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Diabetes Mellitus (in cats)

Diabetes, sugar

Affected Animals:

Most diabetic cats are older than 10 years of age when they are diagnosed. However, diabetes mellitus can be diagnosed at any age. Male cats are diagnosed more frequently than females, and all breeds can be affected. Obesity and the use of medications including steroids and progesterone derivatives are risk factors for the development of diabetes in cats.

Overview:

Often suspected because of the presence of the classic signs of increased thirst, more frequent urination, and a greater appetite, diabetes mellitus is one of the most common endocrine diseases in cats. There are two types of diabetes mellitus in cats. The more common form, type I, or insulin dependent diabetes mellitus, is characterized by a lack of adequate insulin secretion by the pancreas and usually requires insulin injections for treatment.

Type II diabetes mellitus is characterized by resistance to the normal activity of insulin in body tissues, or abnormalities in insulin secretion by the pancreas. Its development may be influenced by the presence of complicating factors such as obesity, concurrent disease, or medications that interfere with insulin's activity. Type II diabetics may not require insulin for treatment initially, but will often eventually develop the need for insulin seen in type I diabetics.

In addition, transient diabetes mellitus can occur in cats. Unlike permanently diabetic cats, transient diabetics may require treatment only for a brief period of time. Transient diabetes can also be seen in overweight cats, cats with additional diseases, or cats on medications that interfere with insulin activity. Some transient diabetics eventually require treatment for permanent diabetes.

Diabetic cats frequently have concurrent diseases at the time of diagnosis, or develop other conditions during treatment that are common in older cats. These conditions can influence the ability to control diabetes and its degree of regulation. Since most cats are older than 10 years of age at the time of diagnosis, the majority of diabetic cats do not live an extended period of time. Many cats diagnosed with diabetes mellitus at a younger age that are able to be controlled with relative ease can live an extended period of time with a good quality of life

Clinical Signs:

The classic signs of diabetes mellitus in cats are the same as those in all diabetic animals: polydipsia, polyuria, polyphagia, and weight loss.

Symptoms:

The most common symptoms of diabetes are increased thirst, increased urination, and weight loss, despite an increase in appetite. Owners may notice that they have to change the litter box more frequently because it is wet all the time. Some cats will begin to void large amounts of urine in places other than the litter box. This may mistakenly be perceived as a behavioral problem in some cats.

Description:

One of the hormones secreted by the pancreas is insulin. Diabetes mellitus results from a relative or absolute deficiency of the secretion of insulin from the pancreas. This deficiency causes decreased tissue use of substances including glucose, amino acids, and fatty acids. As glucose accumulates in the blood, it reaches concentrations that are so high that it cannot be eliminated from the urine. Then glucose loss in the urine, a condition called glucosuria, develops. Once this occurs, the amount of urine produced increases, and the cat begins to drink more to avoid dehydration. Since the tissues of diabetic cats are not able to use glucose properly, weight loss will ensue. Because the cells in the portion of the brain that mediate hunger are also sensitive to insulin, the cat may develop an excessive appetite; without insulin, glucose cannot enter these cells, and perceived hunger persists. These facts account for the classic clinical signs of diabetes: increased urination, increased thirst, weight loss, and increased appetite.

Type I diabetes mellitus is a condition in which destruction or loss of insulin-secreting cells in the pancreas results in a complete lack of insulin. This can occur either very quickly, or gradually over time. This condition, called insulin-dependent diabetes mellitus or IDDM, usually requires treatment with insulin and accounts for approximately 60 percent of cats with diabetes mellitus. IDDM may occur because of protein deposition in the pancreas with degeneration of insulin-producing cells, or as the result of chronic pancreatitis. Other changes may be involved in the development of IDDM, including immune system-mediated inflammation in the pancreas.

With Type II diabetes mellitus -- also known as non-insulin-dependent diabetes mellitus or NIDDM -- there is resistance to the action of insulin on body tissues, as well as abnormalities in insulin secretion from the pancreas. Type II diabetics may not require insulin. Type II diabetes is more common in cats than in dogs. Obesity, hereditary factors, and abnormal protein deposition may be important factors in its occurrence. For cats, there are currently no reliable tests to distinguish whether Type I or Type II diabetes is present. Some cats appear to change from one type to the other over time, and then revert back again.

Secondary diabetes also can occur in cats, usually as a result of diseases or medications that influence insulin activity. Medications, including some long-acting steroids and some

progesterone derivatives, are the most common drugs implicated in the development of secondary diabetes in cats. Another confusing fact about diabetes mellitus in cats is that the need for insulin in an individual cat may come and go over time. Some of these transiently diabetic cats eventually require life-long treatment, but others seem to overcome this state and ultimately require no further treatment.

Diagnosis:

The diagnosis of diabetes mellitus is usually first suspected because of the presence of typical clinical signs. Since similar signs can be seen in other conditions, further evaluation is needed to confirm a diagnosis of diabetes mellitus and to rule out other disorders that can cause similar symptoms. On physical examination, diabetic cats may be either thin or overweight, but many will appear to have normal body condition. Weakness, depression, and dehydration may also be noted.

The diagnosis is based on the observation of these clinical signs as well as documentation of persistently elevated blood glucose concentrations and elevated urine glucose levels. Because stress can cause significant elevations of blood glucose levels in cats, and in rare circumstances, glucose can be seen in the urine of stressed cats, the measurement of a substance called fructosamine may help distinguish stress-induced changes in blood and urine sugar levels from true diabetes mellitus. In stressed cats, serum fructosamine concentrations are usually normal, but they are elevated in diabetic cats. Ketones are another substance that can appear in the urine of diabetic cats, but they are generally not seen due to stress.

There are many other parameters that need to be assessed in a suspected or confirmed diabetic cat once persistent blood and urine sugar levels are noted and stress is ruled out as a factor. A complete blood count is used to look for changes in the red blood cell, white blood cell, and platelet counts. A biochemistry profile may detect evidence of concurrent liver or kidney disease and electrolyte abnormalities. A thyroid hormone level should be checked to rule out hyperthyroidism, as this disease can cause the exact same signs as diabetes mellitus, and can also complicate management of diabetes in a cat that also has hyperthyroidism. However, sometimes hyperthyroidism cannot be ruled out by a single normal reading, as this hormone level can be falsely lowered in the presence of uncontrolled diabetes mellitus. Complete urinalysis and urine cultures are necessary to rule out a complication called ketoacidosis and to rule out urinary tract infection. Chest x-rays and abdominal ultrasound may also be recommended, depending on the cat's overall condition.

Prognosis:

The outlook for diabetic cats depends on a number of factors. The owner's commitment to treatment is a key point, as treatment is seldom easy and is usually life-long. Cats that develop diabetes mellitus along with other diseases may also have a worse prognosis. One study that looked at the length of survival following the diagnosis of diabetes mellitus in cats found that the cats in the group examined live an average of two years after

diagnosis. Proper home care, regular veterinary evaluation, and most importantly excellent client-veterinary communication are vital to the successful treatment of diabetes mellitus in cats.

Transmission or Cause:

There is no one specific, established cause for diabetes in cats. In many Type I diabetic cats, the deposition of an abnormal protein called amyloid is present in the pancreas, and this protein deposition may interfere with the normal insulin secretion by the pancreas. The cause of this protein deposition is unknown. Many diabetic cats will also show chronic inflammatory changes consistent with pancreatitis. This inflammation can ultimately effect insulin secretion from the pancreas, but its cause has not been determined. Obesity, the presence of infection or other concurrent illnesses, and treatment with drugs known to be associated with insulin resistance, such as some steroids and progesterone derivatives, are also factors that may be involved in the development of diabetes in some cats. Other possible causes include genetic predisposition and immune system mediated destruction of insulin secreting cells in the pancreas. The exact role of many of these factors remains to be elucidated.

Treatment:

It is vital that careful thought be given to the decision to proceed with treatment. The management of diabetes mellitus requires very close observation and daily medication. In some situations, the owner's lifestyle may not allow for careful treatment. However, if the classic signs of diabetes mellitus are present, and the owners are willing to proceed, then treatment usually is recommended.

The goals of treatment are to lessen the signs due to diabetes mellitus and to avoid complications of the disease. It is important to prevent the serum glucose concentration from dropping below the normal range, as serious consequences can occur when hypoglycemia, or a low concentration of serum glucose concentration, develops. Owners should watch for signs of hypoglycemia, which can vary from subtle behavioral changes, to wobbliness and weakness, to severe generalized seizure activity.

Diet is an important aspect of treatment, especially since many diabetic cats are either obese or severely underweight. It is essential to ensure a regular intake of calories and to prevent the cat from consuming excessive protein and fat. As a general rule, semi-moist foods are avoided. Especially for overweight cats, high fiber diets may be helpful in encouraging weight loss and in controlling fluctuations in the serum glucose concentrations. It may be difficult to get a cat to eat a high fiber diet because these diets are sometimes not particularly palatable; introducing the diet gradually, however, may encourage acceptance of the new food. If a cat refuses to eat a high fiber diet, then other diets should be used. In underweight diabetic cats, high fiber diets are generally avoided until blood sugar levels are controlled with medication and a normal weight is achieved. Frequency of feeding is usually dictated by the cat's normal dietary behavior. Cats that eat all day long are probably best fed small amounts many times per day, while cats that eat

voraciously but infrequently may do better with meal feedings.

Since some cats have NIDDM, the use of oral medications to lower blood glucose concentrations can be considered. This is especially true if the owners are unwilling to give insulin, if transient diabetes mellitus is suspected, or if the cat seems excessively sensitive to small doses of insulin. The most common oral drug used to treat diabetes mellitus in cats is glipizide. Adverse reactions can include gastrointestinal upset, hypoglycemia, and liver damage. Despite some successes, most permanently diabetic cats cannot be controlled by oral glipizide alone. Other oral medications prescribed for diabetic cats include vanadium and chromium picolinate.

The primary medication used to treat permanent diabetes mellitus in cats is insulin. There are many different types and sources of insulin, but in general, the recombinant human forms of insulin are used most commonly. Production of these types of insulin is unlikely to be discontinued because they are the main types of insulin used to treat human diabetics, although availability of other insulin types has been limited in recent years by discontinuation of their production by manufacturers. The Lente and Ultralente types of recombinant human insulin are used most commonly in diabetic cats. Although some cats do well with once-daily injections of ultralente insulin, most cats eventually require twice-daily administration. Virtually all cats on lente insulin require twice-daily injections.

At-home monitoring requires careful observation for the signs associated with diabetes mellitus. Measurement of urine glucose concentrations and ketones with strips designed for their detection may aid in treatment decisions, but most veterinarians no longer rely heavily on such readings for changes in treatment recommendations. If the signs of increased thirst, urination, appetite, and weight loss are improving, then the treatment is probably appropriate. If those signs are persisting or getting worse, adjustments to the treatment protocol may be needed.

Measurement of serum glucose concentrations over several hours -- ideally 24 hours -- is probably the best way to assess diabetic control. Such glucose curves may be done on an abbreviated basis, as many hospitals are not open overnight. Nevertheless, the ideal method is to measure the glucose level every few hours over 24 hours in a hospital where 24-hour care is available. The measurement substances called fructosamine and glycosylated hemoglobin have recently become more common in veterinary medicine. However, it can be difficult to make specific treatment recommendations based on these readings alone. The measurement of fructosamine can be very helpful in separating stress-induced changes in the blood sugar level from true diabetes mellitus. In cats with well-controlled signs that are extremely distressed by being in the veterinary hospital, the measurement of a single fructosamine level on an outpatient basis may be used in lieu of hospitalization for a full glucose curve. If it is normal, control may be adequate. If the fructosamine level is elevated, then a glucose curve will need to be done to determine what adjustments might be helpful.

As with most illnesses, follow-up recommendations for diabetic cats depend on how well

they are responding to treatment at home. For clinically stable cats on insulin, blood glucose curves, or serum fructosamine concentrations where appropriate, should be assessed every three to four months. Cats with persistent signs of diabetes mellitus or episodes of hypoglycemia will need much more frequent follow-up until they are better regulated. It can take months to establish regulation in some cats, and there are some cats that can never be adequately regulated with treatment for diabetes mellitus.

Prevention:

Since diabetes mellitus in cats frequently is associated with obesity, prevention of excessive weight gain may reduce the likelihood of its development. Certain drugs, particularly high doses of some types of steroids and progesterone derivatives used to treat behavioral abnormalities and skin diseases, can lead to the development of transient or permanent diabetes mellitus in cats. Such medications should be used cautiously, if at all.