



Client Details

Name Test, Test

Address

Phone(s)

Patient Details

Name Testy

Species Canine (Dog)

Breed Labrador Retriever

Age 4 weeks 5 days

Sex Female Spayed

Diabetes Mellitus in Dogs

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 pet has the more common type of diabetes: diabetes mellitus. This is a fairly common disorder and is most often seen in dogs 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 Types of Diabetes

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.

1. 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, dogs 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 dog's 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. Because Type II diabetes does not occur in dogs, oral medications are not appropriate for treating diabetic dogs.

The Purpose of Insulin

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 is unable to get into the cells. It accumulates in the blood, setting in motion a series of events that 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. As a consequence, 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 body's fluids, resulting in the production of a large amount of urine. To avoid dehydration, the dog 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



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

To keep the body from losing its needed glucose, the kidneys do not allow glucose to be filtered out of the blood stream until an excessive level is reached. This means that dogs with a normal blood glucose level will not have glucose in the urine. Diabetic dogs, however, have excessive amounts of glucose in the blood, so it will be present in the urine.

What Diabetes Means to You and your pet

For the diabetic dog, one reality exists: blood glucose cannot be normalized without treatment. Although your dog can go a day or so without treatment and not get into a crisis, treatment should be looked upon as part of your dog's daily routine. Treatment almost always requires some dietary changes and administration of insulin.

As for the owner, there are two implications: financial commitment and personal commitment.

When your dog is well regulated, the maintenance costs are minimal. The special diet, insulin, and syringes are not expensive. However, the financial commitment is significant during the initial regulation process and if complications arise.

Initially, your dog may be hospitalized for a few days to deal with the immediate crisis and to begin the regulation process. The "immediate crisis" is only great if your dog is so sick that it has quit eating and drinking for several days. Dogs in this state, called ketoacidosis, may require a week or more of hospitalization with quite a bit of laboratory testing. Otherwise, the initial hospitalization may be only for a day or two to get some testing done and to begin treatment. At that point, your dog goes home for you to administer medication. 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 financial commitment may again be significant if complications arise. We will work with you to try and achieve consistent regulation, but a few dogs 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. 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 dog is very important in maintaining regulation and preventing crises. Most diabetic dogs 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 dog must receive proper treatment while you are gone. These factors should be considered carefully before deciding to treat a diabetic dog.

Treatment

Consistency is vital to proper management of the diabetic dog. your dog needs consistent administration of medication, consistent feeding, and a stable, stress-free lifestyle. To best achieve this, it is preferred that your dog live indoors. Although that is not essential, indoor living removes many uncontrollable variables that can disrupt regulation.



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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. This means that your dog does not have to process a large amount of sugar at one time. The preferred diets are Prescription Diet Canine w/d, Purina -OM, Purina-DCO, and Royal Canin Glycobalance. If your dog is overweight, Prescription Diet Canine r/d is fed until the proper weight is achieved, and then your dog is switched to one of the others.

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 your 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. 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 dog hardly feels.
- 3) The injections are given just under the skin in areas in which it is almost impossible to cause damage to any vital organ.

Please do not decide whether to treat your dog with insulin until we have demonstrated the injection technique. You will be pleasantly surprised at how easy it is.

The 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. It says on the label to roll it gently, not shake it. The reason for this is to prevent foam formation, which will make accurate measuring difficult. Some of the types of insulin used in dogs have a strong tendency to settle out of suspension. If it is not shaken properly, it will not mix well, and dosing will not be accurate. Therefore, the trick is to shake it vigorously enough to mix it without creating foam. Since bubbles can be removed (as described later), it is more important to mix it well than to worry about 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. 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. Insulin is safe as long as it is used as directed, but it should be kept out of reach of children.

About insulin syringes. There are two types of insulin used in dogs. Some are made for use in humans (NPH) and obtained from regular pharmacies. Vetsulin insulin is made specifically for dogs and cats and obtained only from a veterinarian. Vetsulin has a concentration of 40 units of active insulin crystals per milliliter of fluid. Thus called U-40 insulin. Insulins made for humans have a concentration of 100 units per milliliter and are called U-100 insulin. This is important to know because there are two types of insulin syringes, U-40 syringes and U-100 syringes. They are made to be used with their respective type of insulin and must not be interchanged or improper dosing will occur. Please check with us if you have any questions regarding which syringes to use.

Drawing up the Insulin. Have the syringe and needle, insulin bottle, and your dog ready. Then, follow these steps:

- 1) Remove the guard from the needle, and draw back the plunger to the appropriate dose level.



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- 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 latter will result in injecting the insulin onto your dog's hair coat or onto the floor. 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) Be sure to pet your dog to reward them for sitting quietly.
- 7) Be aware that some communities have strict rules about disposal of medical waste material so don't throw the needle/syringe into the trash until you know if this is permissible. It is permissible in the state of Utah. It is a good idea to break off the needles before throwing them away to prevent injury. If it is not, we can dispose of them for you for a fee of \$40 per container.

It is neither necessary nor desirable to swab the skin with alcohol to "sterilize" it. There are four reasons:

- 1) Due to the nature of the thick hair coat and the type of bacteria that live near the skin of dogs, brief swabbing with alcohol or any other antiseptic is not effective.
- 2) Because a small amount of alcohol can be carried through the skin by the needle, it may actually carry bacteria with it into the skin.
- 3) The sting caused by the alcohol can make your dog dislike the injections.
- 4) If you have accidentally injected the insulin on the surface of the skin, you will not know it. If you do not use alcohol and the skin or hair is wet following an injection, the injection was not done properly.



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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 petting 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 consistent 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.

You should develop a way to measure water consumption. The average dog should drink no more than 7 1/2 oz. (225 ml) of water per 10 pounds (4.5 kg) of body weight per 24 hours. Since this is highly variable from one dog to another, keeping a record of your dog's water consumption for a few weeks will allow you to establish what is normal for your dog. Another way to measure water consumption is based on the number of times it drinks each day. When properly regulated, it should drink no more than six times per day. If this is exceeded, you should take steps to make an actual measurement.

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.

You should keep a small container to catch urine as your dog voids. A large amount of urine is not needed to test for urine glucose; it is not necessary to catch the entire amount of urine. Because the female dog usually squats to urinate, a shallow pan or dish may be placed under the hindquarters when she begins to urinate. For male dogs, urine can be collected as soon as the dog lifts his leg to void. Male dogs often urinate small amounts in several different places and most often urinate on vertical objects, such as bushes and trees.

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.

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.



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Hypoglycemia

Hypoglycemia means low blood sugar. If it is below 40 mg/dl, it can be life threatening. Hypoglycemia occurs under two conditions:

1) *If the insulin dose is too high.* Although most dogs will require the same dose of insulin for long periods of time, it is possible for the dog'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 dog does not eat, skip that dose of insulin.* If only half of the food is eaten just give a half 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 your dog being treated twice.

The most likely time that a dog will become hypoglycemic is the time of peak insulin effect (5-8 hours after an insulin injection). When the blood glucose is only mildly low, your dog will be very tired and unresponsive. You may call your dog and get no response. Within a few hours, the blood glucose will rise, and your dog will return to normal. Since many dogs 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 dog for blood testing.

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 (This is a plan you and your Veterinarian will formulate together)

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. Remember that it is important to give the injections 12 hours apart.

4) Return for a glucose curve 2 weeks from starting the first dose of insulin on this date _____. Plan for _____ to be dropped off in the morning and plan to be picked up by 5pm or later depending on what your vet recommends. Feed your dog that morning and give insulin at your normal scheduled time. This appointment will need to be scheduled so please call ahead.

5) Return to our hospital for a blood glucose test in 1 month. This should be done about 6 hours after the first injection of insulin for the day on this date _____.