



My Dog has **DIABETES?**

With the proper care this common disease is quite manageable and dogs can maintain a good quality of life. Here's what you need to know.

What is 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. Diabetes mellitus is a fairly common disorder and is most often seen in dogs five years of age or older. A congenital (existing at birth) form of this disease can occur 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 insulin. Simply put, diabetes mellitus is a failure of the pancreas to produce adequate amounts of insulin.

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, or blood sugar, 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 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. This causes the dog to eat more, but ultimately results in weight loss.

The body tries to eliminate the excess glucose by excreting it in the urine. However, glucose attracts water, so the urine glucose that is excreted also contains large quantities of the body's fluids. This causes the dog to produce a large amount of urine. To avoid dehydration, the dog drinks more and more water.

Thus, we have the four classical signs of diabetes:

- Weight loss
- Increased water consumption
- Ravenous appetite
- Increased urination

How is diabetes mellitus diagnosed?

The diagnosis of diabetes mellitus is based on three criteria: the four classical 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 to 120 mg/dl. It may rise to 250 to 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 can have a glucose level as high as 800 mg/dl, but most will be in the range of 400-600 mg/dl.

To keep the body from losing vital 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 does a diagnosis of diabetes mean for me and my dog?

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

For the owner, successful treatment depends on financial and personal commitment. When your dog is regulated, the maintenance costs are minimal on a day-to-day basis. The special diet, insulin and syringes are not expensive. However, the financial commitment can be significant during the initial regulation process or in the instance that 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 he/she has stopped 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 is often unnecessary and the initial insulin injections are given at home.

At first, return visits are required every three to seven days to monitor progress. Once the glucose begins to lower, a curve will be recommended to assess how effective the insulin is and how long it is lasting. This is a test in which insulin is injected early in the morning and blood glucose levels are determined every two to four hours throughout the day. The purpose of this test is to determine how long it takes for the blood glucose to reach its lowest level or "peak time." The test is also used to determine how high and low the blood glucose levels are throughout the day. It may take a month or more to achieve good regulation.

We will work with you to try and achieve consistent results, but regulation is not always easy. Inconsistencies in treatment can make regulating your dog especially challenging. It is important that you pay close attention to instructions related to medication administration, diet and home monitoring. Hypoglycemia, or low blood sugar, can occur as a result of incorrect or inconsistent treatment and, if severe, may be fatal.

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 when deciding to treat a diabetic dog.

What is involved in treatment?

Consistency is vital to proper management of the diabetic dog. Your dog needs consistent administration of insulin, consistent feeding and a stable, stress-free lifestyle.

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 the dog does not have to process a large amount of sugar at one time.

Your dog's feeding routine is also important. The preferred way is to feed twice daily, just before each insulin injection. If your dog is currently eating on a free-fed basis, you may try breaking the diet into separate meals.

However, if your dog will not change or if you have several dogs that eat in a free-fed fashion, you may find that this change is not practical. If a two-meals-per-day feeding routine will not work for you, it is still very important that you find some way to accurately measure the amount of food that is consumed.

The foundation for regulating blood glucose is the administration of insulin by injection.

Diabetes Home Care

Typically two daily injections of insulin will be required for the rest of your pet's life. Though with some cats, once the blood sugar has been lowered, the dose of insulin may be reduced or eliminated. However, cats may become insulin-dependent again later in life. It is also important that the injections are given at the same times each day, usually every 12 hours. In sporadic occasions if the 12-hour time frame cannot be met, insulin may be given 10-14 hours apart. The injection is given just under the skin (subcutaneous) and is not painful to your pet. Insulin should be given behind the region of the shoulder blades, along the back, changing the site of administration at each administration.

Handling Insulin and Insulin syringes

Insulin is a hormone that will lose its effectiveness if exposed to direct sunlight or high temperatures; therefore, it should be kept in the refrigerator. Insulin when stored properly, should last 6 to 8 weeks. After that time it should be replaced. Insulin should also be replaced prior to getting close to the bottom of the vial because many pets get overdosed as the insulin becomes more concentrated as the bottle is used up.

The bottle should be mixed by rolling or swirling before withdrawal of the insulin into the syringe. The bottle should **NEVER** be shaken to mix the insulin.

The syringe and needle should be stored in protective wrappers to keep them sterile, until ready to use. Insulin should **NEVER** be pre-drawn up into the syringes.

These syringes and needles are disposable or "single use" only. **THEY SHOULD NOT BE REUSED!** After injecting your pet with insulin, place the needle and the needle guard in a suitable disposal container. **Do Not** recap the needle, you could inadvertently stick the needle into your hand or finger.

Drawing Up the Insulin

1. Set out the syringe and needle, insulin bottle and have your pet ready.
2. Remove the needle guard from the needle; draw back the plunger to the desired dose level.
3. Insert the needle into the insulin bottle.
4. Inject the air in the syringe into the bottle to prevent a vacuum from forming in the insulin bottle.
5. Pull back on the plunger, filling the syringe with insulin to the correct level.
6. Before withdrawing the needle from the bottle check to see that there are no air bubbles in the syringe. If you see an air bubble, draw up slightly more insulin into the syringe and gently tap the barrel with your finger to move the air bubble to the nozzle of the syringe, then gently expel the bubble by pushing the plunger upwards towards the bottle.
7. Now check to see that you have the correct amount of insulin in the syringe. The correct dose of insulin is measured from the needle end, or "0" on the syringe barrel, to the end of the plunger closest to the needle.

How to Give an Insulin Injection

"Sterilizing" the skin with alcohol is not necessary and may be counterproductive if it stings and causes your pet to avoid the injections.

1. Hold the syringe in your right hand (or your left, if left-handed). There are many ways to hold the syringe. With time you will develop the one easiest for you. You may find it helpful to begin practicing with a syringe filled with water and injecting it into an orange.
2. Have a friend or member of your family hold your pet as you pick up a fold of skin along the back with your free hand. Be sure to pick a different spot for each injection. **Insulin injections should not be given between the shoulder blades because insulin absorption is erratic or unpredictable in this area.**
3. Push the very sharp, very thin needle through the animal's skin quickly. This should be easy and painless using the insulin needle. Take care to push the needle through only one fold of the skin, not into your finger, your pet's underlying muscle or through both layers of skin.
4. Pull back gently on the plunger (aspirate) to make sure that no blood fills the syringe. If this happens, remove the syringe from this site, and proceed in another location. You may have just hit a skin blood vessel.
5. With your thumb on the plunger, push the plunger further into the syringe until it will not go in any farther.
6. Withdraw the needle from the pet's skin and immediately dispose of the syringe and needle guard.
7. Pat your pet to reward it for sitting quietly for the injection.

Feeding

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.

When you feed your pet is as important as what you feed your pet. Your pet must be fed the recommended diet in the correct quantity at a regular time each day in conjunction with the insulin injection. Correct dietary management is a critical part of the successful management of the diabetic animal. As a general rule of thumb, the diabetic animal should be fed two to three times daily. Ensure that your pet is eating well before giving each insulin injection. If the insulin is given first and the animal refuses to eat, this could lead to hypoglycemia. Cats that are fed free-choice (i.e., food available all time) require no changes in their lifestyle as long as you are certain that they are eating normally.

Exercise

If your pet is overweight, weight reduction is essential. Obesity decreases the body's tissue responsiveness to insulin (both natural and injected) and can cause dangerous increases in blood sugar levels. Follow the diet program laid out by your veterinarian. Changes in weight will affect the insulin dose that is required.

There are no restrictions on your pet's normal activity. However, it is important that your pet's exercise be moderately regulated and consistent in order to keep the insulin needs as consistent as possible. Dogs undergoing periods of extreme activity (i.e., hunting dogs, herding dogs) will require a slightly lower dose of insulin during periods of extreme activity.

Home Monitoring

It is necessary that your pet's progress be checked on a regular basis. Monitoring is a joint project in which owners and veterinarians must work together.

First, you need to be constantly aware of your pet'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 pet does not eat the whole meal or is unusually hungry after the feeding.

You should weigh your dog at least once monthly. It is best to use the same scale each time.

Also try to develop a way to measure water consumption.

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

Home Testing

Not every pet is amenable to getting pricked with a lancet so that a drop of blood can be harvested for testing. We do not want your pet to fear interaction with you and do not want you to get bitten or scratched; still, some pets are comfortable with periodic glucose monitoring at home. Home testing may work best for pets that become so agitated by going to the vet that their blood sugar levels are altered at the office and cannot be interpreted. Further, a pet owner can save a great deal of money if they can produce their own glucose curve at home when the veterinarian requests one.

Human glucose meters can be obtained from any drugstore but ideally the AlphaTrak glucometer should be used as it is designed for pets. The AlphaTrak is more accurate in cats and dogs than the human equipment, although certainly the human equipment was all that was available for decades and worked sufficiently. If you would like to get an AlphaTrak meter, contact your veterinarian.

If you choose to use a glucometer at home, be sure to keep a log of when your pet was fed, when insulin was given, and what the glucose levels were that you found. Bring this log to your veterinarian when you come for checkups. Glucose levels obtained prior to the first insulin administration of the day are particularly useful.

If your pet is too sensitive for a valid glucose curve at the vet's office and you do not think you are up to blood sugar testing at home, the fructosamine blood test may be particularly useful. Again, this test looks at average glucose levels so wide fluctuations will not be discovered but at least there is a monitoring option for this situation.

Ketostix are used to detect ketones in urine and can be obtained at any drug store. If it is not difficult to access your pet's urine, a first morning test is helpful. Remember, finding ketones occasionally is not a problem but a positive dipstick three days in a row is a criterion for a vet visit.

When to Return to the Vet

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
- has lost weight
- has a ravenous appetite or loses its appetite
- seems to be drinking or urinating excessively
- becomes disoriented or groggy
- has ketones in the urine for three days in a row

Hypoglycemia (Low Blood Sugar)

What is Hypoglycemia?

In pets with diabetes mellitus, hypoglycemia is the condition of having a glucose (blood sugar) level that is too low to effectively fuel the body's blood cells. Hypoglycemia most often results from accidental overdose of insulin, but it can also occur if a pet is not eating well, misses a meal or vomits after eating, or if the type and amount of food he is being fed changes. Hypoglycemia may become a problem with very vigorous exercise; for this reason, regular daily controlled exercise is best.

Hypoglycemia can also result if the body's need for insulin changes. This scenario is particularly common in cats who often return to a non-diabetic state once an appropriate diet and insulin therapy start.

Vet Tips

Avoid "double-dosing" insulin. Only one person in a household should have the responsibility of giving insulin. A daily log should be kept of the time/amount of food and insulin that is given to avoid errors.

Proper daily monitoring of blood and/or urine glucose can help identify changing insulin needs in order to avoid a hypoglycemic crisis.

Signs of Hypoglycemia

The signs of hypoglycemia may occur suddenly and include:

- Lethargy or dullness
- Restlessness, anxiety or other behavioral changes
- Weakness, difficulty standing or a staggering gait
- Muscle twitching
- Seizures
- Coma
- Death

First Steps at Home

If your pet is showing signs of hypoglycemia and is able to eat, feed him a meal. If he is not alert, hand-feed him corn syrup or honey until he is alert enough to eat his normal food. At that time, feed a meal of his normal food.

If your pet is unconscious, rub a tablespoon of corn syrup or honey on his gums. If he regains consciousness, feed him and get him to your veterinarian for continued observation. If he remains unconscious, this is a medical emergency and you should seek veterinary help immediately!

Vet Tips

Always have corn syrup or honey in your home and in your first-aid kit/car in order to be prepared for hypoglycemic emergencies.

You should not give another dosage of insulin after any hypoglycemic episode until you have spoken to your veterinarian.

At the Hospital

Hypoglycemia is a life-threatening emergency. When you get to the vet's office, your pet's blood glucose will immediately be checked to determine if intravenous sugar solutions are necessary or if he is stable enough to be managed by withholding insulin and giving food.

If an insulin overdose or missed meal is not to blame for your pet's hypoglycemia, your veterinarian will need a complete history from you and will perform a full examination to determine how to adjust his insulin in order to prevent a future hypoglycemic crisis.

Most often, dogs and cats will recover from hypoglycemic episodes; however, these episodes can be life-threatening and should be treated as emergencies.

Cats and Hypoglycemia

Cats are unique in that many revert to a non-diabetic state (called diabetic remission) within the first four months of beginning appropriate diet and insulin treatment for diabetes. When remission occurs, a cat becomes non-diabetic and no longer requires insulin therapy. If an owner is not monitoring blood or urine glucose levels routinely, diabetic remission can go unnoticed, and if insulin injections are continued, hypoglycemia may occur.

Other Diabetic Emergencies

Although less critical than hypoglycemia, other symptoms that could indicate an impending emergency include:

- Complete loss of appetite or an appetite that is decreased for several days

- Vomiting or diarrhea

- Straining to urinate or blood in the urine, which could indicate urinary tract infection

- Ketones detected on routine at-home urine testing

It is always best to contact your veterinarian if you are concerned about any changes in your diabetic pet. Make sure to see your veterinarian regularly even if your pet's diabetes is stable, and make sure you have a plan for how to handle any after-hours emergencies.