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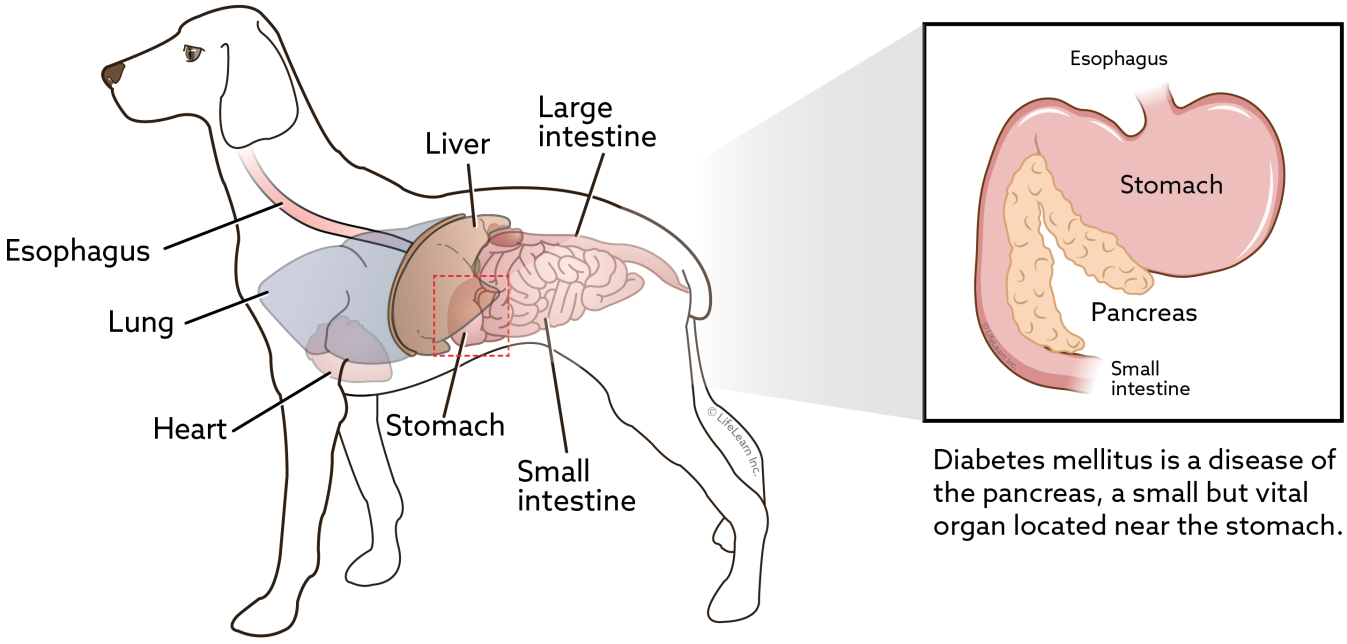
Diabetes Mellitus in Dogs: Overview

This handout provides general information about diabetes mellitus in dogs. For information about its treatment, see the handouts "Diabetes Mellitus: Principles of Treatment in Dogs" and "Diabetes Mellitus: Insulin Treatment in Dogs".

What is diabetes mellitus?

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

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.



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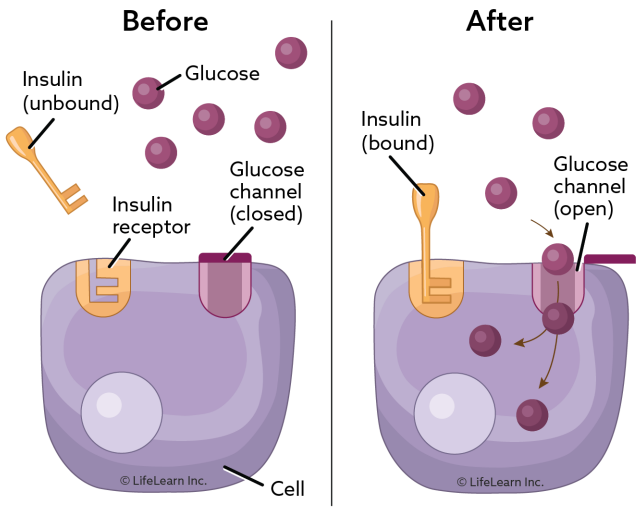
What are the clinical signs of diabetes and why do they occur?

The four main symptoms of diabetes mellitus are increased thirst, increased urination, weight loss, and increased appetite.

Glucose is a vital substance that provides much of the energy needed by cells, but it must first be absorbed by the cells. Insulin tells the body's cells to absorb glucose from the bloodstream. Without an adequate amount of insulin to "open the door," glucose cannot get into the cells and so it accumulates in the blood, causing hyperglycemia (high blood sugar).

When there is not enough insulin, the cells of the body become starved of their primary source of energy – glucose. In response to this apparent starvation, the body starts breaking down stores of fat and protein for energy, causing weight loss despite a ravenous appetite. The body tries to eliminate the excess glucose by urinating more. Since glucose attracts water, it increases the volume of urine produced. To avoid dehydration, the dog drinks more and more water.



Blood glucose is regulated by insulin, a hormone produced by the pancreas.

Insulin acts as a key, unlocking cells to allow glucose from the bloodstream into the tissues of the body, providing energy.

Are there different types of diabetes mellitus in dogs?

There are three types of diabetes mellitus. In all types there is a failure to regulate blood sugar, but the basic mechanisms of disease differ.

- **Type I** diabetes mellitus (sometimes also called insulin-dependent diabetes mellitus) results from total or near-complete destruction of the insulin-producing 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 blood sugar.
- In **type II** diabetes mellitus (sometimes called non-insulin-dependent diabetes mellitus), some insulin-producing cells remain, but the amount of insulin produced is insufficient, or there is a delayed response in secreting it, or the tissues of the dog's body are relatively insulin resistant. Type II diabetes rarely occurs in dogs.
- **Type III** diabetes results from insulin resistance caused by other hormones and can be due to pregnancy or hormone secreting tumors.

How is diabetes mellitus diagnosed?

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. Diabetes is the only common disease that will cause the blood glucose level to rise substantially.

To conserve glucose within the body, the kidneys do not filter glucose out of the bloodstream and 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 a certain level, 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).

How is diabetes mellitus treated in dogs?

As most dogs with diabetes have type I or “insulin-dependent” diabetes, affected dogs generally require two insulin injections each day and do not respond well to oral medications used to treat type II diabetes (non-insulin-dependent). Nutrition can also be an important 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 and not have a crisis, this should not be a regular occurrence; treatment should be looked upon as part of the dog's daily routine. This means that you, as the dog's owner, must make a financial commitment *and* a personal commitment to treat your dog. If you are out of town or go on vacation, your dog must receive proper treatment while you are away.

"Dogs with diabetes mellitus generally require two insulin injections each day, and nutrition is an important component of disease management."

Initially, your dog may be hospitalized for a few days to deal with any immediate crisis and to begin insulin regulation. For instance, if your dog is so sick that he has stopped eating and drinking for several days, he may be experiencing diabetic ketoacidosis, which may require several days of intensive care. Otherwise, the initial hospitalization may be only for a day or two while the dog's initial response to insulin injections is evaluated.

Once your dog is home, you will continue to administer insulin as prescribed. During the initial phase of insulin therapy, regular return visits are required to monitor progress. New technology allows home glucose monitoring with the use of a simple device such as an AlphaTrak® glucometer, or a continuous glucose monitoring system such as the Freestyle Libre®. Additional home monitoring can involve evaluating urine for glucose, although this is not a sensitive way to monitor glucose levels. It may take a month or more to achieve good insulin regulation.

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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.

Your veterinarian will work with you to try to achieve consistent diabetes regulation, but some dogs are difficult to regulate. It is important to pay close attention to all instructions related to administering medication, nutrition, and home monitoring. One serious complication that can arise is hypoglycemia, or low blood sugar, which can be fatal. This may occur due to inconsistencies in treatment.

What is the prognosis for a dog with diabetes mellitus?

Once canine diabetes mellitus is properly regulated, the dog's prognosis is good, if treatment and monitoring are consistent. Most dogs with controlled diabetes have a good quality of life with few symptoms of disease.