

Diabetes Mellitus

What is diabetes mellitus?

Diabetes is an endocrine disease where the body lacks insulin or doesn't respond to it. Insulin is essential to move glucose into cells so that they can use it as energy. Diabetes is a serious and usually lifelong condition that can lead to complications if untreated.

What causes diabetes mellitus?

Just like in people, diabetes in animals comes in 2 types:

- *Type 1*: this is the most common type in dogs. It is where pancreatic cells are lost, and too few are left to produce insulin. These patients have too little insulin. It can be caused by
 - Autoimmune disease attacking the pancreas
 - Pancreatitis causing scarring of the pancreas
- *Type 2*: this is the most common type in cats, but dogs frequently get this type also. It is where there is plenty of insulin but the body has become "numb" to it and no longer responds to it. The pancreas tries making more insulin to get the body to respond, but eventually the pancreatic cells can become exhausted and fail completely, then these patients change to Type 1. "Numbness" or "insensitivity" to insulin can be caused by
 - Obesity - this is a major cause in cats
 - Some medications such as steroids or hormones
 - Cushing's Disease
 - Natural hormones in intact bitches
 - Amyloid (abnormal protein) deposits in cats

What are the signs of diabetes mellitus?

Signs to look out for include:

- Excessive urination and thirst (polyuria and polydipsia, or PUPD)
- Increased appetite
- Weight loss despite this big appetite
- Abnormal "flat-footed" walk in cats, which can be a sign of nerve damage
- Cataracts, which can appear suddenly in dogs and cause vision loss

In severe cases, the body can start producing free fatty acids to use as fuel instead of glucose. This can result in a life-threatening condition called "diabetic ketoacidosis". Signs to look out for include:

- Anorexia
- Vomiting
- Collapse or reduced responsiveness, sometimes coma

How is diabetes mellitus diagnosed?

Diagnosing diabetes requires proving there is excessive glucose in the blood, and glucose in the urine. This may be done using

- A glucose blood test
- A dipstick test on a urine sample, ideally at the same time as the blood test

In cats, the stress of having a blood sample taken can cause a spike in blood sugar. If an initial blood test on a cat shows mildly or moderately raised glucose, your vet may need to run a *fructosamine* blood test which checks average blood glucose over the last 2-3 weeks.

It is often useful to send a urine sample for bacterial culture, as diabetic patients frequently have urinary tract infections, which can make controlling their diabetes difficult.

Diagnosing the cause of the diabetes can be more challenging. Further blood tests can be run to check for Cushing's Disease in pets that are showing signs. Pancreatic biopsies are required to definitively diagnose autoimmune and inflammatory diseases of the pancreas, but these are high-risk and rarely performed, and do not change the treatment given.

How is diabetes mellitus treated?

Just like people, diabetic animals need insulin. Treatment usually involves

- *Insulin* injections under the skin twice per day, usually for the rest of the pet's life
- *Dietary changes* such as a low-carbohydrate diet for cats, and low-fat diet for dogs
 - If caught early, weight loss in some obese diabetic cats can actually reverse their diabetes!
- *Routine* for dogs is essential, such as feeding the same amount of the same food at the same times of day, and the same amount and intensity of exercise each day

Additional treatments may include:

- *Antibiotics* if a urinary tract or other infection is detected
- *Neutering* of female dogs to improve diabetic control
- *Hospitalisation* for stabilisation if a pet is very unwell, especially if ketoacidosis occurs
- *Cataract surgery* by a specialist ophthalmologist to remove problematic cataracts

How will my pet's diabetes mellitus be monitored?

The insulin needs of your individual pet may vary throughout their life. They may have flare-ups triggered by other illnesses, which may increase their insulin needs. If your cat's diabetes is reversed, they may eventually stop needing insulin altogether.

Commonly, the starting dose of insulin is low, and your vet will gradually increase it until control is achieved. It is important to ensure the insulin dose is correct, as under-dosing allows the disease to go unchecked, and overdosing can cause dangerously low blood sugar, called "hypoglycaemia".

There are various approaches to monitoring, and you should discuss with your vet which is most appropriate for you and your pet. Options include

- Monitoring hunger, thirst, urination, and body weight. Often when these are normalised, this is a great indication that control has been achieved
- Regular fructosamine blood tests, especially for cats where glucose blood tests can be unreliable

- Using a finger-prick glucose monitor (AlphaTrak) on your pet's ear at home to generate regular "glucose curves" for your vet to interpret
- Doing urine dipstick tests at home if your pet is prone to developing ketoacidosis

Initially, your pet is likely to need monitoring appointments every few weeks until they are controlled, then will need an appointment every 4 months for their lifetime.

What are the potential complications of diabetes mellitus?

The following complications can occur even in stable patients, but are more likely the more poorly-controlled your pet's diabetes is:

- *Infections*, particularly of the urinary and respiratory tract
- *Ketoacidosis*, which can be life-threatening and requires hospitalisation
- *Hypoglycaemia*, or low blood sugar, which can happen if insulin dose is high or your pet is given insulin without eating. Signs include
 - Anxiety and tremors
 - Wobbliness
 - Collapse
 - Seizures
 - You should always have access to energy gels or liquid sugar such as jam or honey to feed or apply to your pet's gums if you see signs of hypoglycaemia, and contact your vet
- *Cataracts*, in dogs, which can cause blindness and in some cases painful inflammation or glaucoma
- *Neuropathy*, in cats, which can cause weakness of the legs

What is the prognosis for diabetes mellitus?

In some obese cats with early type 2 diabetes, weight loss and insulin therapy can reverse their diabetes, and the prognosis is very good.

For the majority of patients, insulin therapy and monitoring will be lifelong, and can be a significant investment of your time and resources. In some patients, complicating factors can make achieving and maintaining diabetic control very difficult, especially if they have recurrent pancreatitis or combined conditions such as Cushing's Disease or steroid therapy. Additionally, some patients do not tolerate daily injections and frequent appointments well. In these cases, the prognosis may be guarded.

However, if well-controlled, most diabetics go on to live many years of excellent quality life and often a normal lifespan, and their appointments and injections become part of their daily routine.

Useful Resources

Caninsulin: Diabetes in Dogs & Cats <https://www.caninsulin.com/>

International Cat Care Diabetes Mellitus <https://icatcare.org/advice/diabetes-mellitus/>