



FELINE DIABETES MELLITUS

DIABETES MELLITUS – sometimes referred to as “sugar diabetes” is a complicated condition caused by either an absolute or relative lack of the hormone INSULIN.

WHAT IS INSULIN?

INSULIN is produced by specialised cells in the **pancreas** and is critical in the control and utilisation of **blood glucose** (sugar). Insulin is produced and released into the blood stream in response to increasing levels of blood glucose, and this allows the glucose to be taken up by cells in the body (and used for energy), and helps to maintain normal levels of glucose within the blood.

If insulin is deficient then blood glucose levels will rise and the body will not be able to efficiently use glucose as a source of energy, and so will depend on other sources such as breakdown of fats.

Diabetes Mellitus is one of the most common **endocrine** (hormonal) disorders of cats, but fortunately in most cases it can be diagnosed and managed successfully, although management can be quite complex, and treatment has to be adjusted to the individual cat.

WHAT CAUSES DIABETES

DIABETES MELLITUS (DM) in cats appears to be very similar to **Type 2 (non-insulin dependent) diabetes** in humans. This type of diabetes is characterised by abnormalities within the pancreas that interfere with the ability to produce insulin, and also with so-called “**insulin-resistance**”, which is a reduced ability of the tissues in the body to respond to the insulin that is produced.

Type 1 diabetes in people is caused by an **auto-immune disease** that results in destruction of the insulin-producing cells in the pancreas. Although this type of diabetes has been reported in cats, in contrast to dogs, this form of the disease very rarely appears in cats.

Diabetes may also occur as a **secondary disease** to another illness or some forms of drug therapy. Other endocrine diseases such as **hyperadrenocorticism** (excessive production of cortisol from the adrenal glands), or **acromegaly** (excessive production of growth hormone from the pituitary gland in the brain), can strongly impair the response of tissues to insulin, resulting in diabetes. This may also happen occasionally following prolonged use of high doses of **corticosteroids or progestogens**.

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SIGNS OF DIABETES

Diabetes is mainly a disease of **middle-aged to older cats**, and is more common in males than females. It is also much more common in neutered and **overweight cats**, as being overweight and leading a sedentary lifestyle are two of the most common causes of impaired tissue response to insulin (insulin-resistance).



A genetic predisposition to diabetes is well recognised in humans, and there is evidence this may also be true in cats, for example, the disease appears very common in some lines of **Burmese cats**.

Common clinical signs:

- **INCREASED URINATION (POLYURIA)** – Increased blood glucose levels cause glucose to spill over into the urine drawing water with it, therefore creating a larger volume of urine.
- **INCREASED THIRST (POLYDIPSIA)** – To compensate for the water that is being lost through increased urine production.
- **WEIGHT LOSS**
- **INCREASED APPETITE (POLYPHAGIA)** – In some cats this may be markedly present.

Other clinical signs can include:

- **ENLARGEMENT OF THE LIVER (HEPATOMEGALY)** – May be evident on examination by your vet.
- **POOR COAT CONDITION**
- **WEAKNESS (DIABETIC NEUROPATHY)** – Caused by the disease damaging the nerves, especially of the back legs and may result in sunken hocks.
- **SECONDARY BACTERIAL CYSTITIS** – Urinary tract infections (UTIs) are common in diabetic patients due to the presence of glucose in the urine being a haven for bacterial growth. Signs such as straining to urinate and passing blood in the urine could indicate a UTI.

Most diabetic cats will remain well in themselves, but prolonged severe diabetes can occasionally result in a complication termed **DIABETIC KETOACIDOSIS**. In these cases, the cat may become extremely depressed with signs such as **vomiting, diarrhoea, anorexia** and **collapse**, and urgent attention from a vet should be sought.

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DIAGNOSIS OF DIABETES

The clinical signs may suggest diabetes as a differential diagnosis, however there are other conditions that can produce similar symptoms so further investigations are necessary to confirm a diagnosis. This is usually done by testing blood and urine samples.

- Analysis of a **URINE SAMPLE** will show that **GLUCOSE** is present. **KETONES** may also be present in the urine (ketones are used as an alternative source of energy during diabetes).
- **BLOOD TESTS** will show the presence of a high concentration of **GLUCOSE** and **FRUCTOSAMINE and/or GLYCOSYLATED HAEMOGLOBIN** concentrations may also be analysed to measure the quantity of glucose that has become bound to different proteins in the blood, which gives an idea of the average blood glucose concentration during the preceding weeks.

Although the presence of **HYPERGLYCAEMIA** (high blood glucose) and **GLYCOSURIA** (glucose in the urine) are typical findings for DM, these changes can also occur in some cats simply as a result of **stress**. If there is any doubt about the diagnosis, then repeating the initial tests at a later date, or performing additional tests such as fructosamine levels as previously mentioned, may be necessary prior to starting treatment for DM.

TREATMENT OF DIABETES

DM is usually a treatable condition, but is sadly not a simple disease to manage, requiring dedication and commitment from owners. It is important to initially identify any predisposing or complicating factors, for example, if medications are being given that may be causing DM then these should be gradually withdrawn.

DIETARY MANAGEMENT

There are 2 major considerations with dietary management of diabetic cats. Firstly, if your cat is overweight or obese then it is very important that they normalise their bodyweight to "ideal". In some instances, this in itself can result in resolution of diabetes – **DIABETIC REMISSION** – as obesity interferes with the action of insulin, as mentioned previously. Weight loss can be achieved through a combination of a **reduced calorie intake** and **increased exercise or activity levels**, and if your cat is significantly overweight then a **prescription weight-loss diet** will probably be recommended. One of our veterinary nurses can formulate a suitable weight-loss plan for your cat – it is important that cats do not lose weight too rapidly as this can result in further health complications.

As a routine, cats with diabetes appear to benefit greatly from a diet that is **LOW IN CARBOHYDRATES** and **HIGH IN PROTEINS**. Feeding a **prescription diabetic diet** ensures a proper balance of all the essential nutrients your cat needs, but if this is not possible then a low carbohydrate kitten diet may be a suitable alternative.

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Unlike diabetic dogs, diabetic cats do not have to be fed strictly twice daily at the time of insulin administration, as they do not have the same post-prandial (post feeding) blood glucose spike as dogs do. Diabetic cats can continue to be fed in the same manner as they are used to, for example grazing or several small meals throughout the day, which also represents a more natural feeding routine for their species.

ORAL MEDICATION

In people with diabetes, there are a number of oral medications available to help control the condition. Many of these are however, toxic to cats, or simply do not work in cats.

INSULIN INJECTIONS

Most diabetic cats will need to have their condition managed with **DAILY OR TWICE DAILY INJECTIONS OF INSULIN**, as many human diabetic patients also do. The initial prospect of having to regularly inject your cat can be very daunting for most owners, but be reassured it is generally very easy to do with practise, and because insulin needles are so small, the cat does not usually feel a thing. The injection is given under the skin, usually in the scruff of the neck.

One of our vets and/or veterinary nurses will talk you through the entire procedure of giving insulin injections, demonstrating the technique and letting you practise injecting sterile water before actually having to inject insulin into your cat. Some owners pick this up quickly, some can take a little longer and require several visits to the vets to gain confidence in administering insulin injections. It is usually easiest to inject your cat with a distraction, such as eating a tasty treat, and it may be helpful to have a second person help to hold your cat whilst getting accustomed to the procedure.

There are several different types of insulin available, with different lengths of action. Individual cats may respond differently to different insulins, however, most cats will require twice-daily injections of an **intermediate or long-acting insulin preparation**, though some cats can be managed with once-daily injections.



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STORAGE & HANDLING OF INSULIN

It is important that insulin is stored appropriately to maintain its efficacy – it should be **STORED IN THE FRIDGE AT ALL TIMES AND NEVER FROZEN**. The contents of the insulin vial should be gently mixed prior to drawing up into the syringe to ensure an even suspension is obtained, but **NEVER SHAKE THE BOTTLE**.

Carefully draw up the correct amount of insulin into the recommended syringe as advised by your vet (*be aware that there are different types of insulin syringes available depending on the insulin preparation being used*). Special insulin pens are occasionally used to make administration of small amounts of insulin easier.

If you are not sure whether an injection was given successfully, **NEVER give a second injection** – it is better to miss a dose rather than risk giving too much insulin.

STABILISING A DIABETIC CAT

Diabetic cats that are currently well are usually stabilised on an **out-patient** basis after teaching owners how to give their cat insulin injections. We will normally need to see your cat back quite regularly in the early stages of stabilisation to monitor blood glucose levels and check their general health, and **BLOOD GLUCOSE CURVES** may be employed to monitor your cat's individual response to the insulin over a period of several hours. Blood glucose curves involve taking tiny pin-prick **serial blood samples**, usually from the ear, every 1 or 2 hours throughout the day, and plotting the readings on a graph to observe when the insulin reaches its peak effect following injection, and how long it's effect lasts, and also how much the blood glucose levels are reduced by the insulin. This allows us to make changes to your cat's insulin dosage safely and in a controlled manner as there is sadly no "one-size-fits-all" for treatment of diabetic patients, so dosage of insulin must be tailored to the individual. Blood glucose curves can be performed at the clinic on a "day-patient" basis, or preferably by the owner in the cat's home environment to prevent issues with falsely high blood glucose levels occurring due to stress in the veterinary environment. One of our veterinary nurses can teach you how to take pin-prick blood glucose samples, and loan you a handheld **glucometer** for measuring the blood glucose.

Unfortunately, stabilisation can take time, as increases in insulin dosage can only be made in small increments, and the body must be given time to adjust to this new dosage, to prevent serious consequences of over-dosing from increasing the dosage too frequently or by too high a volume.

LONG-TERM MANAGEMENT

Once your cat's diabetes has been stabilised, the dose of insulin may still need to be adjusted on an occasional basis following consultation with your vet. We will need to continue to monitor your cat periodically to perform blood profiles, urine tests and examine the general health and bodyweight of your cat.

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Keeping a diary at home to record key things on a daily basis can be useful for assessing trends and changes over time. Things to monitor include:

- **Time of insulin injection and the dosage given.**
- Your **cat's appetite** and the amount of food eaten.
- **Overall demeanour** of your cat, especially noting any **lethargy** or sleeping more than usual.
- Any **vomiting or diarrhoea**.
- **Water intake** – if your cat is the only pet in the house, then measuring their water out and recording how much is drunk over a specific period of time can be very useful for monitoring how well the diabetes is controlled.
- **Bodyweight** – if possible, weighing your cat weekly can be useful for your vet to monitor changes over a period of time.
- **Urine glucose** – your vet may recommend collecting a urine sample from your cat periodically to check for the presence of glucose using a simple paper test-strip – this can be performed easily at home by owners or at the veterinary surgery.

HYPOGLYCAEMIA

HYPOGLYCAEMIA (low blood glucose concentration) is a potentially life-threatening situation that requires urgent action. This may be caused by giving your cat too much insulin, or giving insulin when they are unwell. **NEVER change your cat's insulin dosage** unless you have discussed this with your vet first, and always follow their recommendation.

Signs of hypoglycaemia include:

- **GENERALISED WEAKNESS**
- **DISORIENTATION**
- **ACTING DRUNK**
- **COLLAPSE**
- **SEIZURES and/or COMA**

If your cat ever shows any of these signs, contact the surgery immediately on **01325 380111**. In the meantime it is helpful to administer some **GLUCOSE SYRUP OR HONEY** by mouth to your cat (can be rubbed onto the gums) – it is sensible to always have this available in the house as a precaution (glucose syrup can be ordered for you by the practice).

PROGNOSIS

The long-term outlook for cats with DM can vary according to how old they are, how easy it is to stabilise their diabetes, and whether they have concurrent diseases and how severe these are. Many diabetic cats can continue to have an excellent quality of life, and can live very happily with their diabetes if they are well managed. These cats can be very rewarding to manage for both owners and the veterinary team, but sadly not every cat responds well.

Regular veterinary examinations will be required to evaluate your cat's response to treatment, and if your cat proves difficult to stabilise, becomes unstable, or appears to need very large doses of insulin, then further tests may be required down the line to look for other underlying problems.

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