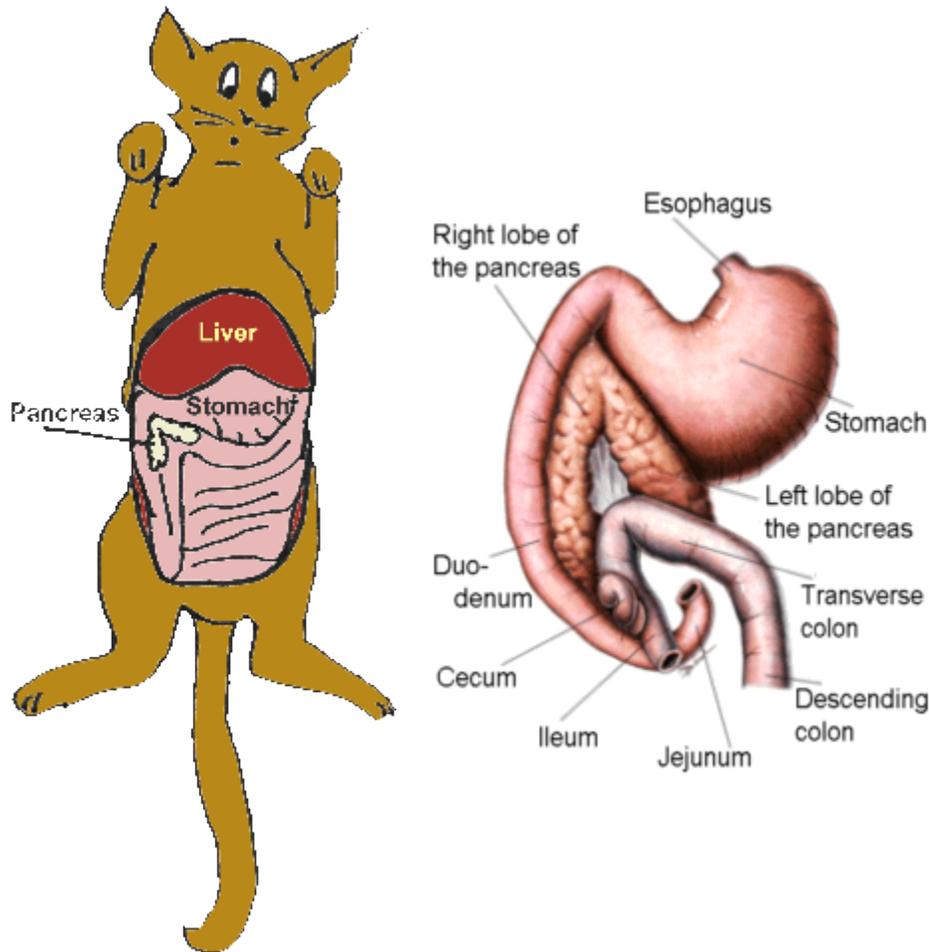


## Diabetes Mellitus

In order to understand the problems involved in diabetes mellitus, it is necessary to understand something of the normal body's metabolism.



The cells of the body require a sugar known as glucose for food and they depend on the bloodstream to bring glucose to them. The cells cannot, however, absorb and utilize glucose without a hormone known as insulin. This hormone, insulin, is produced by the pancreas. Insulin is like a key that unlocks the door which separate cells from the sugars in our bloodstream.

Glucose comes from the diet. When an animal goes without food, the body must break down fat, stored starches, and protein to supply calories for the hungry cells. Proteins and starches may be converted into glucose. Fat, however, requires different processing that can lead to the production of ketones rather than glucose. Ketones are another type of fuel that the body can use in a pinch but the detection of ketones indicates that something wrong is happening in the patient's metabolism. Ketones may therefore be detected in the urine of starving animals because massive fat mobilization is required for ketone formation. Ketones can also be detected in diabetic ketoacidosis, a severe complication of unregulated diabetes, so it is helpful to periodically monitor for ketones in a diabetic patient's urine.

## **IN A DIABETIC ANIMAL THERE ISN'T ENOUGH INSULIN**

The cells cannot receive glucose from the blood because there is no insulin to permit it.

The body is unable to detect the glucose in the blood and is fooled into thinking it is starving.

Protein, starch, and fat break-down occur as they do in starvation.

Yet all along there has been plenty of glucose in the blood. In fact, by now, there is a large excess of glucose as all resources have been mobilized. Still, without insulin, this bounty of fuel cannot get to the tissues that need it.

The normal kidney is able to prevent glucose loss in urine. In a diabetic animal, there is so much glucose in the blood that the kidney is overwhelmed and glucose spills into the urine and is lost.

Glucose is able to draw water with it into the urine. This leads to excess urine production and excess thirst to keep up with the fluid loss.

### **Thus the main clinical signs of diabetes mellitus are:**

- Excessive eating
- Excessive drinking
- Excessive urination
- Weight loss

History and tests showing dramatic glucose elevations in the blood and in the urine helps establish a diagnosis of diabetes mellitus. Some pets are able to substantially raise their blood sugars from stress (such as might occur when a sensitive, sick, and anxious patient goes to the vet's office). This could create misleading test results. If there is any question about the diagnosis, a test called a fructosamine level may be requested. This test reflects an average blood glucose level over the past several weeks. If this is also elevated, a one-time elevated glucose can be distinguished from the persistent elevations of true diabetes mellitus.

In dogs, sugars can enter the lens of the eye causing rapid [cataract](#) formation. Because a cat's lens is different, this phenomenon primarily occurs in dogs.

Another common symptom of diabetes mellitus is urinary tract infection. All the sugar in the urine makes the bladder an excellent incubator for bacteria. Antibiotics are necessary to clear up such an infection and some monitoring may be needed to help detect these infections.

### **What Happens Once a Diagnosis Is Reached**

First, an insulin type and dose will need to be selected. There are several types of insulins and it is not possible to know how much insulin your individual pet will require. Your veterinarian can make a guess based on what works for other cats and dogs and what has been reported in the literature. Most pets require injections twice a day, approximately 12 hours apart, following a meal.

You will need to learn how to give insulin injections to your pet. The technique of subcutaneous (under the skin) insulin administration should be thoroughly demonstrated by your doctor or an assistant. You may be surprised to find that the most common reason for a pet having difficulty achieving regulation is that the owner is not giving the injections properly. Be sure you know how to hold the bottle, manipulate the syringe, hold your pet, and give the injection. Some situations require that the pet be hospitalized for a few days for the initial regulation.

Some insulins are available from the neighborhood pharmacy and some kinds are available only through veterinary offices and pharmacies. You will need syringes and a bottle of insulin to begin home treatment. Your veterinarian will either provide you with supplies or will give you the necessary prescriptions. Insulin syringes are marked in insulin units so the insulin syringes must match the insulin concentrations (either U-100 syringes for 100 unit/cc insulins or U-40 syringes for 40 unit/cc insulins.) Always double check these numbers whenever you receive more supplies.

Never alter the insulin dose recommended by your doctor. To determine whether dose adjustments are needed (or if a different type of insulin is more appropriate), your pet will need a glucose curve where blood sugar levels are monitored every 2 to 4 hours or so for 12 to 24 hours. This kind of testing tells the doctor how long the insulin injection is lasting as well as what the lowest and highest glucose levels of the day are. It is important to find out when your pet's curve is due. Often in the beginning, it takes several dose selections and several curves before the right dose is determined.

***A bottle of insulin, when stored properly, should last 6 to 8 weeks. After that time it should probably be replaced.***

### **When to Return to the Hospital/What to Watch for**

Your pet will probably require re-regulation at some point. During re-regulation periods, expect a curve to be run a week or two after each adjustment in insulin dose.

Bring your pet in for a re-check exam and glucose curve if your pet:

- seems to feel ill
- is losing weight
- has a ravenous appetite or loses its appetite
- seems to be drinking or urinating excessively
- becomes disoriented or groggy

### **Annual Dental**



It is important for diabetic pets to have their teeth cleaned annually. Dental tartar seeds the body with bacteria and when blood sugar levels run high, infections in important organs can take root. The kidneys and heart are particularly vulnerable.

### **Insulin Shock/Hypoglycemia**

If your pet appears wobbly or drunken, the blood sugar level may have dropped too low. This occurs after an insulin overdose. First try to get your pet to eat. If the pet will not eat, administer light Karo syrup, honey, or even sugar-water at a dose of one tablespoon per 5 pounds. If

no improvement occurs, immediately see your veterinarian for emergency treatment. When your pet is more stable, a glucose curve will be needed to determine why this happened and what a more appropriate insulin dose might be.

### **Some Pets are Difficult to Regulate**

Your pet will probably require re-regulation at some point. There may be an underlying reason to sort out. If your pet seems to fit in this category, some reasons could be:

*Improper administration of insulin.* If possible, have your doctor observe you giving the insulin to your pet. Another possibility is that your insulin may be out of date.

*Rapid insulin metabolism.* Insulin wears off quickly in some animals. Your pet may require a different type of insulin or a second injection during the day or even additional injections during the day.

*Insulin overdose* may actually lead to elevated glucose levels (and clinical signs of diabetes mellitus). In this situation, too much insulin brings the blood glucose too low and other hormones respond to bring it back up (and generally over-do it).

*Steroid administration* (such as [prednisone](#), [prednisolone](#), etc.) will interfere with insulin.

*Progesterone*, a female hormone, also interferes with insulin. Unspayed female diabetics should be spayed once they are sufficiently regulated.

For more details on trouble with regulation, read about hard to regulate [dogs](#) or [cats](#).

### **Feeding a Diabetic Pet**

Regulation is achieved via a balance of diet, exercise, and insulin. Realizing that therapeutic diets are not always attractive to pets, there are some ideal foods which should at least be offered.

The most up-to-date choice for cats is a low carbohydrate high protein diet. These diets promote weight loss in obese diabetics and are available in both canned and dry formulations. For dogs, high fiber diets are still in favor as fiber seems to help sensitize the pet to insulin. Talk to your veterinarian to select an appropriate choice for your pet.

Avoid soft-moist diets as sugars are used as preservatives. Avoid breads and sweet treats. If it is not possible to change the pet's diet, then regulation will just have to be worked out around whatever the pet will eat.