

USEFUL INFORMATION ON CANINE DIABETES



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Having your dog be diagnosed with Diabetes can be an overwhelming experience. We have put together this information guide in the hope of providing you with information to make understanding the diagnosis easier.

DIABETES MELLITUS - AN OVERVIEW

Diabetes mellitus is a disease of the pancreas, a small organ located near the stomach. The pancreas has two different types of cells that have very different functions. One group of cells produces the enzymes necessary for proper digestion. The other group, called beta cells, produces the hormone insulin, which regulates the level of glucose (sugar) in the bloodstream and controls the delivery of glucose to the tissues of the body. In simple terms, diabetes mellitus is caused by the failure of the pancreas to regulate blood sugar.

Diabetes mellitus is usually classified into 2 types of disease:

Type I diabetes mellitus results from total or near-complete destruction of the beta cells. This is the most common type of diabetes in dogs. As the name implies, dogs with this type of diabetes require insulin injections to stabilize the blood sugar.

Type II diabetes mellitus (sometimes called non-insulin-dependent diabetes mellitus), some insulin-producing cells remain, but the amount of insulin produced is insufficient, there is a delayed response in secreting it, or the tissues of the dog's body are relatively insulin resistant. Type II diabetes may occur in older obese dogs. People with this form can often 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. Unfortunately, dogs do not respond well to these oral medications and usually need some insulin to control their disease.

The clinical signs of diabetes mellitus are related to elevated concentrations of blood glucose and the inability of the body to use glucose as an energy source.

DIABETES INSIPIDUS - AN OVERVIEW

Diabetes insipidus (DI) gets its name from the fact that the urine of these patients is dilute enough to be “tasteless” or “insipid.” Diabetes insipidus (DI) is rare in dogs and is characterized by excessive thirst/drinking and the production of enormous volumes of extremely dilute urine. Some dogs may produce so much urine that they become incontinent (incapable of controlling their urine outflow). The irony of this disease is that despite drinking large volumes of water, the dog can become dehydrated from urinating so much.

There are many causes of increased thirst (polydipsia) and increased urine production (polyuria), including diabetes insipidus, diabetes mellitus, liver problems, and kidney disease, to name a few. It is essential that some diagnostic tests be performed to determine the cause of your dog's problem.

CLINICAL SIGNS

The four main signs of diabetes in dogs are:

- **Increased thirst-** They may drink frequently and empty the water bowl more often.
- **Increased urination-** They may ask to go outside frequently, and may start having accidents in the house.
- **Increased appetite-** They are hungry all the time because the body's cells aren't getting all the glucose they need, even though the dog is eating a healthy amount.
- **Weight loss-** They can lose weight despite eating a healthy portion. This is a result of not efficiently converting nutrients from food.

In more advanced cases, those symptoms can become more pronounced, and can also include a loss of appetite, a lack of energy, vomiting, and a depressed attitude.

RISK FACTORS

There are a multitude of factors that can contribute to developing diabetes. The majority of cases are seen in dogs over the age of 5.

Gender can also play a role, as unspayed female dogs are twice as likely as male dogs to have diabetes. Obesity contributes to insulin resistance and is also a risk factor for pancreatitis, which can also lead to diabetes.

Other health conditions and the long-time use of steroid medication can also be contributing factors.

DIAGNOSIS

Diabetes mellitus is diagnosed by the presence of the typical clinical signs (excess thirst, excess urination, excess appetite, and weight loss), a persistently high level of glucose in the blood, and the presence of glucose in the urine.

The normal level of glucose in the blood is 80-120 mg/dl (4.4-6.6 mmol/L). It may rise to 250-300 mg/dl (13.6-16.5 mmol/L) following a large or high-calorie meal, but diabetes is the only common disease that will cause the blood glucose level to rise above 400 mg/dl (22 mmol/L). Some diabetic dogs will have a glucose level as high as 700-800 mg/dl (44 mmol/L), although most will be in the range of 400-600 mg/dl (22-33 mmol/L).

To conserve glucose within the body, the kidneys do not filter glucose out of the bloodstream into the urine until an excessive level is reached. This means that dogs with normal blood glucose levels will not have glucose in the urine. Diabetic dogs, however, have excessive amounts of glucose in the blood, so it spills into the urine. Once blood glucose reaches 180 mg/dl, the excess is removed by the kidneys and enters the urine. This is why dogs and people with diabetes mellitus have sugar in their urine (glucosuria) when their insulin levels are low.

Part of diagnosing **diabetes insipidus** involves first eliminating other potential explanations for increased drinking and increased urinating. Typical laboratory testing will include a complete blood count (CBC), blood chemistry panel to evaluate liver and kidney parameters and blood sugar, and a urinalysis. The urine concentration (specific gravity) is quite low in these dogs. A more advanced test involves calculating average daily water intake, measuring how much the dog is truly drinking in 24 hours, depriving him of a portion of the volume he is consuming (closer to the average volume), and then measuring the urine concentration to assess whether or not the urine can be concentrated.

Your veterinarian may recommend a CT or MRI if there is any suspicion of a tumour in the pituitary gland. Likewise, your veterinarian may recommend a trial treatment with a medication to assess his response to this therapy.

TREATMENT OPTIONS

Dogs with **diabetes mellitus** generally require two insulin injections each day, and nutrition is an essential component of disease management. In general, they must be fed the same food in the same amount on the same schedule every day. Although a dog can go a day or so without insulin without a crisis, this should not be a regular occurrence. Treatment must be looked upon as part of the dog's daily routine. This means that you, as the dog's owner, must make both a financial and personal commitment to treat your dog. If you must be out of town or go on vacation, your dog must receive proper treatment while you are away. Once your dog is well regulated, the treatment and maintenance costs are reasonable. The special diet, insulin, and syringes are not overly expensive, but the financial commitment may be significant during the initial regulation process or if complications arise.

Dogs with diabetes insipidus are treated using a synthetic formulation of antidiuretic hormone (ADH) that is applied either as eye drops or by injection under the skin. It may also be treated with oral hydrochlorothiazide and a low-salt diet. Treatment depends on the cause of diabetes insipidus.

MONITORING

It is essential to monitor the treatment of diabetes mellitus to be sure the dog is doing well. Home monitoring of blood glucose is becoming more popular and more common, although part of treatment monitoring will involve periodic blood samples collected by your veterinarian.

To assist in the care of your dog, it is particularly valuable to keep accurate records of the following information:

Daily record:

- time of insulin injection
- amount of insulin injected
- amount and time of food fed and eaten, and at what time
- amount of water drunk

Weekly record:

- weight of the dog

When insulin therapy is first started, we will need to monitor your dog's blood glucose values frequently. Typically, this involves serial blood or serum glucose determinations, often in the form of a glucose curve. To obtain a glucose curve, your dog will need to be hospitalized for the day. They will be fed his usual amount of food and given his prescribed insulin dosage. Blood samples will then be taken every 2 hours throughout the day, and the results will be plotted on a graph. This will show how well the insulin is controlling their blood glucose, when the insulin reaches its peak effect, and how long the action of the insulin lasts.

While further adjustments in your dog's insulin dosage will undoubtedly need to be made, the blood glucose curve is valuable in evaluating your dog's response to the prescribed insulin product.

At home, one of the most simple and important things you can do for your dog is to monitor his appetite, water consumption, energy level, and urine output. Any changes may signify the need for additional testing or adjustments in the insulin dosage.

It is very important that you do not make any adjustments to dosage without first consulting your veterinarian.

DIABETIC KETOACIDOSIS

Diabetic ketoacidosis is a medical emergency that occurs when there is not enough insulin in the body to control blood sugar (glucose) levels. The body can't use glucose properly without insulin, so blood glucose levels get very high, and the body creates ketone bodies as an emergency fuel source. When these are broken down, it creates byproducts that cause the body's acid/base balance to shift, and the body becomes more acidic (acidosis), and it can't maintain appropriate fluid balance. The electrolyte (mineral) balance becomes disrupted, which can lead to abnormal heart rhythms and abnormal muscle function.

If left untreated, diabetic ketoacidosis is fatal.

The clinical signs of diabetic ketoacidosis are:

- Excessive thirst/drinking
- Increased urination
- Lethargy/Weakness
- Vomiting
- Increased respiratory rate
- Decreased appetite
- Weight loss (unplanned) with muscle wasting
- Dehydration
- Unkempt hair/coat

These same clinical signs can occur with other medical conditions, so it is important for your veterinarian to perform appropriate diagnostic tests to determine if diabetic ketoacidosis is indeed the issue at hand.

DIABETIC DIETS

The ultimate goal for diabetic dogs is to be fed two similar meals, roughly 12 hours apart, to help maintain their insulin schedule. Overweight dogs should be fed an amount tailored to help with weight loss, and any food given should be specially formulated for dogs with diabetes. These diets are high in protein and low in carbohydrates. These diets are generally available in both a wet and dry formulation.

Some other guidelines for feeding diabetic dogs are:

- Obese dogs should not lose more than 2% of their body fat per week. Losing more than this can put them at risk for lipidosi, a form of liver failure.

- The food should be relatively high in arginine. This is an amino acid that stimulates the pancreatic cells that create insulin.
- The food should be relatively high in L-carnitine, a biochemical that helps to transport fats in cell to help with metabolism.

Please feel free to ask your veterinarian or our nutritional advocate for advice on starting a new diet.

ADMINISTERING INSULIN

There are step-by-step guides for each of the tools needed to check blood sugars and administer insulin.

We have compiled a list of video resources for you to watch below. Click on any of the titles to be taken to the associated page.

- How to administer insulin to your dog
- How to test your dog's blood glucose at home
- Merck Caninsulin Pen Tutorial Video

There are also worksheets available to help you track glucose curves and home care from the American Animal Hospital Association.

- Glucose Curve Worksheet
- Homecare Diary for dogs

What to do with used needles

- Needles should be disposed of in a specialized container. These are available from most pharmacies.
- Full, tightly sealed containers should be dropped off at participating pharmacies and local public health units.
- Pharmacy participation in the return program is voluntary. Please phone ahead to confirm the pharmacy can/will take used needles.
- [A list of Public Health Units is here](#)

Please note that we are not able to accept single used needles, or containers of needles.

KEEP IN TOUCH

Caring for a diabetic dog means that you will play an important role in the treatment plan laid out by your veterinarian. Please take some time to consider your ability to monitor and provide insulin therapy. We will work with you on an individualized treatment plan for your dog that meets your comfort level.