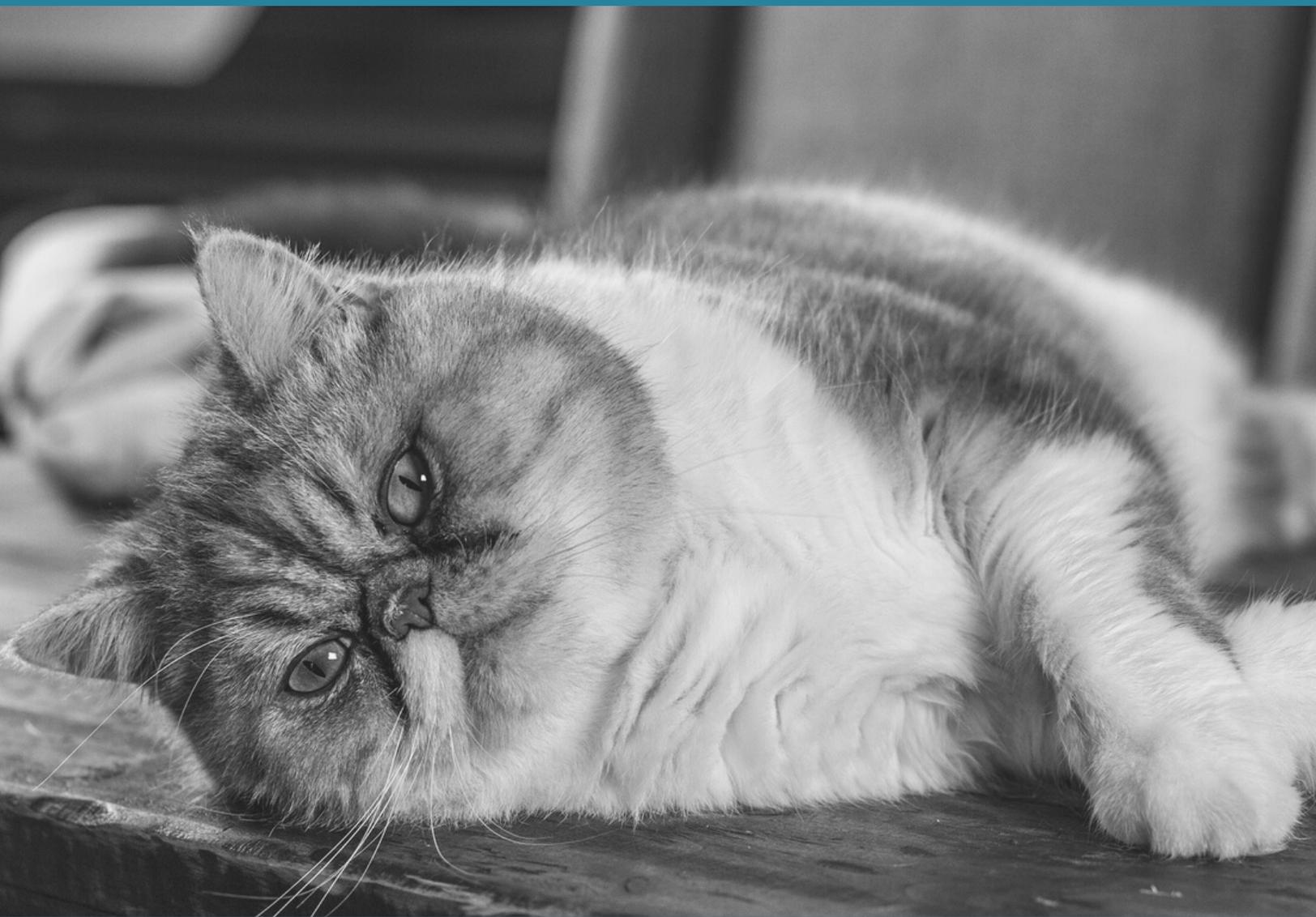


USEFUL INFORMATION ON FELINE DIABETES



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Having your cat be diagnosed with diabetes can be an overwhelming experience. We have put together this information guide in the hope of providing you with information to make understanding the diagnosis easier.

DIABETES MELLITUS - AN OVERVIEW

Diabetes mellitus is a disease of the pancreas, a small organ located near the stomach. The pancreas has two different types of cells that have very different functions. One group of cells produces the enzymes necessary for proper digestion. The other group, called beta cells, produces the hormone insulin, which regulates the level of glucose (sugar) in the bloodstream and controls the delivery of glucose to the tissues of the body. In simple terms, diabetes mellitus is caused by the failure of the pancreas to regulate blood sugar.

Diabetes mellitus is usually classified into 2 types of disease:

Type I diabetes mellitus results from total or near-complete destruction of the beta cells. This appears to be a rare type of diabetes in the cat.

Type II diabetes mellitus is different because some insulin-producing cells remain, but the amount of insulin produced is insufficient, there is a delayed response in secreting it, or the tissues of the cat's body are relatively insulin-resistant. Obesity is a predisposing factor in type II diabetes, which appears to be the most common type of diabetes in the cat.

The clinical signs of diabetes mellitus are related to elevated concentrations of blood glucose and the inability of the body to use glucose as an energy source.

CLINICAL SIGNS

The four main symptoms of diabetes mellitus are increased thirst, increased urination, weight loss, and increased appetite. Because of the nature of cats, these signs may go unnoticed, especially in the early stages of the disease or if a cat spends a lot of time outdoors. Cats that are fed canned or semi-moist diets receive much of their water intake from their food, and increased water intake will be harder to recognize.

RISK FACTORS

Diabetes mellitus is the second most common endocrine disease in cats. It is seen more frequently in middle-aged to senior cats and is more common in males than females. While the exact incidence is unknown, the number of diabetic cats is increasing at an alarming rate due to the tremendous increase in the number of overweight and obese cats. It is important to note that a cat three pounds over its ideal weight is considered obese, and that means the average domestic cat weighing 13 pounds or more is at high risk for developing type 2 diabetes mellitus.

DIAGNOSIS

Diabetes mellitus is diagnosed by the presence of the typical clinical signs (excess thirst, excess urination, excess appetite, and weight loss), a persistently high level of glucose in the blood, and the presence of glucose in the urine. The normal level of glucose in the blood is 80-120 mg/dl (4.4-6.6 mmol/L). It may rise to 250-300 mg/dl (13.6-16.5 mmol/L) following a large or high-calorie meal. However, diabetes is the only common disease that will cause the blood glucose level to rise above 400 mg/dl (22 mmol/L). Some diabetic cats will have a glucose level as high as 700-800 mg/dl (44 mmol/L), although most will be in the range of 400-600 mg/dl (22-33 mmol/L).

To conserve glucose within the body, the kidneys do not filter glucose out of the bloodstream into the urine until an excessive level is reached. This means that cats with normal blood glucose levels will not have glucose in the urine. Diabetic cats, however, have excessive amounts of glucose in the blood, so it spills into the urine. Once blood glucose reaches 180 mg/dl or more, the excess is removed by the kidneys and enters the urine. This is why cats and people with diabetes mellitus have sugar in their urine (glucosuria).

Definitive confirmation of feline diabetes mellitus may require a specialized test called a serum fructosamine test.

TREATMENT OPTIONS

Diabetes mellitus is a treatable condition. Although long-term treatment requires commitment and dedication, it can be rewarding to manage this condition successfully in a beloved cat.

Initial steps in treating a diabetic cat include removing potential predisposing causes for diabetes. For example, some medications predispose cats to develop diabetes, and withdrawal of these drugs may lead to resolution of the condition. Obesity is a risk factor for diabetes in cats so weight normalization may also lead to the resolution of diabetes in some cats.

Feeding Recommendations and Diet

To help keep diabetes under control and to prevent further damage, your cat needs to maintain a healthy weight. As with humans, a healthy diet and active lifestyle can make your cat's treatment more effective and improve the quality of life. Your veterinarian will determine your cat's ideal weight, and help find a low carb diet to help your cat achieve and maintain that weight. For best results at home, use a pediatric scale for the most accurate weight.

Insulin Therapy

Many insulin formulations are available that can be combined with an appropriate diet. Insulin is delivered by injection, and your veterinarian can teach you how to successfully test glucose levels and administer injections to your cat. Most cats require twice-daily injections. Many caregivers of cats with diabetes find that with practice, they are able to administer the insulin to their cats quite easily.

MONITORING

It is essential to monitor the treatment of diabetes mellitus to be sure the cat is doing well. Home monitoring of blood glucose is becoming more popular and more common, although part of treatment monitoring will involve periodic blood samples collected by your veterinarian.

To assist in the care of your cat, it is particularly valuable to keep accurate records of the following information:

Daily record:

- time of insulin injection
- amount of insulin injected
- amount and time of food fed and eaten, and at what time
- amount of water drunk

Weekly record:

- weight of the cat

In addition, it may be valuable to monitor the quantity of glucose passed in the urine as a guide to the effectiveness of the treatment. Glucose levels are best measured on urine that is passed during the night or first thing in the morning.

To collect cat urine, it is usually easiest to replace the regular cat litter with specially designed urine collecting pellets or with clean and washed aquarium gravel overnight. These materials will not soak up any urine, which can then be collected into a clean container for testing. Your veterinarian may provide you with test strips to dip into the urine and measure the sugar level. If there is a marked change in the amount of glucose in the urine or blood glucose levels, this may indicate the need to modify the insulin dose. Still, you should never change the dose of insulin without first discussing it with your veterinarian. Changes in insulin doses are usually based on trends in blood and urine glucose levels, as there usually is some day-to-day variation.

DIABETIC REMISSION

The primary goal of treating diabetes is to regulate blood glucose quickly and reach a point where the cat no longer needs insulin therapy. Diabetic remission occurs when a cat maintains a normal glucose level for more than four weeks without insulin injections or oral glucose regulating medications.

Not all cats go into remission, but those that do may stay that way for months or years. One estimate states that 17 to 67% of cats experience remission after insulin therapy. Other estimates predict remission is possible in 90% of cats.

The key factors in achieving remission are a quick institution of insulin therapy post-diagnosis and strict adherence to a low carbohydrate diet. Frequent monitoring with appropriate adjustments of insulin dosage increases the odds of remission.

What other factors impact remission?

- **Diet type**

Since canned food has fewer carbohydrates than dry food, moist diets are recommended, but low carbohydrate content is not the only dietary requirement of diabetic cats. There is a higher chance of remission if the food also has low fibre content. Many diabetic cats suffer from renal disease, so having a low phosphorus level in the diet is also important. A proper diet can result in better blood glucose control and reduce the amount of daily insulin needed.

- **Insulin and other glucose regulators**

The goal is to lower blood glucose levels without going too low (hypoglycemia). Calculated insulin doses paired with a consistently low carbohydrate diet (no cheating) helps balance blood glucose. Cats can enter remission while treated with any type of insulin; however, many doctors find that cats have better glycemic control with long-acting products.

There are several veterinary-approved insulin products available. In addition to the commonly used medications, there are a couple of newer drugs. Glargine is a human medication that is long-acting and maintains more consistent glucose levels.

Detemir is synthetic insulin that has a long duration of activity. Both of these newer insulin products can help promote remission in cats by achieving quick glucose control.

Acarbose is a medication that decreases the absorption of glucose from the intestinal tract into the bloodstream. It can be used with insulin or oral medications to achieve better overall glucose control. Acarbose is used in cats that cannot eat a low carbohydrate diet due to other medical conditions. Blood glucose is decreased significantly in cats eating high carbohydrate diets when acarbose is given twice as day orally.

- **Timing of glucose regulation and remission**

Unfortunately, the longer a cat is diabetic, the less likely remission will occur. Achieving glucose control quickly increases the chances of remission. Cats that have diabetes for more than six months are less likely to go into remission. This is because the increased blood glucose injures cells in the pancreas that produce insulin, preventing the cat's body from ever controlling glucose without an external source of insulin. One study found that cats with good glucose control within six months of diagnosis had a 60 to 80% chance of remission as compared to 30% for cats that started insulin therapy more than six months after diagnosis.

- **Body condition score**

Overweight cats are less sensitive to the effects of insulin, so cats with a healthy body condition score (5 out of 9) respond better to diabetes therapy. Obese diabetic cats should be fed a diet that promotes 1 to 2% loss of body weight per week. This slow, regulated weight reduction improves insulin sensitivity, may reduce the amount of insulin required, and increases the probability of long-term remission.

- **Other factors**

Cats that require a lower insulin dose to control glucose levels are more likely to enter remission, as are cats that become diabetic at an older age. Cats with low cholesterol levels also do better.

Staying in remission is likely, as long as the cat remains healthy and infection free and maintains a good body condition score while eating a low carbohydrate diet. Remission can happen! But, remember that diabetes is still a disease that is more likely to be controlled than cured.

DIABETIC KETOACIDOSIS

Diabetic ketoacidosis is a medical emergency that occurs when there is not enough insulin in the body to control blood sugar (glucose) levels. The body can't use glucose properly without insulin, so blood glucose levels get very high, and the body creates ketone bodies as an emergency fuel source. When these are broken down, it creates byproducts that cause the body's acid/base balance to shift, and the body becomes more acidic (acidosis), and it can't maintain appropriate fluid balance. The electrolyte (mineral) balance becomes disrupted, which can lead to abnormal heart rhythms and abnormal muscle function.

If left untreated, diabetic ketoacidosis is fatal

The clinical signs of diabetic ketoacidosis are:

- Excessive
- thirst/drinking
- Increased urination
- Lethargy
- Weakness
- Vomiting
- Increased respiratory rate
- Decreased appetite
- Weight loss (unplanned) with muscle wasting
- Dehydration
- Unkempt haircoat

These same clinical signs can occur with other medical conditions, so it is important for your veterinarian to perform appropriate diagnostic tests to determine if diabetic ketoacidosis is indeed the issue at hand.

DIABETIC DIETS

As mentioned before, diabetic cats should eat a low-carbohydrate, high protein diet. If your cat is overweight, the amount should be tailored to help with weight loss.

Some other guidelines for feeding diabetic cats are:

- Obese cats should not lose more than 2% of their body fat per week. Losing more than this can put them at risk for lipidosi, a form of liver failure.
- The food should be relatively high in arginine. This is an amino acid that stimulates the pancreatic cells that create insulin.
- The food should be relatively high in L-carnitine, a biochemical that helps to transport fats in cell to help with metabolism.

There are several therapeutic diets that have been created explicitly for diabetic cats, including Purina Pro Plan Veterinary Diets DM Diabetic Management and Hill's MD Glucose/Weight Management.

Please feel free to ask your veterinarian or our nutritional advocate for advice on starting a new diet.

ADMINISTERING INSULIN

There are step-by-step guides for each of the tools needed to check blood sugars and administer insulin.

We have compiled a list of video resources for you to watch below. Click on any of the titles to be taken to the associated page.

[Caring for your diabetic cat collection of videos](#)

[How to administer insulin to your cat](#)

[How to test your cat's blood glucose at home](#)

[Merck Caninsulin Pen Tutorial Video](#)

There are also worksheets available to help you track glucose curves and home care from the American Animal Hospital Association.

[Glucose Curve Worksheet](#)

[Homecare Diary for cats](#)

KEEP IN TOUCH

Caring for a diabetic cat means that you will play an essential role in the treatment plan laid out by your veterinarian. Please take some time to consider your ability to monitor and provide insulin therapy. We will work with you on an individualized treatment plan for your cat that meets your comfort level.