bleeding, significant blood loss or even death due to exsanguination.

Diagnosis of hepatic lipidosis will involve several different tests, in addition to the history of the bird, dietary evaluation, weight and physical examination. In some cases, it is possible to actually visualize and/or palpate the enlarged liver in the hands of an astute avian veterinarian. Radiographs may show an enlarged liver, however, end-stage livers may actually appear smaller and denser. Ultrasound, as well, may show an enlarged liver, or when end-stage, a smaller liver. Liver enzyme may be elevated, and the bile acids (the most specific test for a liver problem) is usually elevated. Other blood tests may be abnormal, as well, and often the blood is lipemic, meaning that there is too much fat circulating in the bloodstream.

Because of the risk of prolonged bleeding in birds with hepatic lipidosis, I usually choose to use the medial metatarsal vein for drawing blood and not the usual jugular vein. The reason being that I can easily apply a pressure bandage around the leg to help stop the bleeding, but a bandage around the neck, well, that's never a good idea. I don't routinely use the wing veins for the same reason; there aren't any supporting structures around the wing veins to help seal off the vessels and it is very difficult to apply a pressure bandage correctly to the wing. When drawing blood, there is a very real risk of prolonged bleeding, so choice of vein and close observation after the blood draw are crucial.

A liver biopsy will often provide a definitive diagnosis, however, this procedure may not be advisable in all cases, as the risk from anesthesia and the biopsy itself may prove too high. It may not be possible to control bleeding safely in a bird with compromised liver function, and while a biopsy can usually be performed through endoscopic procedures, it must be



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determined if the risk is necessary. Often a diagnosis may be made without a liver biopsy, but this will be a presumptive diagnosis, based on the history, physical and lab test results.

So what can be done to treat a bird with hepatic lipidosis? First, with the help of your avian veterinarian, the bird should be put on a diet and exercise program. It is very important that a bird with hepatic lipidosis be placed on a lower fat diet to minimize impact to the liver. Your veterinarian will tailor a diet plan specifically for your bird. High quality pellets that are low in fat and perhaps lower in protein are an excellent base for birds with fatty liver problems.

If your bird is a die-hard seed eater, it will need to be switched over to a pelleted diet, but in some cases, this is easier said than done. Some birds may be persuaded to start consuming sprouted seed, instead of dry seed. The process of sprouting uses the fat stored in the seed to start the growing process. So, sprouted seed will be lower in fat. Also, the texture will be different, more vegetable-like, so this may encourage a bird to begin consuming some veggies. There are seed-sprouting kits available, or if you choose, you may sprout fresh seed mix yourself. Information is available from many sources. The bird should not be offered any peanuts or food items that could possibly contain any mycotoxins that could further damage the liver.

Any infectious or metabolic problems identified should be treated, taking into consideration that many medications are removed or changed by the liver, so dosages may need to be adjusted.

A bird that is having problems with excessive bleeding may benefit from the administration of vitamin K. I always recommend that the owner of a bird with bleeding tendencies have on hand a type of clotting gel or liquid to be used in an emergency bleeding situation. Ask your avian vet what product would be best for your bird.

Nutritional supplements are often helpful, especially those that are known to support liver function. Biotin and choline (B vitamins) are important and may be supplemented. Methionine is an amino acid that is important in transporting fats from cells. This amino acid is not available from plant sources, but is found in eggs, fish, meat and milk. I do not recommend offering any milk products containing lactose, as birds cannot digest this sugar; however, lactose is almost entirely removed in the process of the manufacturing of cheese, cottage cheese and yogurt, so these products are safe to offer to your bird. If you have any questions, discuss your bird's diet with your avian veterinarian.

Milk thistle is very good support for a damaged liver. Your avian veterinarian will decide if this is an appropriate therapeutic for your bird. Make sure that any milk thistle supplement does not contain ethyl alcohol as a base, as that can potentially intoxicate a small bird and alcohol can also further damage the liver. Another nutritional supplement is dimethylglycine (DMG), which is an antioxidant. DMG is also a very good supplement for birds with liver damage, and I put all hepatic lipidosis birds on this nutrient. Other nutritional supplements, such as aloe or dandelion, may also be helpful. Other amino acids, rare essential micronutrients and probiotics are also all beneficial to the recovering bird.

It is important to set up an exercise program for a bird suffering from hepatic lipidosis. Your avian veterinarian will help you put together an exercise routine that will be safe for your bird. In all cases, when dealing with a sedentary bird, the exercises will need to begin slowly and progress gradually in intensity. Wing flapping exercises, ladder-climbing exercises and walking are safe; however the bird should be monitored closely to ensure that it is not becoming over-exerted at any time or injuring itself.

With diligent care, veterinary supervision, exercise, correct nutritional support and appropriate medications, it is possible to reverse the affects of hepatic lipidosis, but some permanent liver damage may occur. The liver does have a remarkable ability to heal itself and reverse damage, but once liver tissue has been destroyed and all that remains is fibrous connective tissue (scar tissue) that portion of the liver will be gone for good. So, the sooner that hepatic lipidosis is diagnosed, the better the prognosis for a return to good health and normal function. It is possible for a bird diagnosed with hepatic lipidosis that has been successfully treated to live a long, healthy life, as long as it doesn't return to its old ways that caused it to develop hepatic lipidosis in the first place.



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