

Diabetes Mellitus

Treating a diabetic cat can be a challenge. Some cats just never seem to stay regulated. However, there are several important concepts that make this process much more likely to be successful.

1. Tight control is not necessary in cats. Human diabetics must maintain blood glucose values very close to normal at all times. If they don't, they will develop some disastrous complications of diabetes, such as loss of fingers, toes, feet, and hands, kidney failure, and cataract formation. These complications do not happen to diabetic cats. Therefore, as stated above, it is better for the blood glucose to be too high than too low.
2. Hyperglycemia (high blood glucose) is always better than hypoglycemia (low blood glucose).
3. As the dose of insulin goes up, the blood glucose goes down.
4. Food intake causes the blood glucose to rise. Failure to eat allows the blood glucose to fall below normal.

If you are not sure if you gave a dose of insulin or if it was properly injected, do not give it again. If your cat does not eat, do not give insulin. If you must miss a dose or two of insulin (occasionally), do not be concerned.

Understanding Diabetes

There are two forms of diabetes in cats: diabetes insipidus and diabetes mellitus. Your cat has the more common type of diabetes, diabetes mellitus. This disease is seen on a fairly regular basis, usually in cats 5 years of age or older. Simply put, diabetes mellitus is a failure of the pancreas to regulate blood sugar.

Types of Insulin

In cats, 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.

1. Type I, or Insulin Dependent Diabetes Mellitus, results from total or near-complete destruction of the beta cells. This is the most common type of feline diabetes. As the name implies, cats with this type of diabetes require insulin injections to stabilize blood sugar.
2. 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, and the tissues of the cats body are relatively resistant to it. These cats 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. Alternatively, they may be treated with insulin. Cats with NIDDM may ultimately progress to total beta cell destruction and then require insulin injections.

What Insulin Does for the Body

Insulin helps the body to break down glucose so it can be used.

CLASSICAL SIGNS OF DIABETES MELLITUS:

Weight loss
Ravenous appetite
Increased water consumption
Increased urination

Diagnosing Diabetes

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. It may rise to 250-300 mg/dl following a meal or when the cat is very excited. However, diabetes is the only common disease that will cause the blood glucose level to rise

above 400 mg/dl. Some diabetic cats will have a glucose level as high as 800 mg/dl, although most will be in the range of 400-600 mg/dl.

Diabetic cats also have excessive amounts of glucose in the blood, so it will be present in the urine.

In some cats, another test is performed called fructosamine. This test represents the average blood glucose level for the past two weeks. It minimizes the influence that stress and eating have on blood glucose levels and can be very helpful in understanding difficult cases.

What It Means for Your Cat to be Diabetic

Blood glucose cannot be normalized without treatment. Although the cat can go a few days without treatment and not get into a crisis, treatment should be looked upon as part of the cat's daily routine. Treatment almost always requires some dietary changes.

The first few months of owning a diabetic pet are usually very frustrating. You are learning to give in the injections, closely monitoring the pet, and often changing personal habits to give the insulin. The animal is often changed to a new food, and every time we change the insulin dose or the food, we have to monitor the blood glucose in the hospital. We will work with you to try and achieve consistent regulation, but some 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.

Your personal commitment to treating the cat is very important in maintaining regulation and preventing crises. Most diabetic animals require insulin injections once or 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.

Treatment

Consistency is vital to proper management of diabetes. To best achieve this, it is preferred that your cat lives indoors. Although that is not essential, indoor living removes many uncontrollable variables that can disrupt regulation.

The first step in treatment is to alter your cat's diet. Diets that are high in fiber are preferred because they are generally lower in sugar and slower to be digested. We generally prescribe Hills W/D or M/D, or Eukanuba Weight-loss or Glucose Control.

Your cat's feeding routine is also important. The cat needs to eat consistently. . We realize that if you have more than one cat, this may be difficult, but please make an effort, as this is part of the home monitoring that should occur. Often, it helps to give the cat a special meal of ½ cup canned food prior to giving insulin to monitor the cat's interest in food.

Insulin injections are the first choice to control diabetes. The foundation for regulating blood glucose is the administration of insulin by injection. Luckily, insulin does not cause pain when it is injected, the needles are so small they are hardly felt and it is almost impossible to cause damage to any vital organ while injected. You will be pleasantly surprised at how easy it is.

Insulin Therapy and Administration

About Insulin

About Insulin. Insulin comes in an airtight bottle that is labeled with the insulin type and the concentration. Before using, mix the contents. Roll it quickly and thoroughly, but do not shake it (to prevent foam formation)

Insulin is a hormone that will lose its effectiveness if exposed to direct sunlight or high temperatures. It should be kept in the refrigerator, but it should not be frozen.

Drawing up Insulin

Have the syringe and needle, insulin bottle, and cat ready. Then, follow these steps:

- 1) Remove the guard from the needle, and draw back the plunger to the appropriate dose level.
- 2) Carefully insert the needle into the insulin bottle.
- 3) Inject air into the bottle; this prevents a vacuum from forming within the bottle.
- 4) Withdraw the correct amount of insulin into the syringe.

Before injecting your cat with the insulin, verify that there are no air bubbles in the syringe. If you get an air bubble, draw twice as much insulin into the syringe as you need. Then withdraw the needle from the insulin bottle and tap the barrel of the syringe with your finger to make the air bubble rise to the nozzle of the syringe. Gently and slowly expel the air bubble by moving the plunger upward.

When this has been done, check that you have the correct amount of insulin in the syringe. The correct dose of insulin can be assured if you measure from the needle end, or "0" on the syringe barrel, to the end of the plunger nearest the needle.

Injecting Insulin

The steps to follow for injecting insulin are:

- 1) Hold the syringe in your right hand (switch hands if you are left-handed).
- 2) Have someone hold your cat while you pick up a fold of skin from somewhere along your cat's back with your free hand (pick up a different spot each day).
- 3) Quickly push the very sharp, very thin needle through your cat's skin. This should be easy and painless. However, take care to push the needle through only one layer of skin and not into your finger or through two layers of skin. The needle should be directed parallel to the backbone or angled slightly downward.
- 4) To inject the insulin, place your thumb on the plunger and push it all the way into the syringe barrel.
- 5) Withdraw the needle from your cat's skin. Immediately place the needle guard over the needle and discard the needle and syringe.
- 6) Stroke your cat to reward it for sitting quietly.

Monitoring

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 can be performed in one or both of two ways. The **first way** is to monitor your cat for signs of diabetes. To do this, 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 each day, which will allow you to be aware of days that your cat does not eat all of it or is unusually hungry after the feeding. If you have several cats that eat together and use the same litter box, monitoring weight is the best because it is specific to this one cat.

Urine output can be measured by determining the amount of litter that is scooped out of the litter box. This is a little less accurate if you have more than one cat that uses the litter box, but it can still be meaningful

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 the cat at that time for blood testing.

The **second method** of home monitoring is to determine the presence of glucose in the urine. If your cat is properly regulated, there should be no glucose present in the urine.

You may purchase urine glucose test strips in any pharmacy. They are designed for use in humans with diabetes, but they will also work in the cat. The use of special non-absorbing kitty litter permits you to dip the test strip into urine in the litter box. Aquarium gravel, Styrofoam packing "peanuts," and commercial non-absorbing litter can be used. Since these are not ideal litter materials, they are best used on a periodic basis.

Monitoring of Blood Glucose

Determining the level of glucose in the blood is the most accurate means of monitoring. This should be done about every 3-4 months if your cat seems to be well regulated. It should also be done at any time the clinical signs of diabetes are present or if glucose is detected in the urine for two consecutive days.

Timing is important when the blood glucose is determined. Since eating will elevate the blood sugar for several hours, it is best to test the blood at least 6 hours after eating.

When testing the blood we want to know the highest and lowest glucose readings for the day. The highest reading should occur just before an injection of insulin is given. The lowest should occur at the time of peak insulin effect.

- 1) Feed your cat its normal morning meal then bring it to hospital immediately. If you cannot get it to the hospital within 30 minutes, do not feed it. In that situation, bring its food with you.
- 2) Bring your cat to the hospital early in the morning without giving it insulin.
- 3) A blood sample will be taken immediately, and then we will give insulin and feed your cat if it did not eat at home.
- 4) More samples will be taken during the day.

Hypoglycemia

Hypoglycemia means low blood sugar. If it is below 40 mg/dl, it can be life threatening. Hypoglycemia occurs under three conditions: (i.e. the dog did not eat, yet got the full amount of insulin), or if the wrong dose was given, or multiple family members gave the insulin. Rarely a cat will get into a spontaneous remission of the diabetes.

When the blood glucose is only mildly low, the cat will be very tired and unresponsive. You may call it and get no response. If your cat is slow to recover from this period of lethargy, you should give it corn syrup (1 tablespoon by mouth) or feed one packet of a semi-moist cat food. If there is no response in 15 minutes, repeat the corn syrup or the semi-moist food. If there is still no response, contact us immediately for further instructions. (Note: *Diabetic cats should not be fed semi-moist foods except for this situation.*)

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.

Spontaneous Remission

Spontaneous remission means that a diabetic cat is no longer diabetic. This is a phenomenon that happens in about 15-20% of diabetic cats. Unfortunately, it can happen rather suddenly so a hypoglycemic crisis may be created because the owner does not realize remission has occurred and continues to give the normal amount of insulin. When it occurs, the cat may be normal for a few weeks or for many months. However, diabetes will almost always return because these cats have limited ability to make insulin. Therefore, you should watch for the typical signs of diabetes then contact us for insulin instructions.

SUMMARY OF INSTRUCTIONS FOR CATS RECEIVING INSULIN INJECTIONS

- 1) Read and reread this material so that you understand the specifics of proper regulation and how to recognize and treat hypoglycemia.
- 2) Give the first injection of insulin of _____ units at about _____ AM/PM.
- 3) Return for a glucose curve at about the same time as you normally give insulin in 5-7 days. Allow your cat to eat through the night or feed it that morning and immediately bring it to the hospital. Do not give insulin, but bring it with you. (If it will take more than 30 minutes to drive to the hospital, call for instructions on feeding.)
- 4) Feed your cat one of the foods mentioned above.