

## **Diabetes Mellitus**

There are two forms of diabetes in dogs: diabetes insipidus and diabetes mellitus. Diabetes insipidus is a very rare disorder that results in failure to regulate body water content. Your dog has the more common type of diabetes: diabetes mellitus. This is a fairly common disorder and is most often seen in animals 5 years of age or older. There is a congenital form that occurs in puppies, but this is not common.

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.

### **The Purpose of Insulin**

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

### **Diagnosis**

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. However, diabetes is the only common disease that will cause the blood glucose level to rise above 400 mg/dl. Some diabetic animals will have a glucose level as high as 800 mg/dl, although most will be in the range of 400-600 mg/dl.

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

### **What Diabetes Means to You and Your Dog**

For the diabetic pet, blood glucose cannot be normalized without treatment. Treatment almost always requires some dietary changes and administration of insulin.

Initially, your dog may be hospitalized for a few days to deal with the immediate crisis and to begin the regulation process. If the pet is more stable, treatment can begin at home. At first, return visits are required every 5-7 days to monitor progress. It may take a month or more to achieve good regulation.

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 dog 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 dog must receive proper treatment while you are gone.

### **Treatment**

Consistency is vital to proper management of the diabetic dog.

The first step in treatment is to alter your dog's diet. Diets that are high in fiber are preferred because they are generally lower in sugar and slower to be digested. The preferred diets are Prescription Diet Canine w/d or m/d, IVD Mature or Highfactor, and Eukanuba Glucose Control or Restricted Calorie™.

Your dog's feeding routine is also important. Some dogs prefer to eat several times per day. This means that food is left in the bowl at all times for free choice feeding. Another way is to feed twice daily, just before each insulin injection. If a two-meals-per-day feeding routine does not work for you dog, it is still very important that you accurately measure the amount of food that is consumed.

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.

Injection technique is as follows:

*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 should be kept in the refrigerator, but it should not be frozen. It is not ruined if left out of the refrigerator for a day or two and not exposed to direct sunlight, although this is not advisable

*Drawing up the Insulin.* Have the syringe and needle, insulin bottle, and dog 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 dog with the insulin, check 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 the 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 dog while you pick up a fold of skin from somewhere along your dog's back with your free hand (pick up a different spot each day).
- 3) Quickly push the very sharp, very thin needle through your dog'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 dog's skin. Immediately place the needle guard over the needle and discard the needle and syringe.
- 6) Stroke your dog to reward it for sitting quietly, or give it a veterinary approved treat.

It is neither necessary nor desirable to swab the skin with alcohol to "sterilize" it.

Although the above procedures may at first seem complicated and somewhat overwhelming, they will very quickly become second nature. Your dog will soon learn that once or twice each day it has to sit still for a few minutes. In most cases, a reward of stroking results in a fully cooperative dog that eventually may not even need to be held.

## **Monitoring**

It is necessary that your dog'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 dog's appetite, weight, water consumption, and urine output. You should be feeding a constant amount of food each day that will allow you to be aware of days that your dog does not eat all of it or is unusually hungry after the feeding. You should weigh your dog at least once monthly. It is best to use the same scales each time.

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

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

There are several ways to detect glucose in 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 dog. A fresh urine sample should be collected and tested with the test strip. If glucose is detected, the test should be repeated the next two days. If it is present each time, we should see your dog for a blood test.

### 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 dog 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.

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 dog 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 dog 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 dog if it did not eat at home.
- 4) Additional levels 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 if the insulin dose is too high (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.

Signs are a dog that is very tired and unresponsive. You may call it and get no response. If your dog is slow to recover from this period of lethargy, you should give it corn syrup (1 tablespoon per 10 pounds of body weight 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 dog 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. If you will be using urine glucose tests strips, they should be purchased at a pharmacy.
- 3) Give the first injection of insulin of \_\_\_\_\_units at about \_\_\_\_\_AM/PM.
- 4) Return for a glucose curve, no later than 8:00 a.m., on \_\_\_\_\_. Feed your dog 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.)
- 5) Return to our hospital for a blood glucose test in 1 month. This should be done about 5-8 hours after an injection of insulin. If two injections are given each day, be sure the test is done *before* the evening injection.