Diabetes Care in Cats

What is diabetes mellitus?
Diabetes mellitus is a disease of the pancreas. This is a small but vital organ that is located near the stomach. It has two significant populations of cells. One group of cells produces the enzymes necessary for proper digestion. The other group, called beta-cells, produces the hormone called insulin. Simply put, diabetes mellitus is a failure of the pancreas to regulate blood sugar.

In humans, two types of diabetes mellitus have been discovered. Both types are similar in that there is a failure to regulate blood sugar, but the basic mechanisms of disease differ somewhat between the two groups:

Type I, or Insulin Dependent Diabetes Mellitus, results from total or near-complete destruction of the beta-cells. This is the only type of diabetes known in dogs. As the name implies, pets with this type of diabetes require insulin injections to stabilize blood sugar.

Type II, or Non-Insulin Dependent Diabetes Mellitus, is different because some insulin-producing cells remain. However, the amount produced is insufficient, there is a delayed response in secreting it, or the tissues of the body are relatively resistant to it. People with this form may be treated with an oral drug that stimulates the remaining functional cells to produce or release insulin in an adequate amount to normalize blood sugar. Cats can have either type, but either way, are treated with insulin injections. If the cat has Type II diabetes, using insulin can sometimes give the pancreas a "rest" and it will start working again, sometimes months later, causing the cat to go into "remission" from its diabetes, requiring the insulin injections to be stopped, sometimes permanently.

Why is insulin so important?
The role of insulin is much like that of a gatekeeper. It stands at the surface of body cells and opens the door, allowing glucose to leave the blood stream and pass inside the cells. Glucose is a vital substance that provides much of the energy needed for life, and it must work inside the cells. Without an adequate amount of insulin, glucose in unable to get into the cells. It accumulates in the blood, setting in motion a series of events which can ultimately prove fatal.

When insulin is deficient, the cells become starved for a source of energy. In response to this, the body starts breaking down stores of fat and protein to use as alternative energy sources. Consequently, the dog eats more; thus, we have weight loss in a dog with a ravenous appetite. The body tries to eliminate the excess glucose by excreting it in the urine. However, glucose (blood sugar) attracts water; thus, urine glucose takes with it

large quantities of the bodies fluids, resulting in the production of a large amount of urine. To avoid dehydration, the cat drinks more and more water. Thus, we have the four classical signs of diabetes:

CLASSICAL SIGNS OF DIABETES MELLITUS:
Weight loss
Ravenous appetite
Increased water consumption
Increased urination

The diagnosis of diabetes mellitus is based on three criteria: the four classical clinical signs, the presence of a persistently high level of glucose in the blood stream, and the presence of glucose in the urine. The *normal level of glucose in the blood is 80-120 mg/dl* (4.4-6.6 mmol/L). It may rise to 250-300 mg/dl (13.8-16.7 mmol/L) following a meal. However, diabetes is the only common disease that will cause the blood glucose level to rise above 400 mg/dl (22 mmol/L). Some diabetic cats will have a glucose level as high as 800 mg/dl (44 mmol/L), although most will be in the range of 400-600 mg/dl (22-33 mmol/L). To keep the body from losing its needed glucose, the kidneys do not allow glucose to be filtered out of the blood stream unless very high levels of glucose are circulating in the blood. This means that cats with a normal blood glucose level will not have glucose in the urine. Diabetic cats, however, have excessive amounts of glucose in the blood, so it will be present in the urine.

What are the implications for me and my cat?
Treatment requires some dietary changes and administration of insulin. As for the owner, there are two implications: financial commitment and personal commitment. When your cat is well regulated overall maintenance costs will include the special diet, insulin, and routine testing. The financial commitment is higher during the initial regulation process and if complications arise.

It may take a month or more to achieve good regulation.

The financial commitment may again be significant if complications arise. We will work with you to try and achieve consistent regulation, but a few cats are difficult to keep regulated. It is important that you pay close attention to our instructions related to administration of medication, to diet, and to home monitoring if you choose to do this. Another complication that can arise is hypoglycemia, or low blood sugar; if severe, it may be fatal. This may occur due to inconsistencies in treatment. This will be explained in subsequent paragraphs. Your personal commitment to treating your cat is very important in maintaining regulation and preventing crises. Diabetic cats require insulin injections twice daily. They must be fed the same food in the same amount on the same schedule every day. If you are out of town, your cat must receive proper treatment while you are gone.

What is involved in treatment?
Consistency is vital to proper management of the diabetic cat. Your cat needs as consistent administration of medication, consistent feeding, and a stable, stress-free lifestyle as possible.

The first step in treatment is to alter your cat's diet. Diets that are high in protein and fat are preferred because they are generally lower in sugar. The preferred diets are Hills Prescription Diet Canine m/d or Purina Prescription DM. I recommend feeding your cat ¼ to ½ can at each insulin injection to make sure he's eating, and then leaving dry available in case he needs to eat because his blood sugar is low. If he is getting too heavy, we'll have to change this routine.

The foundation for regulating blood glucose is the administration of insulin by injection. Many people are initially fearful of giving insulin injections. If this is your initial reaction, consider these points.
1) Insulin does not cause pain when it is injected.
2) The injections are made with very tiny needles that your cat hardly feels.
3) The injections are given just under the skin in areas in which it is impossible to cause damage to any vital organ.

We will demonstrate how to draw-up and give insulin injections to your pet.

Is continual or periodic monitoring needed?
It is necessary that your cat's progress be checked on a regular basis. Monitoring is a joint project on which owners and veterinarians must work together.

Home Monitoring
Your part consists of two forms of monitoring. First, you need to be constantly aware of your cat's appetite, weight, water consumption, and urine output. You should be feeding a constant amount of food at each insulin injection and be aware of how much dry food is in his bowl each day which will allow you to be aware of days that he does not eat all of it or is unusually hungry after the feeding. You should try to weigh him at least once monthly. It is best to use the same scales each time.

You should try to develop a way to measure or estimate water consumption.

Any significant change in your cat's food intake, weight, water intake, or urine output is an indicator that the diabetes is not well controlled. We should see your cat at that time for blood testing.

Monitoring of Blood Glucose

Determining the level of glucose in the blood is the most accurate means of monitoring. This should be done every 10-14 days until your cat is well regulated, then every 3-6 months as long as your pet continues to appear well regulated. It should also be done at

any time the clinical signs of diabetes are present or if signs of hypoglycemia develop (see below).

Does hypoglycemia (low blood sugar) occur in cats?
Hypoglycemia means low blood sugar. If it is below 40 mg/dl (2.2 mmol/L), it can be life-threatening. Hypoglycemia occurs under two conditions:

1) *If the insulin dose is too high.* Although most cats will require the same dose of insulin for long periods of time, it is possible for the cat's insulin requirements to change. However, the most common causes for change are a reduction in food intake and an increase in exercise or activity. The reason for feeding before the insulin injection is so you can know when the appetite changes.

If your cat does not eat, skip that dose of insulin. If only half of the food is eaten, just give half the dose of insulin. Always remember that it is better for the blood sugar to be too high than too low.

2) If too much insulin is given. This can occur because the insulin was not properly measured in the syringe or because two doses were given. You may forget that you gave it and repeat it, or two people in the family may each give a dose. A chart to record insulin administration will help to prevent the cat being treated twice.

When the blood glucose is only mildly low, the cat will be very tired and unresponsive. You may call it and get no response. Since many cats sleep a lot during the day, this important sign is easily missed. Watch for it; it is the first sign of impending problems. If you see it, please bring in your cat for blood testing.

If your cat is slow to recover from this period of lethargy, you should give it corn syrup (1 teaspoon by mouth). If there is no response in 15 minutes, repeat the corn syrup. If there is still no response, contact us immediately for further instructions.

If severe hypoglycemia occurs, a cat will have seizures or lose consciousness. This is an emergency that can only be reversed with intravenous administration of glucose. If it occurs during office hours, come in immediately. If it occurs at night or on the weekend, call our emergency phone number for instructions.

SUMMARY OF INSTRUCTIONS

1) Read and reread this material so that you understand the specifics of proper regulation and how to recognize and treat hypoglycemia.

2) Get the supplies for treatment. Your prescription will specify the type of insulin and syringes. We have prescribed _____ insulin for your cat. Be sure to only use this type of insulin unless instructed to change.

3) Start your cat on _____ units of insulin, given _____ daily.

4) Schedule a glucose curve in 7-10 days after starting the insulin injections and new food. Cats should be fed normally and given insulin at home the morning of the scheduled appointment. You should bring your cat to the hospital by 8am and expect them to remain here for the duration of the day.

5) If you are interested in testing your cat's blood glucose at home, we can teach you how to do this. Sometimes owners learn to do this when their cat gets extremely stressed for the day in the hospital.

6) We may also monitor your cat's blood glucose control using a single blood test called a *Fructosamine* which is sent to the diagnostic lab about once every 6 months.