

Oh no! My Ferret Has Insulinoma!

Dooking and bouncing, weasel-war-dancing, romping through tunnels, chasing one another and fearlessly climbing to the highest possible spot in the room... these are just a few of the reasons that ferrents (parents of ferrets) claim to love their babies. It is this incredible energy that makes ferrets such dynamic and entertaining companions. So, when ferrents begin to notice a ferret slowing down or becoming lethargic, one of the most common causes is insulinoma.

Insulinoma, adrenal disease and lymphoma are the most prevalent diseases in ferrets. These diseases may even occur in tandem! And while veterinarians and researchers work to provide treatments and cures, it is still extremely disheartening for a ferrent to hear of such diagnoses. With all of these diseases, early diagnosis and treatment are a benefit. In the case of insulinoma, there are several possible treatments.

Insulinoma is a form of cancer that impacts the islet cells of the pancreas. These are the cells that regulate sugar levels in the blood by producing insulin. Insulin is the hormone that enables the body to metabolize carbohydrates and fats. When the islet cells grow irregular cells, or tumors, they produce an over-abundance of insulin. This may cause the ferret to become hypoglycemic, or its blood sugar becomes too low. A ferrent may notice that the ferret is not as playful, sleeps more and is lethargic. Other symptoms include hind-end weakness, drooling, depression and pawing at the mouth. A ferret's blood sugar may become so low that the ferret suffers from a seizure. This can even result in a coma, and even death.

With ferrets, any symptoms noted by the ferrent that are not "normal" should warrant a trip to the vet. The vet will examine the ferret and likely do tests such as a complete blood count (CBC) and profile of chemistries that will assist in getting a better picture of the ferret's overall health. The CBC includes a measure of the ferret's blood glucose (BG). The average or mean BG for a healthy ferret is 110 mg/dl, while the acceptable range for ferrets is from 65-164 mg/dl. Ferrets with a BG lower than 70 mg/dl may have insulinoma, although many veterinarians now suspect insulinoma may be present if a ferret tests with a BG lower than 90 mg/dl. If your ferret tests within the 70-90 mg/dl range, your veterinarian will likely ask for a retest in a week's time to confirm suspicions.

Once diagnosed by the vet, there are a few options for treatment of insulinoma in ferrets. First, medical treatments involving drugs such as prednisone and diazoxide are most commonly used. Prednisone acts to increase the sugar level in the ferret's blood, while diazoxide inhibits the production of insulin. The vet may prescribe these medications individually or together. Regardless, ferrents must be vigilant in monitoring the ferret to assist in appropriate dosing. This can be done at home using a blood sugar meter such as Accu-Chek, One Touch, or a special glucometer made for pets called the AlphaTrak. Your veterinarian will

show you how to best test glucose at home using your machine, so it's a wise idea to bring your home meter with you to the vet's office. Here, your veterinarian can calibrate it to their machine by testing a single sample of blood with both their machine, and your machine, and compare the results. This way, at home, you know to add or subtract a general amount to get the range more similar to that of your vet's machine.

Prednisone is usually prescribed to be given twice per day. It is important for ferrets to maintain the dosage schedule so that the ferret does not suffer from major spikes or drops in blood sugar level. Prednisone is a common corticosteroid drug, often prescribed in both human and veterinary medicine for a variety of ailments. Everything from irritable bowel disease, to insulinoma and lymphoma are commonly treated with prednisone and its metabolite, prednisolone. Prednisolone is what an animal's liver turns prednisone into, and it is this form utilized by the body. For this reason, many veterinarians prefer to prescribe prednisolone over prednisone, as it may help protect the liver, especially if there are concurrent illnesses.

Generally, vets will prescribe the lowest possible dose to maintain the ferret's blood sugar level and then as time passes and the disease progresses, the dose can be increased. So again, it is very important for ferrets to closely monitor symptoms and collaborate with the vet to maintain the optimum dosage. Fortunately, prednisone appears to have few side effects in ferrets. Both prednisone and prednisolone are inexpensive and have few side-effects in ferrets. Some side-effects to watch for, however, are: weight gain, especially that of a pot-belly appearance, thin skin, cataracts, and liver disease. It's a good idea to routinely check liver enzymes through a CBC/Chemistry panel when on prednisone long-term, and in senior ferrets in general.

Diazoxide is normally added to the treatment regimen in cases where prednisone is not having an adequate effect. This drug has a diuretic effect, meaning it causes the ferret to produce more urine, and so the vet may wish to monitor more closely the ferret's chemistries by performing more frequent CBC and profiles, as well as urinalysis. Also, diazoxide may cause gastrointestinal distress producing vomiting, loose stools/diarrhea, lack of appetite and even ulcers. The effectiveness of the drug must be weighed against these side effects and additional treatments for them may be needed.

Both prednisone/prednisolone and diazoxide can be harsh on the stomach, so your veterinarian may decide to add in a tummy-soothing medicine such as Carafate (also known as sucralfate.) Carafate works to prevent stomach ulcers by coating the stomach lining in a sort of barrier, which helps to calm inflammation and protect the delicate stomach lining from the stomach acids it contains. This prevents and heals ulcers, which can be a common occurrence in ferrets when on long-term medication. Carafate is most beneficial when given before medications and food, to allow for it to coat the stomach thoroughly. Your

veterinarian will likely discuss a regimen or schedule of medications and meals that will best help your ferret. Generally, this involves administering the Carafate, waiting 15 minutes, administering a high protein meal, waiting 15 more minutes, and administering prednisone or diazoxide. However, check with your veterinarian on their preferred schedule for this.

While medications may be used to manage the disease, they do not stop its progression. Thus, surgical treatment of insulinoma is sometimes another option. Surgery to remove the tumors may be performed, while simultaneously allowing the vet to biopsy the pancreas to confirm the diagnosis. One tumor or multiple tumors may be removed, as well as a portion of the pancreas itself. Exploration of the other organs should also take place during the procedure to get a better overall picture of the ferret's health and provide all treatment necessary. While not all ferrets are candidates for surgery due to their age, the severity of their condition or additional illnesses present, surgical treatment of insulinoma may have a longer-lasting impact than medical treatments.

Lastly, dietary and nutritional changes are a critical part of caring for insulinomic ferrets. Since ferrets are obligate carnivores, their diet must be high in protein (at least 40% Crude Protein if feeding a dry kibble diet.) Most ferrets with insulinoma offer their ferret a "soup" recipe of easily digestible, meat-based liquid food. However, when using this regularly for meals, it's important to balance the meals appropriately. Most homemade "soup" recipes are deficient in calcium and other minerals, which can be problematic. You may use a canned cat food that is high in meat protein, also, or a balanced, home-prepared raw meat blend. Additionally, ferrets' digestive tracts are short and digestion is brief in duration. Feeding the appropriate diet on a regular schedule can make a huge difference in symptoms and quality of life. Adherence to a schedule allows avoidance of blood sugar spikes and then subsequent crashes. Also, treats containing carbohydrates should be avoided! Appropriate treats of meats, either fresh and raw, or cooked are encouraged. You may even offer freeze-dried or dry-roasted meat treats intended for dogs and cats! If you are so inclined, treats of pre-killed whole prey items such as mice can be offered also. To assist in administering medications, you may find it helpful to offer treats of oils such as salmon or fish oil, or extra-virgin olive oil. Most ferrets find these oils highly palatable and it can make a nice "chaser" if your ferret does not like taking medications.

While not fully researched as of yet, the role of diet cannot be underestimated. Insulinoma is less prevalent in other parts of the world. In other countries, breeding practices are different and diets vary. For instance, in Europe, ferrets are fed diets comprised of small prey and/or raw meats. Since ferrets are obligate carnivores, such diets may result in lower incidence of insulinoma than in countries such as the U.S., where kibble is more relied upon and may contain more carbohydrates and include nutritional components that cause the insulinoma. In addition to the issues with many kibbles, even those labeled for

ferrets, treats such as FerretVite, Nutrical, raisins, Bandits and others will cause a spike in blood sugar forcing the islet cells of the pancreas to produce more insulin. Over time, this increase in insulin production can lead to the development of the irregular or cancerous cells in the pancreas that cause the symptoms seen in ferrets with insulinoma.

One of the most important aspects of caring for a ferret with insulinoma irrespective of the treatment regimen you and your vet agree upon, is the constant and careful monitoring of the ferret's symptoms and behavior. Take your ferret to the vet immediately if it appears to be suffering from extremely low blood sugar that might lead to seizure or coma. Be sure you have identified and located an emergency clinic that treats ferrets to which you can take the ferret should such an incident occur after the hours of your regular vet. If the ferret is unresponsive or begins to seizure, alert the vet but also begin treatment immediately at home. Ferrets with ferrets suffering from insulinoma should keep Nutrical, corn syrup or honey on hand for such emergencies. Allow the ferret to lick a few drops from your finger. If the ferret is completely unresponsive, rub a few drops on the lips and gums. ***You should be on your way to the vet as you begin these steps.***

Regardless of the treatment your ferret receives, more frequent visits to the vet and more frequent testing is important to maintain the ferret's health. It is recommended to get all senior ferrets over age four a full wellness check twice yearly, including blood work. For ferrets with diagnosed insulinoma that is well-managed, this schedule may work, but if your ferret is not yet well-stabilized on medications and/or diet therapy, you will likely need to discuss a more frequent exam schedule with your veterinarian in order to better monitor your ferret's condition. Another good idea is to keep a log or journal from day to day, noting the ferret's behavior with times of medication administration as well as what and when the ferret has eaten. This will enable you to more effectively communicate with the vet and provide greater stability for your ferret. Always remember, your ferret's vet plays a critical role in its health and wellbeing. Maintaining good communication and effective collaboration is a must when keeping your ferrets healthy.

Most of all, make sure your ferret is comfortable, happy, and well-loved. Illnesses such as insulinoma can be managed and are not an immediate death-sentence, so try to live in the moment with your fuzzy friend, and continue to make lasting memories with your companion – they all deserve it!

The American Ferret Association Education Committee wrote this article from the perspective of longtime ferret owners. The information it contains should not take the place of the expert advice of your veterinarian.

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