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Caring People Caring for Animals

Diabetes Mellitus

What is Diabetes Mellitus?

Diabetes mellitus is a metabolic disorder characterized by decreased production of insulin by the pancreas and/or decreased utilization of insulin by other cells in the body. The pancreas is an organ located near the stomach and cells within the pancreas called beta cells are responsible for the production of insulin. Insulin then helps to regulate blood glucose levels by taking glucose from the blood and bringing it into cells where it can be used for energy. When insulin is lacking, cells are unable to use glucose and glucose levels in the blood rise, leading to hyperglycemia. Elevated glucose in the blood eventually spills over into the urine (glucosuria) which causes increased urinating with increased drinking in order to compensate. Decreased utilization of glucose requires the body to use other sources of energy and may lead to the presence of byproducts called ketones in the blood and urine as well.

What causes Diabetes Mellitus?

Diabetes mellitus may be caused by several different problems. Beta cells in the pancreas may be damaged by a number of factors including immune-mediated destruction and chronic pancreatic inflammation, among others. Destruction of beta cells results in decreased insulin production, which leads to hyperglycemia. Cells in the body may also become insulin-resistant, making the insulin that is present less effective.

There are three types of diabetes mellitus

- Type I (insulin dependent) occurs due to an absolute deficiency of insulin resulting from a lack of production of insulin by the pancreas. This is the most common form in dogs.
- Type II (noninsulin dependent) occurs due to a combination of reduced insulin production and peripheral insulin resistance. This is the most common form in cats.
- Type III (hormone-induced diabetes) occurs when insulin resistance occurs in association with high levels of other hormones. Associated conditions such as Cushing's disease (increased cortisol), pregnancy (increased progesterone), and others may lead to Type III diabetes.

Diabetes mellitus typically occurs in middle-aged to older dogs and cats. In dogs, females are twice as likely to be affected as males, while in cats neutered males are most commonly affected. Certain dog breeds are more likely to be affected including the Australian terrier, bichon frise, Cairn terrier, fox terrier, keeshond, miniature poodle, standard poodle, Samoyed, miniature schnauzer, standard schnauzer and spitz. No breed predisposition is noted in cats.

What are the Clinical Signs of Diabetes Mellitus?

The most common clinical signs of diabetes mellitus include increased drinking (polydipsia), increased urinating (polyuria) and weight loss despite an increased appetite. Other clinical signs may include lethargy, poor hair coat/poor body condition, rear limb weakness (cats) and development of cataracts (dogs).

How is Diabetes Mellitus Diagnosed?

Diabetes mellitus is diagnosed based on characteristic clinical signs as described above, a general blood panel showing increased blood glucose levels (hyperglycemia) and a urine sample showing glucose in the urine (glucosuria). Other blood work findings including elevated cholesterol and elevated liver enzymes may also be noted. The urine sample may also show the presence of ketones and may show signs of a urinary tract infection (UTI), as UTIs are common in diabetic patients. A urine culture will often be performed to aid in diagnosis and treatment of a potential UTI.

How is Diabetes Mellitus Treated?

Diabetes mellitus is treated with insulin injections given under the skin (subcutaneously) in order to replace the insulin no longer being produced by the pancreas. Insulin injections may be given at home. They are typically given twice daily and the patient should be fed at the time of the insulin injections. Insulin must be kept refrigerated and should be gently mixed prior to use. It is also important to ensure that the type of insulin syringes being used matches the type of insulin being given.

Diet is also an important component in the treatment of diabetes mellitus. Patients must eat consistently while receiving insulin injections in order to minimize the risk of hypoglycemia. Prescription diets, which are high in fiber for dogs and high in protein/low in carbohydrates for cats, may be recommended. In some cases of feline diabetes mellitus, once a proper diet has been established, insulin supplementation requirements may be reduced or even eliminated with time. In addition, consistent exercise on a regular schedule can also help with regulation of diabetes mellitus.

Treatment is typically life-long and frequent monitoring is required. Glucose levels are often assessed using a test called a glucose curve. A glucose curve is a series of blood glucose measurements taken every 1-2 hours in order to assess glucose levels over a period of time. This allows for determination of high and low blood glucose values during the course of a day. In many cases, a glucose curve will be recommended approximately 1 week after starting insulin to assess the effectiveness of the treatment. The glucose curve will be repeated weekly until adequate blood glucose control (100 mg/dL-300 mg/dL) is established. A blood test called a fructosamine test may also be used to assess control of blood glucose levels. A single blood sample is required for a fructosamine test and the result gives an average blood glucose concentration over the preceding 2-3 weeks, allowing assessment of blood glucose levels over an extended time period. A fructosamine test may be recommended every 3-6 months once adequate blood glucose control has been established.

Routine monitoring of general health parameters is also important in diabetes mellitus patients. Untreated or poorly treated diabetic patients may develop a life-threatening metabolic disorder called diabetic ketoacidosis, which can quickly lead to severe illness and death. Patients receiving insulin injections are also at risk of developing low blood sugar (hypoglycemia) and must be monitored for any signs of reduced appetite, lethargy and weakness. Dogs diagnosed with diabetes mellitus are at increased risk of developing cataracts and should be monitored routinely for cataract formation.

In some cases, monitoring such glucose curves may be performed at home. This can be especially useful in feline patients, as cats are prone to artificial elevations in blood glucose during times of stress such as hospitalization.

What is the Prognosis with Diabetes Mellitus?

Prognosis depends heavily on the ability to achieve and maintain adequate blood glucose control. Patients that are able to achieve good control are often able to live relatively normal lives, though frequent care and monitoring is required.