The Signs, Diagnosis & Types of Diabetes Mellitus in Cats

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There are certain signs or symptoms which are commonly seen in cats with diabetes mellitus. Unfortunately, these signs also occur in other diseases and conditions. Therefore, laboratory tests are necessary to diagnose diabetes mellitus in cats. The following article includes a discussion of how this diagnosis is made and the types of diabetes found in cats.
What are the signs of diabetes mellitus in cats and why do they occur?

Depending on how severely insulin production is impaired, there may be few signs of disease, or the signs may be severe. Dogs with diabetes often develop cataracts; cats do not. The most common signs of diabetes are:

- Increased thirst (polydipsia) and urination (polyuria)
- Inappropriate elimination
- Change in appetite
- Weight loss
- Change in gait (walking)
- Decreased activity, weakness, depression
- Vomiting

Increased Thirst and Urination: Because the glucose cannot enter the cells, the glucose levels in the blood become abnormally high (hyperglycemia). The glucose is filtered out by the kidneys and is found in the urine (glucosuria). When it is filtered out, it carries water with it. The animal, then, is losing more water through the urine than normal and has to make up for it by drinking more.

Inappropriate Elimination: The increased urination may result in the cat not always urinating in the litter box. This inappropriate urination may be one of the first signs of diabetes in cats. In addition, cats with diabetes can often develop urinary tract infections, which may also result in inappropriate elimination.

Change in Appetite: Some diabetic cats eat less, because frankly, they do not feel well. Other cats may have voracious appetites and eat a lot (polyphagia) because their hypothalamus keeps telling them they are hungry.

Weight Loss: Because the cat cannot use the calories he eats for energy, he has to start breaking down his own body fat for energy. As the fat is used, the cat loses weight.

Change in Gait/Walking: Some cats with diabetes mellitus develop an abnormality of their nervous systems. It results in them walking with their hocks touching the ground ('plantigrade stance'). The veterinary term for this disorder is called diabetic neuropathy.

Decreased Activity, Weakness, Depression: Even though the animal is eating calories, he cannot use them, and has less energy. You know how you feel if you have not eaten for a long time. A diabetic cat, whether he eats or not, feels the same way. Some cats may lose considerable muscle mass which contributes to the weakness. Cats with diabetes mellitus may become depressed and lethargic. They may not groom themselves well, and will not be interested in their surroundings. As diabetes mellitus progresses, cats often become more depressed and lethargic.

Vomiting: Cats with more severe diabetes, who need to break down their own fat for energy accumulate waste products from the process. These waste products are called ketones. If they build up in the blood, they can cause nausea and vomiting. This build-up of ketones and a subsequent drop in pH of the blood is called ketoacidosis. It can become severe and life-threatening.

As the disease progresses, diabetic cats may have poor hair coats, develop

liver disease, be more susceptible to infections, and ketoacidosis is more likely to occur.

What is ketoacidosis?

Ketoacidosis is an emergency! Ketoacidosis is a condition in which ketones (break down products of fat) build-up in the bloodstream. They are broken down into various acids which cause the pH of the blood to decrease (become more acid).

Diabetic ketoacidosis is an emergency! Any cat

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The common signs of ketoacidosis are loss of appetite, vomiting, diarrhea, weakness - sometimes to the point of collapse, dehydration, and changes in respiration. In some cases, the smell of acetone can be detected on the cat's breath.

Cats with ketoacidosis need intensive care, strict monitoring, and multiple laboratory evaluations. They are treated with intravenous fluids, insulin, medications to bring their potassium level back to normal, and sometimes antibiotics since they are very prone to infections.

emergency. Any cat suspected of having ketoacidosis should be seen by a veterinarian immediately.

How is diabetes diagnosed?

The diagnosis of diabetes mellitus in cats is based upon the presence of persistently high blood glucose levels (hyperglycemia) even when the animal had not eaten recently (fasted), glucose in the urine (glucosuria), and clinical signs. Clinical signs alone cannot be a basis for the diagnosis since hyperthyroidism and renal failure, two common diseases in older cats, can have similar signs. Similarly, laboratory tests alone are not sufficient for a diagnosis.

History: The history of the onset, duration and severity of the signs described above are important in leading to the correct diagnosis.

Physical Examination: On a physical examination, the veterinarian may find depression, dehydration, unkempt haircoat, and change in weight. Enlarged livers (hepatomegaly) can be found in some cats, as can enlarged kidneys.

Laboratory Evaluation: The signs of diabetes can also occur with other diseases, so laboratory testing is essential in determining a diagnosis. In diabetes, persistent high sugar levels are found in the blood and glucose is found in the urine (it is normally not present). If ketones are found in the urine, then the diagnosis of ketoacidosis is also made.

On the chemistry panel, in addition to high blood glucose levels, increased liver enzymes, and high levels of cholesterol may be seen. Potassium, sodium, and phosphorous levels may be below normal.

Some normal cats can have a condition called stress-induced hyperglycemia (high blood sugar). Under stress (such as being in a veterinary office), these cats can rapidly develop high blood glucose levels (300-400 mg/dL; normal is 55-160 mg/dL). This is the same high glucose level that can be observed in some diabetic cats. This is why it is necessary to also demonstrate glucose in the urine, to show that the increased levels of sugar in the blood and urine are persistent, and for the cat to show signs of diabetes before a diagnosis of diabetes mellitus can be made.

If it becomes difficult to determine if the hyperglycemia and glucosuria are due to diabetes or stress, a laboratory test to measure the amount of a chemical called fructosamine in the blood can be performed.

What is the difference between the two types of diabetes mellitus?

The classification system for diabetes mellitus is complicated when trying to compare diabetes in cats with diabetes in humans. In humans, diabetes is often classified into types. In the United States, Type I diabetes is considered insulin-dependent (IDDM), and is often termed juvenile onset because it usually develops in young people. Type II diabetes in humans is called non-insulin-dependent (NIDDM), or mature-onset because it usually develops in older people. Some people then, consider Type I and insulin-dependent as synonymous and Type II and non-insulin dependent as terms describing the same thing.

Some veterinarians in Europe use a different classification scheme. The 'Type' of diabetes is determined by the microscopic changes in the pancreas. Both types can have both insulin-dependent and non-insulin-dependent subcategories.

For our purposes, we will adopt the classification scheme most commonly used in the veterinary literature in the United States.

Type I, Insulin-dependent Diabetes Mellitus (IDDM): Approximately 50-75% of cats with diabetes mellitus have IDDM. In IDDM, enough of the beta cells, which are the cells in the pancreas that produce insulin, have been destroyed, so that the animal is in critical need of supplemental insulin. Cats with this type of diabetes are often thin, and can develop serious, life-threatening conditions (ketoacidosis) as a result of the body's inability to use fat instead of glucose for energy. In these cats, insulin therapy is absolutely necessary for life.

Type II, Non-insulin-dependent Diabetes Mellitus (NIDDM): Approximately 25-50% of cats with diabetes mellitus have NIDDM. In NIDDM, the beta cells are still present but the insulin response to a high blood glucose level is abnormal. There is a delay in insulin secretion when the blood glucose starts to increase, followed by excess insulin secretion. In addition, the cells of the body do not react to the insulin as they normally would. In this form of diabetes, although the insulin production and its effect on the body's cells are impaired, the animal can continue to survive without additional insulin, however, therapy is often necessary to alleviate the signs of diabetes and maintain weight control. Some cats with NIDDM can be successfully treated with diet changes and oral hypoglycemic agents such as glipizide. Cats with this type of diabetes tend to be overweight and rarely need insulin to survive. The beta cells of some cats with NIDDM may continue to die, and the cat could progress to IDDM.

Comparison of Human and Feline Diabetes

	Humans	Cats

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Features	*IDDM*	*NIDDM*	*IDDM*	*NIDDM*
Percent of diabetes mellitus cases	10-20	80-90	50-75	25-50
Age at onset	Usually less than 30 years	Usually over 35 years	Middle-age or older	Middle-age or older
Type of onset	Usually rapid	Gradual	Usually rapid	Gradual
Weight	Lean	Usually overweight	Usually lean; sometimes overweight	Usually obese; sometimes lean
Signs	Moderate to severe; increased thirst, urination and appetite	Mild; often not recognized	Usually moderate to severe; increased thirst, urination, and appetite; weight loss	Variable, usually mild; increased thirst, urination, and appetite; weight loss
Ketosis	Common	Rare	Common	Rare
Risk Factors	Viral infections, toxins, autoimmune disease	Obesity, nutrition	Obesity, certain medications, and diseases	Obesity, certain medications, and diseases
Insulin	Necessary	Necessary	Required	Typically not necessary
Oral Hypoglycemic Agents	Ineffective	Usually effective	Ineffective	Often effective
Diet	Important, with insulin	May be effective alone	Important, with insulin	May be effective alone

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Secondary Diabetes Mellitus: In secondary diabetes another disease either destroys the beta cells or causes the body's cells to not react adequately to insulin. Hyperthyroidism, pancreatitis, acromegaly (a condition in which too much growth hormone is produced), and Cushing's disease (hyperadrenocorticism) can cause secondary diabetes in cats. Depending on the severity of the condition, these cats may or may not need supplemental insulin. Depending on the cause, secondary diabetes may or may not be reversible.

For many cats, the classification of their disease into insulin-dependent, non-insulin dependent or secondary cannot be clearly made. There is a spectrum of disease from severely insulin dependent, to requiring small doses of insulin, to requiring no insulin at all. In addition, the insulin-dependence of an individual cat may change during its lifetime. Some cats may start out with non-insulin-dependent diabetes and gradually progress to insulin-dependent diabetes. Some cats may have transient diabetes in which they require insulin for a short period in their lives and then several months or a year later no longer require it.

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