



## Insulinoma: Diagnosis & Treatment

Insulinoma is one of the most common forms of cancer diagnosed in ferrets. It's a common misconception that insulinoma is a ferret's version of diabetes, but in fact, insulinoma is the *exact opposite* of diabetes for ferrets.

A ferret with insulinoma has cancer of the pancreas, which is when the islet cell tumors on the pancreas cause an overproduction of insulin. Insulin is a hormone which allows cells in the body to use glucose that is in the blood stream. Overproduction of insulin forces the glucose in the blood into the cells, which causes a drop in glucose level, or hypoglycemia. Diabetes in ferrets is when low levels of insulin render cells unable to use the glucose that is in the blood stream, causing an overabundance of glucose. This is known as hyperglycemia.

**Hypoglycemia = too much insulin ? = low blood sugar ? = Insulinoma**

**Hyperglycemia = too little insulin ? = high blood sugar ? = Diabetes**

A normal blood sugar level for a ferret is anywhere between 90 – 120. When a ferret has low blood sugar (anything 70 or below), this is considered to be diagnostic of insulinoma. A fasting blood sugar test (no food for 4 – 6 hours prior to the blood test) can be administered by your vet.

These are the symptoms that should raise an alarm in your head!

\* Overall Weakness   \* Lethargy   \* Excessive Salivation   \* Tremors   \* Seizures  
\* Staring off with a dazed look   \* Deep Sleep (Hard to Awaken)   \* Mouth Ulcers  
\* Pawing at the mouth   \* Loss of coordination   \* Vomiting   \* Weight Loss  
\* Hind leg weakness (*this is one of the most common signs that is almost always attributed to insulinoma*)

If your ferret is exhibiting one or more of these symptoms, make an appointment to see the vet and have a blood glucose level test. If you see these symptoms come and go, don't assume that your ferret is alright. Insulinoma symptoms can come and go as their blood sugar drops and raises.

If your ferret has been diagnosed with insulinoma – you have a few different options.

- 1) Surgery – either to remove any visible pancreatic masses or a pancreatic biopsy. This will stop or slow the progression, but it is rarely a cure. Pancreatic tumors are small seedy nodules, generally located throughout the pancreas of an insulinomic ferret. The chance that the vet will get all of the tumors is unlikely, any they will probably come back. Though by having the surgery this gives the ferret a longer survival and symptom free interval.

- 2) Medication – surgery is not always the best option for older, unhealthy ferrets, and sometimes it's not an option at all. The most common medications used to control insulinoma are Prednisone and Diazoxide (Proglycem). Prednisone raises the blood glucose and increases the production of glucose in the liver. It doesn't, as some people think, block the insulin. Rather, it counteracts the hypoglycemic effects of insulin with hyperglycemic action, effectively balancing it out. Diazoxide, on the other hand, is an insulin blocker. For best results, medicine should be given twice a day, 12 hours apart, to keep the glucose levels as stable as possible.
- 3) Diet Change – this is recommended regardless of whether you choose surgery, medication, or both. Ferret diets higher in animal protein help insulinomic ferrets to lead a more symptom free life, as protein helps to regulate and raise blood sugar levels. Generally, more frequent meals or feedings of duck soup, canned A/D, or baby food can be very beneficial in keeping your ferrets glucose at a constant level.
- 4) Alternative Therapy – Gymnemia, an herbal, that regulates carbohydrate metabolism. Brewer's Yeast contains chromium which is known to stabilize blood glucose and insulin swings.

What precautions should you take as the parent of a ferret with insulinoma? First, ***always*** keep something around to bring your ferret out of a seizure! This can be Karo Syrup, honey, or maple syrup ~ something high in sugar that you can smear on their gums to stabilize them. Seizures are probably going to happen as the disease progresses, so make sure whatever you use is easily accessible. Your ferret could need up to 40 minutes to fully recover from a seizure, and should be fed a high protein food (A/D, baby food) as soon as she/he is alright to eat. Also, make sure to give the feedings and doses of medication on a regular basis. This is very important to keep your ferret stable! Medication should be every 12 hours, feeding every 8 – 10 hours. Feed your ferret prior to giving the medication can help to prevent stomach ulcers with occur when giving Prednisone on an empty stomach.

***No sugary treats should be given, as this will make the problem worse!*** A diet that is high in protein is the best for your ferret. If you wish to provide snacks and treats for your ferret look to treats such as cooked meat, egg scraps or strained meat baby food.

Though insulinoma is a disease that is going to cause some necessary life changes for you and your ferret, the outlook could be a lot worse. If cared for properly, *many* insulinomic ferrets can live long and happy lives, untouched for the most part by symptoms or episodes. The cause of death for ferrets that have insulinoma is often a disease or health issue other than the insulinoma. The most important thing you can do is remember that your ferret *depends on you* for diagnosis and treatment!