FELINE DIABETES MELLITUS

What is diabetes mellitus?

Diabetes mellitus (DM or 'diabetes') is characterised by persistently **high blood glucose** (blood sugar), and if left untreated, it results in life-threatening complications. This is due to a lack of production or response to the hormone insulin. Insulin is a hormone produced by the pancreas that moves glucose out of the blood and into cells to be used for energy. If there is not enough insulin being produced, or the body cannot respond to it, diabetes occurs.

The majority of cats have diabetes similar to Type 2 (adult-onset) diabetes in humans: they may still be able to produce some quantity of insulin but their body cannot respond to it properly.

Why has my cat got diabetes?

Diabetes is more common in cats over 8 years old. Overweight male cats, Burmese cats and cats receiving corticosteroids (cortisone-like medications) in any form (whether by mouth/in food or locally as eye/ear drops) are more frequently affected. Cats can frequently come in and out of a diabetic state, so it is not unusual for a previously diabetic cat to enter remission at some point.

Diagnosing diabetes

Common clinical signs of diabetes include increased drinking, urination and appetite together with weight loss. This is because diabetic cats are unable to access the glucose in the bloodstream: this means that their body is in a starvation state and the high level of glucose in their urine drags extra water with it. Cats may also develop "diabetic neuropathy" which affects the nerves, particularly in the hind limbs. These cats are often wobbly and have difficulty walking and jumping.

Diabetes is diagnosed by measuring the concentration of glucose in the blood. In some cases, blood glucose may be temporarily increased by stress or illness. In other cases blood glucose may be inappropriately high but the cat has not yet developed signs of diabetes. In these cases, further tests may be recommended. Some cats may be diagnosed as pre-diabetic.

If your cat has other signs of being unwell (reduced appetite, vomiting, lethargy) then your vet may recommend additional tests (such as extra blood tests or scans) to rule out concurrent conditions that may trigger or complicate diabetes.

How is diabetes treated?

Diabetes is very treatable in cats, and up to 90% of newly diagnosed cats may achieve diabetic remission. The most common and successful treatment includes a combination of medication (twice-daily insulin injections or once-daily glucose-lowering liquid) and a low carbohydrate diet. If a cat is unwell at diagnosis then they may require a few days in hospital for initial stabilisation.

DIET

Veterinary diets to help control diabetes are high in protein and low in carbohydrates, resulting in less of a burden of glucose entering the bloodstream. Appropriate diets include Hill's m/d, Purina DM and Royal Canin Diabetic. It has also been shown that cats fed a dry food diet are more likely to develop DM (possibly due to the higher proportion of carbohydrates and higher energy densities of these diets), so if your cat will eat a wet food diet then this is preferable.

If your cat has other dietary requirements, such as being on a hypoallergenic diet, then it may be more important to continue this than to switch to a diabetic diet: your vet will discuss this with you.

Weight loss is very important, as obesity is a major driver of DM. It is therefore ideal to feed your cat strict portions designed to result in slow and gradual weight loss.

ORAL ANTI-HYPOGLYCAEMICS

The latest development in feline DM is the creation of an oral-anti hypoglycaemic: **velagliflozin ("Senvelgo").** This medication is an SGLT-2 inhibitor: it blocks channels in the kidney (SGLT-2 channels) that would otherwise reabsorb glucose back into the bloodstream, resulting in extra glucose loss in the urine. The overall result of this is to lower blood sugar levels. Despite the name, this family of drugs is very unlikely to lead to true hypoglycaemia (low blood sugar!).

Velagliflozin is a once-daily liquid administered on food and is suitable for a newly-diagnosed diabetic cat that is otherwise in good health. Cats receiving velagliflozin need regular checks, particularly over the first few weeks, to make sure they are not building up "ketones" (toxic compounds that can build up when there is not enough insulin in the body). The majority of these are urine checks that can potentially be performed at home.

Velagliflozin is generally very well-tolerated, however if your cat becomes unwell (lethargic, reduced appetite, vomiting) then please seek immediate veterinary advice: you must be sure to tell the veterinarian that your cat is receiving velagliflozin to ensure that they receive the correct care.

INSULIN

Insulin is the traditional way of managing diabetes by providing the body with the extra insulin it is lacking. Insulin is administered as an injection under the skin twice daily (ideally 12 hours apart). Injections can be given under the skin anywhere on the body, but most commonly are given over the back of the neck (the “scruff”), as this is easiest.

- Insulin should be stored in the refrigerator.
- The insulin particles need to be resuspended before the insulin dose is drawn up into a syringe. Handling of insulin depends on the type of insulin you are using:
  - Caninsulin: shake the bottle
  - Prozinc: gently roll the bottle
  - Glargine: not required
- There is no need to disinfect the skin.
- Hold the vial with the rubber stopper pointing downwards and insert the needle vertically upwards into the bottle. Draw back until the top of the black plunger reaches the number (the “units”) advised by your vet.
- Remove any air bubbles in the syringe by gently flicking the syringe with your fingers; pointing the needle upward, gently push the plunger to expel the air. Air bubbles injected under the skin are not dangerous, but they will affect the dose drawn up. NB: you must make sure that the needle still contains the prescribed dose once any air has been expelled.
- Part your cat’s hair to clearly see the skin in that area. We tend to recommend injecting under the skin of the scruff of the neck to begin with.
- Lift a fold of skin gently upwards using a pinching motion with your thumb and finger, to form a small tent of skin. The site of the injection should be different every time in order to prevent a build-up of scar tissue at the site, affecting insulin absorption.
- Place the needle in the centre of the tented skin, angling slightly downwards from the horizontal. Push it gently and fully into the skin.
- Push the plunger in the syringe completely, emptying its contents. NB: it is best to pause for 1-2 seconds after the injection to ensure the needle is not removed too quickly.
- Withdraw the syringe from the skin.There is no need to massage or rub the skin after injection.

If you have problems with the insulin injection, do not hesitate to contact your vet.

If by accident the injection is not performed correctly, it is possible that part of the insulin will not be injected under the skin but rather will come out, wetting the skin. In this case, do not administer more insulin, to avoid an overdose (insulin underdose is better that insulin overdose). The next injection should be done as usual without increasing the dose.

How is diabetes monitored?

There are a number of different ways that response to DM treatment is monitored, and the most appropriate route for you and your cat may vary depending on treatment and your pet's tolerance:

REGULAR VET VISITS AND WEIGHT CHECKS

URINE KETONE MEASUREMENT:

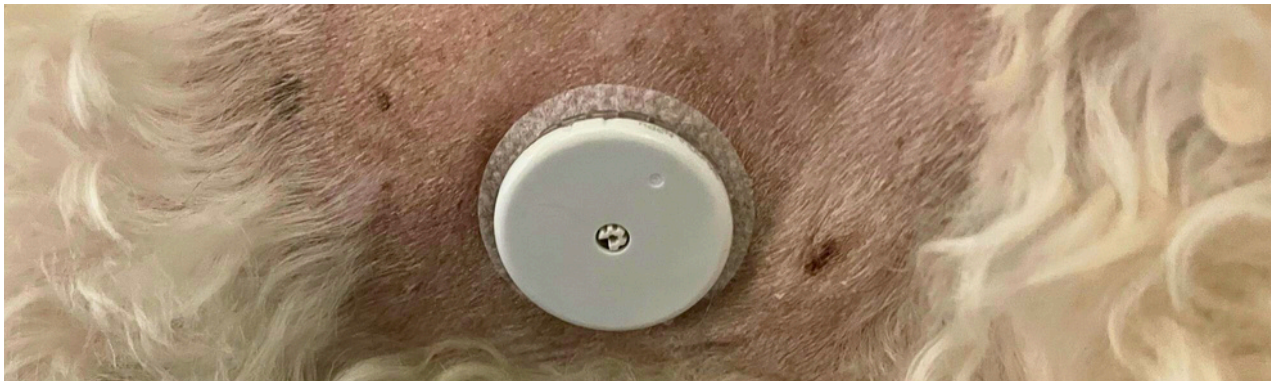
This is particularly important in cats receiving velagliflozin ("Senvelgo"). A small amount of urine can be collected using non-absorbent litter, with a dipstick used to give an assessment of ketone levels in the urine using a graded colour scale: the deeper the colour, the greater the amount of ketones.

BLOOD GLUCOSE CHECKS:

These are performed using a small drop of blood, usually from an 'ear prick', and measured with a device called an "AlphaTrak". This can be performed at home as you become more comfortable.

CONTINUOUS INTERSTITIAL GLUCOSE MONITORING:

A wearable glucose monitoring device called a "Freestyle Libre" is stuck to a clipped patch of skin allowing near constant monitoring of your cat's glucose level via a smartphone app. This is particularly useful in troubleshooting difficult diabetics or if we think a patient might be entering diabetic remission (see next page).



FRUCTOSAMINE CONCENTRATION:

This is a single blood test that gives a rough average of glucose concentrations over the past 10-14 days. Whilst it does not give a detailed insight into fluctuations in blood sugar levels, it can be useful in monitoring stable patients or cats once they have gone into remission.

What to watch out for at home

Hypoglycaemia (low blood sugar) occurs when blood glucose concentrations drop dangerously low, which can result in restlessness, trembling or twitching, a "drunk" walk, dilated pupils, weakness, lethargy, or more seriously, seizures ('fits') or even loss of consciousness.

If your cat is showing any signs please feed your cat immediately. If more severe, add 0.5 to 1g of glucose syrup for diabetics to food, or squeeze glucose solution/honey directly onto the gums if not able to eat.

If signs are marked, or seizures or coma occur, immediate veterinary care is required. If possible, rub honey or glucose syrup on the gums and take your cat immediately to your veterinary practice after phoning ahead of time to notify them you are on your way.

Diabetic remission

Unlike dogs, cats have the ability to improve their response to insulin and the amount of insulin their pancreas can produce, meaning that they can enter "remission": no longer requiring medication to manage their glucose levels.

This can be achieved by helping your cat to achieve a slim body condition, feeding a diabetic diet, and by trying to get control of blood glucose concentrations as quickly as possible (high levels of blood sugar can be toxic to the pancreas over time).

If your cat is starting to develop frequent low blood sugar levels at home or on their routine tests then your vet may discuss a trial without medication.

Cats who have been diabetic and entered remission sadly remain at increased risk of developing DM again later in life. It is therefore very important to continue to feed diabetic food and to avoid further weight gain!

Further information

There is a wealth of data on the internet regarding diabetes in cats. We would recommend the following links for more information:

- General information on feline DM: International Cat Care - https://icatcare.org/advice/diabetes-mellitus/
- How to inject insulin: The American Animal Hospital Association - How to administer insulin to your cat (Youtube)
- Information regarding velagliflozin ("Senvelgo"): https://cat.senvelgo.co.uk/

If you have any further questions, do not hesitate to contact your veterinary team.