Feline diabetes mellitus (DM) is on the increase, with recent UK surveys suggesting that nearly 1 in 200 cats are diabetic. Despite being so common, feline diabetes is surrounded by much confusion. The disease has many differences when compared with DM in dogs; it can be difficult to manage, and both owner compliance and home care form an important part of management. Treatment goals for feline DM have also changed in recent years with the realisation of just how common 'transient' DM is in cats.

### Classification and aetiology
In dogs and humans, type 1 DM predominates, with a combination of genetic susceptibility and immunological destruction of pancreatic beta cells leading to progressive insulin insufficiency. However, in cats type 2 DM is most common, characterised by insulin resistance and impaired insulin secretion.

#### Key differences between canine and feline DM

<table>
<thead>
<tr>
<th>Dogs</th>
<th>Cats</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type 1 disease</strong></td>
<td><strong>Type 2 disease</strong></td>
</tr>
<tr>
<td>Noticeable polyuria/polydipsia (PU/PD) usually present</td>
<td>Owners may not report PU/PD</td>
</tr>
<tr>
<td>Usually lifelong insulin requirement</td>
<td>Often transient insulin requirement</td>
</tr>
<tr>
<td>More predictable insulin response</td>
<td>Large variation in response to insulin and duration of action</td>
</tr>
<tr>
<td>Stress hyperglycaemia not a significant concern</td>
<td>Stress hyperglycaemia makes diagnosis difficult</td>
</tr>
<tr>
<td>Postprandial hyperglycaemia occurs</td>
<td>Does not occur</td>
</tr>
<tr>
<td>Defined meal times recommended</td>
<td>Ad libitum feeding usually recommended</td>
</tr>
<tr>
<td>High fibre, high complex carbohydrate diet recommended</td>
<td>High protein, low carbohydrate diet recommended</td>
</tr>
<tr>
<td>Usually polyphagic if hypoglycaemic</td>
<td>Cats do not usually become polyphagic when hypoglycaemic</td>
</tr>
</tbody>
</table>

### Treatment of feline DM

- **Correction of ‘glucose toxicity’.** Prolonged hyperglycaemia can result in resolution of this toxicity, at least initially. Management of obesity.
- **Resolution of pancreatitis.**
- **Treatment of concurrent or underlying disease.**
- **Removal of diabetogenic drugs.**
Optimising early diagnosis

- Perform routine urinalysis annually in all cats from 7 years onwards (though DM can potentially occur at any age)
- Consider more frequent routine urinalysis (every 3-6 months) in Burmese cats and those that are indoor, obese or receiving corticosteroid/progestagen treatment. Particular vigilance is required in cats with additional risk factors
- Encourage home urine sampling using a non-absorbent litter (eg, Katkter/Mikki litter or washed aquarium gravel)
- Add blood glucose measurement to the pre-anesthetic protocol of any cat over the age of 7 years
- Care needs to be taken in the interpretation of hyperglycaemia/glucoinosa in samples collected in the practice because of the possibility of stress hyperglycaemia - following FAB’s ‘Cat Friendly Practice’ principles will help to minimise this and make results easier to interpret (www.fabcats.org/catfriendlypractice)
- Equally, care must be taken not to attribute all blood/urine glucose elevations to stress, as early DM may otherwise be missed
- Always follow up a high blood glucose or glucosuria result with serum fructosamine measurement
- Consider measuring serum fructosamine annually if urine samples cannot be obtained
- Educate owners about observing their cats for early clinical signs of DM
- Regularly weigh (and calculate percentage weight change) and body condition score cats to detect trends in changes in bodyweight or body condition

TREATMENT FUNDAMENTALS

- Although most cats have type 2 DM, the majority are, at least initially, insulin dependent.
- Initiating insulin treatment and dietary management as soon after diagnosis as possible will give the best chance of transient DM and resolution of insulin requirements.
- Oral hypoglycaemic agents are not advised as a first-line treatment, unless there is a good reason for not using insulin.
- Manage underlying causes (eg, obesity, corticosteroid treatment).
- Manage owner expectations to ensure long term compliance (see box on right). Owners should be informed that it is likely to take 2-3 months to fully stabilise a patient, but that insulin requirements may re-solve after 3-4 months if the cat is treated appropriately.

INSULIN THERAPY: KEY POINTS

- Twice-daily dosing regimes are usually more effective. (NB: doses are quoted per injection, not per day!)
- Insulin doses should not be increased by more than 0.5 IU per injection at a time. After any increase in insulin dose, at least 3-5 days (preferably one week) should be allowed before making any further increases in dose. This is because it takes 3-5 days for glucose homeostasis to be re-established after starting insulin therapy or adjusting doses.
- Do not worry if an owner cannot manage a strict dosing regime; it is better to achieve 5 days of twice-daily dosing and 2 days of once-daily dosing than for a cat to be euthanased because its owner is worried about always being able to inject twice daily.
- Twice-daily dosing of an intermediate-acting insulin (eg, Lente insulin) is a good first choice.
- Ensure the owner has the correct syringes for the type of insulin being used. A 40 IU/ml syringe is needed for Caninsulin; all other syrings require 100 IU/ml syringes.
- In some cats, intermediate-acting insulins do not have a long enough duration of effect.
- In some cats, the longer acting insulin, PZI (prota- mine zinc insulin), is not absorbed well. Many cats require PZI twice daily.
- Insulin glargine is a new synthetic insulin analogue that is currently only licensed for use in humans and undergoing assessment in cats. It should only be used off-licence in cats if the veterinary licensed for- mulations have proven ineffective (eg, PZI) is poorly as- sorbed and intermediate forms have a short duration.

Optimising client compliance

- Provide adequate information about diabetes at the initial consultation
- Explain at the outset the expected time for stabilisation, possible complications, possibility of fluctuating insulin requirements, need for home monitoring, etc
- Explain that insulin requirements may be transient if treatment is prompt and aggressive
- Allow clients enough time to discuss any concerns and ensure they understand the disease and what is involved. Many owners are daunted by the prospect of handling insulin and injecting their pet, and need support until they are completely familiar with these procedures. Enlisting the practice staff to provide client support is very helpful.
- Some clients can find it easier to use a 40 IU/ml preparation (Caninsulin). This product has earned a FAB ‘easy to give’ award
- Be flexible with instructions regarding timing of feeding and insulin administration, and realistic in what the client can achieve; missing insulin dosing a day is a week is better than not treating at all

Risk factors for feline DM

- Diabetes is often thought of as a disease of old cats, but it is more common in the ‘mature’ adult lifestyle (7-10 years), although potentially can occur at any age
- Male neutered cats are more frequently affected by makers of diabetogenic drugs in cats with additional risk factors.
- Extra caution should be taken when using diabetogenic drugs.
- Does receiving diabetogenic drugs should be monitored for development of diabetes.
- Extra caution should be taken when using diabetogenic drugs in cats with additional risk factors.

Practical implications of diabetic risk factors

- Routine ‘screening’ of ‘at risk’ cats may allow earlier detection of diabetes.
- Prevention and monitoring of obesity is important for diabetes prevention, particularly in cats with other risk factors.
- Owners should be warned about the risk of DM when administering diabetogenic drugs.
- Cats receiving diabetogenic drugs should be monitored for development of diabetes.
- Extra caution should be taken when using diabetogenic drugs in cats with additional risk factors.

Diagnosing DM

- The classical clinical signs of DM include polyuria/ polydipsia and unexplained weight loss. However, it is common for many of these signs, particularly PUPD, to go unnoticed by owners, especially in outdoor cats.
- Unless ketoadisis is present, physical examination is usually largely unrevealing in the uncomplicated diabetic cat. It is important to look for clues for causes of insulin resistance (eg, obesity, skin/oral infections, hyperadrenocorticism, acromegaly) and alterna- tive/concurrent diseases that could explain the clinical signs or complicate the DM (eg, hyperthyroidism, chronic renal disease).

Blood glucose concentrations

- Significant blood glucose (>10 mmol/l) persistent hyperglycaemia is the hallmark of DM. However, it is extremely important to be aware of the problem of stress-induced hyperglycaemia in cats as a result of catecholamine production. The cat does not have to appear overtly stressed to be for this to be an issue; in fact, often the most stressed cats will be ones that do not struggle or vocalise. Blood glucose concentrations can rise above 20 mmol/l, so the degree of hyperglycaemia does not always correlate with stress and DM.
- If the cat is hospitalised and allowed time to relax before a further sample is taken, blood glucose levels can return to within normal limits with stress hyperglycaemia. However, it is equally possible for stress hyperglycaemia to result in elevations in blood glucose concentrations that persist for the whole day. It is, therefore, essential that DM is not definitively diag- nosed and insulin treatment initiated on the basis of hyperglycaemia alone.

Urinalysis

- The presence of glucosuria can help to distinguish between persistent hyperglycaemia and stress- induced hyperglycaemia. However, it is not unusual for stress to increase blood glucose levels above the renal threshold (12-14 mmol/l), thereby also resulting in glu- cosuria. The most useful way of using urinalysis to aid in diagnosis, is by asking owners to collect a urine sample at home, in a non-stressened environment. Urine samples can easily be obtained from cats that will use a litter tray by temporarily replacing the normal litter with a non-absorbent litter. Urine bacterial culture should also be performed on all newly diagnosed diabet- ic cats since urinary tract infections (UTIs) are com- mon sequelae to glucosuria, will not necessarily cause any clinical signs, and will result in insulin resistance if untreated.

Serum fructosamine concentration

- Fructosamines are glycated proteins that result from binding of glucose to serum proteins. The concentra- tion of fructosamine is directly related to blood glucose concentration, increasing when blood glucose is per- sistently increased. The protein has a half-life of 2-3 weeks, and therefore fructosamine gives an indication of the average blood glucose concentra- tion over the preceding 2-3 weeks. Fructosamine can hence help to distinguish between DM and stress- induced hyperglycaemia. However, interpretation is not always straightforward. Fructosamine can be raised if there has been prolonged stress hyperglycaemia (eg, when a cat has been hospitalised) or prolonged hyper- glycaemia as a result of Somogyi over-swing. Also, in newly diagnosed diabetic cats fructosamine may sometimes be normal if hyperglycaemia has only been present for a short period of time. In addition, hypo- albuminaemia and hyperthyroidism can result in falsely low fructosamine concentrations.

Further diagnostics

- Any concurrent diseases such as inflammatory, infec- tious or neoplastic disorders can cause insulin resist- ance and thereby influence fructosamine concentration. It is therefore essential that any concurrent disorders are recognised and appropriately managed. A thorough physical examination (including assessing for peri- odontal disease) and further evaluations including haematology, full biochemistry, thyroxine, urinanalysis and culture, and survey imaging of every newly diag- nosed diabetic cat will allow much better initial man- agement of the diabetes and subsequently minimise complications, treatment disappointments and future financial outlay.

Early diagnosis

- Recent survey data suggest there may be up to 15,000 new cases of feline DM in the UK each year. Disease is usually diagnosed when cats are presented with clinical signs consistent with DM. However, given that early diagnosis and treatment will increase the chance of resolution of feline diabetes the cat should be presented with clinical signs before clinical signs become evident is obviously preferable. Ways to assist in earlier detection of feline DM are highlighted on page 3.

Stress can be a cause of hyperglycaemia and glucosuria

- Early diagnosis is therefore essential that any concurrent disorders are recognised and appropriately managed. A thorough physical examination (including assessing for periodontal disease) and further evaluations including haematology, full biochemistry, thyroxine, urinanalysis and culture, and survey imaging of every newly diagnosed diabetic cat will allow much better initial management of the diabetes and subsequently minimise complications, treatment disappointments and future financial outlay.

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Initiating insulin treatment

- Start on 0.25 IU/kg (or injection to a maximum of 3 IU/cat), twice daily.
- On day 1, check blood glucose at the estimated peak action time (4-8 hours after administration) to ensure hypoglycaemia has not occurred. As long as blood glucose is not below 10 mmol/l, continue in conjunction with the cat’s clinical status, fructosamine results and the environment

Discharge the cat for one week with instructions for owners to check their cat’s blood glucose

- Occurred. As long as blood glucose is not below 10 mmol/l, consider performing a more complete BGC.

Performing and interpreting BGCs

- The aim of a BGC is to identify the blood glucose concentration at the nadir, obtain a more precise time for the nadir, and assess the effect of the insulin and ensure there is no Somogyi overswing effect (see later). Once this information has been amassed, subsequent BGCs may only require 4-hour sampling, particularly if the cat is clinically stable.

- A BGC is performed by first checking the cat’s blood glucose concentration, giving it its usual breakfast and dose of insulin, and then determining its blood glucose level every 1-2 hours over a 24-hour period. The usual waking pattern in cats is as follows: usually wakes up at around 8 a.m., has breakfast at around 10 a.m., will take a nap at 3 p.m., will have dinner at 7 p.m., and then may go to sleep for the night. If the cat is sleeping for its first nap, wake it up, offer breakfast, and then perform a BGC in an individual cat they will vary widely from day to day. It is very important that more careful treatment is not based on a single curve. All BGCs need to be interpreted in conjunction with the cat’s clinical status, fructosamine results and the environment the patient was in when the curve was performed. The most important aspect to consider with BGC results is trends of change, as comparing against previous results is an important part of interpretation. It is useful to think in terms of a week, rather than a 24-hour period, aiming to keep the BGC consistent from week to week (trends), while accepting that daily fluctuations are a normal occurrence.

Diabetic therapy: key points

- High fibre, moderately fat-restricted diets are usually successful weight loss diets for obese cats. High insoluble fibre, moderately fat-restricted diets are also indicated for cats with diabetes in addition to obesity.

- Dry foods tend to contain much higher proportions of carbohydrate compared with wet foods, so a wet diet is generally preferable.

- Examples of commercially available high-protein, low-carbohydrate diets include Hills DM and Hill’s m/d, and to a lesser extent Royal Canin Feline Diabetic. If prescription diets are not an option, look for market diets with the lowest carbohydrate and highest protein proportions.

- Cats do not develop significant postprandial hypoglycaemia and therefore it is not necessary to have a strict regime for insulin administration in relation to feeding.

- Monitoring insulin during or after feeding is most practical, to ensure that the cat is eating before insulin is given.

- Cats that are fed ad libitum and ‘graze’ their food throughout the day and/or night should continue this regime providing they are not gaining weight. Cats that eat only 2 meals a day or even 2 meals (half the total calorie intake at each meal), at the time of insulin injections if on twice-daily insulin treatment.

In addition to diet, exercise also forms a vital part of any weight loss programme. Most obese cats are extremely inactive, with activity levels by even just 10-15 minutes a day can make a big difference. This can be done variously by playing with the cat, making it walk upstairs or around a room to get its food, feeding in different areas around the house, using ‘puzzle’ feeders to make the cat work a little to get its food, etc.

Monitoring diabetic control

Approaches

Four main aspects need to be considered in relation to monitoring longer-term diabetic control.

- Weight and body condition score;
- Demeanour; and
- Thirst (be realistic here – a subjective assessment by the owner is usually helpful so don’t insist that the owner guess – if the cat is dehydrated its information is likely to be inappropriate at all). consistent feeding regime, and monitor- ing the amount of food eaten daily, are most important. If no concurrent disease should be considered in relation to dietary choice; e.g., if chronic renal disease is also present, a diet with lower protein content may be selected.

Which diet to choose

High protein, moderately fat-restricted diets have been previously shown to improve glycaemic control in diabetic cats. However, these diets are expensive and may result in inappropriate weight loss in cats, in addition to the larger faecal volume and subsequent risk of constipation in some individuals. Cats with high-amino acids and fat, rather than carbohydrates. High carbohydrate diets increase the risk of obesity and diuresis, and diabetics cats predisposes to higher postprandial blood glucose concentrations. More recently, therefore, high protein and low carbohy- droxidation and achievement of the insulin-dependent state.

Weight loss programmes for obese cats

Feeding strategies have become an ever-present problem in recent years, and may be associated with the current trend of feeding ad libitum dry food, together with the fact that more cats are being kept solely indoors. Weight reduction in obese cats will significantly improve glycaemic control, and many cats will even revert to a subclinical diabetic state, no longer requir- ing exogenous insulin.

- Weight loss can be difficult to achieve in cats and is best evaluated against monthly diet compliance. Situations where there is one obese cat in a multicat household are even more difficult to manage, because the other cats may encourage the cat to eat if they see food being offered. Inattention to diet constraints and unsupervised eating can increase the daily energy intake of cats. When offered a meal that is too high in protein and low in carbohydrate content, the cat will respond to its hunger and the carbohydrate diet will result in better glycaemic control and increase the chance of being able to discontinue exogenous insulin.

- Weight reduction should be performed by reducing calorie intake to about 75-80% of maintenance requirements. It is best to feed a diet restricted in calories, rather than simply to decrease the volume of food, to ensure adequate intake of protein and essential nutrients. Weight loss programmes do not occur too rapidly, since obese cats experiencing rapid weight loss are at high risk of developing hepatic lipodisosis. It is therefore recommended that any weight loss programme is at least 1-2 weeks. Once the initial goal is attained, a new target can be set until the cat has reached an ideal body weight.

Cats that ‘graze’ their food throughout the day and/or night should be allowed to continue this regime; however, some owners may prefer to feed a diet restricted in calories, rather than a 24-hour period, aiming to keep the BGC consistent from week to week (trends), while accepting that daily fluctuations are a normal occurrence.

- Food intake should be appropriately managed.
- Diet and exercise also forms a vital part of any weight loss programme. Most obese cats are extremely inactive, with activity levels by even just 10-15 minutes a day can make a big difference. This can be done variously by playing with the cat, making it walk upstairs or around a room to get its food, feeding in different areas around the house, using ‘puzzle’ feeders to make the cat work a little to get its food, etc.

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Reassessments

In the longer term, once stabilised, diabetic cats should be reassessed at least every 3–6 months. Each check should comprise as a minimum:

- Review with the owner of the cat’s diabetic diary, and discussion of any changes noted in clinical signs;
- Full physical examination;
- Assessment of weight and body condition score, and calculation of percentage change in weight since previous visit;
- Serum fructosamine measurement.

In addition, the following tests would be useful, where possible:

- Blood pressure measurement;
- Full urinalysis including urine protein:creatinine ratio and culture;
- Routine haematology;
- Serum biochemistry.

If the cat is free from clinical signs and physical examination is unremarkable, then adequate glycaemic control is likely, and measurement of serum fructosamine will assist in confirming this. If fructosamine is low/normal, it may indicate cessation of insulin requirements in a transient diabetic. If clinical signs of persistent hyperglycaemia or episodes of hyperglycaemia are reported, or if there is evidence of weight loss, or other complications such as a peripheral neuropathy, then further diagnostics should be performed.

Periodic monitoring of urine for glucosuria and ketonuria in the home environment can also be useful for monitoring glycaemic control. It is not particularly helpful for owners to make frequent urine glucose measurements, as this often results in them making their own adjustments to insulin doses. However, periodic measurements are useful in detecting the transient diabetic whose insulin requirements are reducing, as absence of glucosuria would be suggestive of this. It is also useful for owners to check periodically for urine ketones, to try to detect ketoadiposis in the early stages before the cat becomes too unwell.

Common causes of poor stabilisation

- Problems with storage and/or administration of insulin (see text);
- Inappropriate insulin dose/preparation, failure of insulin absorption or inadequate duration of action;
- Infections – most commonly mouth, skin and urinary tract infections. The effect on insulin requirements is often vastly underestimated. Every effort should be taken to ensure a healthy oral cavity through routine dental care. UTIs are very common in diabetic cats; they will not always be accompanied by signs of cystitis and an inflammatory sediment is not always evident, so urine culture should be routinely performed. Treatment of a UTI should involve appropriate antibiotics based on culture and sensitivity testing, and be continued for at least 2 weeks;
- Recent weight gain, resulting in increased insulin resistance;
- Pancreatitis – over 50% of diabetic cats are likely to have pancreatitis. Cause and effect is difficult to establish but the presence of pancreatitis often results in very variable insulin requirements. Chronic pancreatitis can be difficult to diagnose and cats may show few clinical signs associated with it. Measurement of feline pancreatic lipase immunoreactivity (fPLI) is the most sensitive test available for diagnosing pancreatitis, but even this is not 100% sensitive so a normal fPLI does not exclude pancreatitis. In practice, achieving a diagnosis of pancreatitis is unlikely to alter the way a cat’s DM is treated, and treatment for the pancreatitis itself is merely symptomatic; however, it helps to explain why a cat may have extremely variable insulin requirements. These patients can be very difficult to control;
- Diabeticogenic drugs (corticosteroids, progestagens);
- Renal/hepatic disease;
- Additional endocrine disease (eg, hyperthyroidism, acromegaly, hyperadrenocorticism);
- Variable quantity or type of food being fed;
- Incorrect insulin storage;
- Incorrect insulin mixing/injection technique.

The first thing that should be done when there are any problems with stabilisation is to ask the owner to demonstrate how they mix and inject insulin, to check that this is being carried out correctly. If these problems are eliminated as a cause of the poor stabilisation, then further investigations may be needed to identify the problem. In some cases it will be necessary to re-admit the cat for more detailed assessment, which may include a 24-hour glucose curve.

Commonly encountered problems

Hypoglycaemia

Hypoglycaemia can arise as a complication of insulin treatment in a number of ways. For example, the insulin dose may have been increased too rapidly (particularly if stress hyperglycaemia is mistaken for poor glycaemic control), previous insulin resistance may have resolved, or a cat may have reverted to a non-insulin-dependent state.

It is important to be aware that hypoglycaemia can be difficult to recognise quite early in cats, because, in contrast to dogs, cats do not always exhibit polyphagia when they become hypoglycaemic. Often the earliest sign that owners note is that the cat goes and hides more than usual.

Hypoglycaemia can be life threatening if left untreated so it is very important that early signs are recognised and treated what to do if you notice any of these signs:

If signs are mild and your cat will eat, offering food may be enough to relieve the signs. If signs are more severe, or if your cat will not eat, glucose syrup, honey, jam or sugar water can be rubbed on the gums. Your veterinary surgeon should then be contacted for further advice. If signs have progressed to collapse or seizures, an emergency vet should be contacted immediately.

client instruction sheets can be downloaded from www.fabvets.org
If hypoglycaemia develops, insulin treatment should be discontinued until hyperglycaemia recurs and then reintroduced at half the previous dose. If blood glucose levels are still low or normal when the cat is receiving 1 IU or less of insulin, then resolution of the insulin-dependent state should be suspected.

**Somogyi overswing**

The so-called Somogyi overswing is a normal physiological response to hypoglycaemia induced by excessive insulin administration. It commonly occurs when insulin doses are increased too quickly with inadequate monitoring, or in cats that have very fluctuating insulin requirements. When blood glucose concentrations fall below 3.5 mmol/l, or when they decrease very rapidly, counter-regulatory hormones such as glucagon and adrenaline are secreted, resulting in a rebound hyperglycaemia and insulin resistance within a few hours. This hyperglycaemia persists for at least 24 hours in most cases, and can last for up to 72 hours, or occasionally even longer. Clinical signs of hypoglycaemia are rarely seen, and therefore the cat will present as not responding to insulin.

The speed of reduction in blood glucose is often the trigger for Somogyi overswing, so overt hypoglycaemia may not be present. The overswing can occur very rapidly following injection and requires half-hourly to hourly blood glucose measurements following insulin administration to be detected. Insulin should be withdrawn for 3 days prior to this to ensure that any rebound hyperglycaemia has resolved.

If the Somogyi phenomenon is not recognised, and insulin doses are further increased, the result is an even more severe rebound hyperglycaemia. Diagnosis is made by demonstrating hypoglycaemia or a rapid fall in blood glucose (eg, > -10 mmol/l in one hour), but can be missed if blood samples are taken less frequently than every hour following insulin administration. Furthermore, the reduction in blood glucose will not always be evident if the subsequent rebound hyperglycaemia and insulin resistance last for more than 24 hours. In addition, serum fructosamine may be elevated if rebound hyperglycaemia is prolonged.

If there is a possibility of overswing occurring, it is advisable to reduce the insulin dose to 0.25-0.5 IU/kg for a few days and assess the cat’s response. In the short term, hypoglycaemia is a ‘safer’ state than insulin-induced hypoglycaemia. If no improvement in clinical signs is observed, and no reduction in blood glucose demonstrated, then another cause of insulin resistance should be considered.

**Fluctuating insulin requirements**

Some cats have very fluctuating insulin requirements, potentially exhibiting signs anywhere on the spectrum from uncontrolled diabetes through to hypoglycaemia. The most usual reason for this is the development of a concurrent disease that causes a mild insulin resistance, which later resolves spontaneously or waxes and wanes. Inflammatory diseases such as chronic pancreatitis are commonly associated with these fluctuating requirements. These cases can be extremely difficult to manage, and this is one situation where home blood glucose monitoring can be very useful.

**Insulin resistance**

The majority of diabetic cats can be controlled with 1 IU/kg of insulin (per dose, not per day). Insulin resistance is generally defined as insulin requirements exceeding 2 IU/kg.

Many disorders can interfere with the action of insulin. In cats the most common causes of insulin resistance include obesity, chronic pancreatitis and chronic infections (eg, oral infections, UTIs and gingivostomatitis). Other concurrent disorders such as chronic renal disease and hyperthyroidism can also have a significant impact. Less common but very important causes of severe insulin resistance in cats are acromegaly and hyperadrenocorticism; uncontrolled DM is the most common presentation of both of these unusual endocrinopathies. Medications such as corticosteroids and prostaglandins (eg, megestrol acetate) are also important causes of insulin resistance.

**Prognosis**

The long-term outlook for cats with DM depends on how easy it is to stabilise their diabetes, whether they have any other diseases and how severe these are. Cat and owner compliance also plays an important role in determining the prognosis in the individual patient. Many diabetic cats have an excellent quality of life and are extremely rewarding cases to treat.

The most common causes of death in diabetic cats appear to be related to pancreatitis, UTIs, renal disease and cardiac disease.

**Acknowledgements**

The diabetes prevalence data quoted on page 1 was provided by PetProtect.

Further reading

Appleton DJ, Rand JS, Sunvold GD. Insulin sensitivity decreases with obesity, and lean cats with low insulin sensitivity are at greatest risk of glucose intolerance with weight gain. J Feline Med Surg 2001; 3: 211–28


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