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DIABETES

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The role of the pancreas

The pancreas is the organ that secretes insulin, a hormone that makes glucose and other important molecules enter organs. These molecules serve as fuel for them to perform their functions.

Types of diabetes

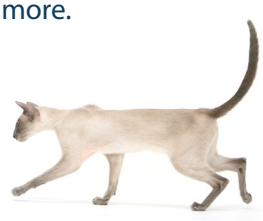
Two types of diabetes exist: I and II. With type I, the pancreas does not produce enough insulin. With type II, the pancreas produces insulin, but it is ineffective: the cells do not respond to it. In cats, type II is more common.

The chronic excess of glucose is toxic for organs, including the pancreas. Over time, less and less insulin is secreted. Type II diabetes, possibly reversible, then becomes type I, which is irreversible.

Symptoms

"Uncomplicated" diabetes

Without insulin, the various fuels do not enter the organs' cells. These are then deprived of food. Result: the cat is hungry and eats more.



The body draws on its reserves of glucose, fat and proteins to produce the glucose, fatty acids and amino acids it needs: the cat loses weight.

The excess glucose gets in urine and attracts water: the cat pees more.

Because he pees more, he becomes thirsty: he drinks more water.

Those 4 symptoms are most often observed at the onset of the disease. At this point, cats often don't "look sick". However, complications will appear if they are not treated.

Hind limb weakness
- Walking on heels
- Difficulty jumping

Skin infections
- Itching
- Oily and dull coat
- Crusts, scabs, pimples, etc.

Urinary tract infections
- Sticky, bloody and foul smelling urine
- Pain while peeing
- Frequent trips to the litter box
- Frequent production of small amounts of urine
- House soiling

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"Complicated" diabetes

Without insulin, fat tissue breaks down and produces fatty acids that are transformed into ketone bodies. These are toxic and they poison the cat when there are a lot of them. This is called ketoacidotic diabetes or "complicated" diabetes. The animal, which was doing fairly well before, becomes very ill.

Here are the typical symptoms:
- Depression and weakness
- Dehydration
- Loss of appetite
- Vomiting
- Diarrhea
- Collapse
- Death

Cats who develop ketoacidotic diabetes must be taken to the vet immediately!!!

Risk factors

Certain factors predispose cats to diabetes and interfere with treatment because they prevent insulin from working in the organs:
- Obesity;
- Aging;
- Gender: males develop diabetes more often than females;
- Certain medications (eg cortisone);
- Certain diseases (eg hyperthyroidism, chronic pancreatitis, etc.).

How is diabetes diagnosed?

The diagnosis is usually confirmed when great quantities of glucose are found in a symptomatic cat's urine and blood. However, stress can also cause glucose levels to increase. To differentiate stress from the disease, fructosamine can be measured.

Fructosamine

Fructosamine is a protein that attaches to excess glucose in the blood. Its level increases when this excess lasts for 6 to 12 hours. Fructosamine represents the previous two to three weeks' average glucose level. A recent stress should therefore not influence it.

Managing concurrent diseases

It is important to try to identify and eliminate risk factors mentioned before by doing additional tests. For example:
- **A blood test.** To detect anemia, pancreatitis, inflammation or infection and to check the condition of the kidneys, liver, thyroid gland, etc;
- **A urinalysis.** To detect infection, stones, abnormal cells, etc.;
- **A blood pressure measurement.**

How is diabetes treated?

Cats that do not eat, that vomit, that are weak or that are dehydrated need to be hospitalized.

At home, they will have to receive insulin, have their weights managed, eat diabetic food and have their environment enriched.

Insulin

Several types of insulin exist. The difference between them is mainly related to their speed and duration of action.

ProZinc® (Protamine Zinc insulin) and Lantus® (glargin insulin) are the two insulins mainly used because they control blood sugar levels better than others in most cats. They have to be administered subcutaneously, twice a day, with a syringe that is compatible with the insulin prescribed.

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Weight control

Energy needs

A cat's energy needs represent the amount of calories that he must consume to be able to practice his daily activities (eg sleeping, eating, playing, exercising, etc.). By knowing how many calories cats need, we can determine precisely how much food they should eat to reach and keep a healthy weight. Obese cats should lose 1% of their weight each week.

Exercising

Diabetic cats need to be more active. If they are obese, exercising will help them lose the excess weight. If they are too thin, it will help them build muscle mass. In addition, physical activity improves the action of insulin and reduces stress. Toys and interactive feeders, cat teasers, and exercise wheels are good ways to get cats to exercise more.

Nutrition

Food

Diabetic cat food is high in proteins and low in sugar, which is more appropriate for carnivores than most commercial cat food, often too rich in sugar and fiber.

Specifically, diabetic food helps control diabetes because it:

- **improves glucose metabolism and use;**
- **increases insulin secretion and facilitates its action;**
- **helps obese cats lose weight.**

Canned food controls diabetes more effectively than dry food because it contains less sugar and more water. Water takes up space in the stomach, which helps to relieve cats' hunger. Furthermore, water provided by food improves their hydration and helps replace the one lost in urine.

Cats should eat several small meals during the day to keep their blood sugar levels as stable as possible.

Treats

Many treats available on the market are also high in sugar and calories. To avoid affecting the disease's management and their weight loss, cats shouldn't eat too many of them.

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Does your cat eat treats? Let his vet know, so that he or she can make sure they are compatible with his treatment. If not, he or she will recommend tasty ones suitable for his condition and will calculate how much he is allowed to eat.

Interactive feeders

An interactive feeder is a special bowl or a toy into which kibbles or treats are put. Cats have to get them out to eat them. They lose weight more easily because they:

- exercise more;
- eat only small portions of food at a time, thus preventing large amounts of sugar from getting in their blood all at once and turning into fat;
- eat more slowly, which facilitates digestion and the sensation of fullness.

Environmental enrichment

Enriching diabetic cats' environment consists of creating a living space that will help them lose weight, reduce stress and improve their physical and mental well-being:

- Create hunting conditions inside (eg. shelves to climb on, boxes to hide in and observe, mobile toys to attack).
- Respect their need for solitude and interactions.
- Stimulate their senses of touch (eg. scratching post) and vision (eg. mobile toys).
- Avoid overstimulating their senses of smell and audition with perfumed litter and loud music.
- Provide mental stimulation (eg. interactive feeders).

Clinical remission

Up to 70% of diabetic cats reach clinical remission, meaning that their symptoms disappear. This can be possible if they are treated with insulin, if they eat diabetic food, if their weight is managed correctly and if they do not suffer from a disease that can interfere with the action of insulin.

The chances of achieving remission are higher if:

- the disease started less than 6 months before;
- small doses of insulin are sufficient to keep glucose levels under control;
- they do not have muscle weakness;
- they eat canned food rather than dry food.

Once in remission, cats no longer need insulin. However, they must continue to eat diabetic food throughout their lives, otherwise the diabetes will return. In less than a month in 95% of cases.

Treatment complications

Giving insulin to cats can cause hypoglycemia, an important decrease in their blood sugar level. This can happen if the dosage prescribed is too high, if too much is taken from the bottle or if the cat is in remission.

Here are the symptoms to watch out for:

- Depression and weakness
- A staggering gait
- Dizziness
- Stiffness
- Seizures
- Coma
- Death in severe cases

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It is practical to have a blood glucose meter at home to monitor cats' glycemia. If a cat shows at least one symptom listed above and his blood sugar level is below 3.5 mmol/L, he should be given 1 tbsp. of corn syrup or honey to drink every 10 minutes until his blood sugar level reaches at least 4 mmol/L. If he is unable to swallow, the syrup or honey should be applied on his gums.

If you don't have a blood glucose meter at home, give him the syrup or honey anyway. Just in case. Again every 10 minutes until he gets back to his normal self.

Immediately contact a veterinarian to find out what to do next.

Monitoring

Cats' response to treatment is not the same for all of them. Monitoring the progression of the disease must therefore be adapted to each animal.

It is mainly their symptoms, their weight, their blood and urine glucose levels, as well as their fructosamine, that are closely monitored.

The blood sugar curve

Doing a "blood sugar curve" consists of measuring the glucose level a few times during a day. The goal is to check that the insulin dose is adequate: neither too low nor too high.

The curve can be performed at the clinic by the medical staff or at home by the owner. At home is ideal because it prevents the stress of the visit from artificially raising the blood sugar level. The results should be noted, along with the meal and insulin administration times, and forwarded to the veterinarian. He or she will analyze them and adjust the insulin dosage if needed.

When should a blood glucose curve be done?

About 10 days after starting treatment or changing the insulin dosage or type, if hypoglycemia occurs and if symptoms recur after remission.

When diabetes appears to be under control, glucose levels can be checked at random, regularly. If the glycemia is too high or too low, a glucose curve needs to be done.

How is cats' blood sugar level measured at home?

Two devices are available on the market: the AlphaTRAK$_2$® glucose meter and the FreeStyle Libre® System.

AlphaTRAK$_2$® glucose meter

FreeStyle Libre® Glucose Monitoring System

AlphaTRAK$_2$®

The AlphaTRAK$_2$® is a blood glucose meter designed for animals that measures the amount of glucose in a drop of blood. In cats, it is taken on the ear.

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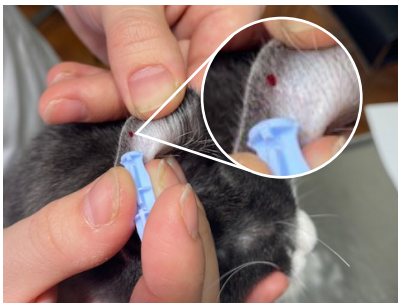
How does the AlphaTRAK$_2$® work?

The person pricks the vein that runs along the ear's edge.



A small drop of blood appears.

The person puts one of the black areas on each side of the strip in contact with the drop of blood.

At the beep, the blood glucose level appears in the device's window.

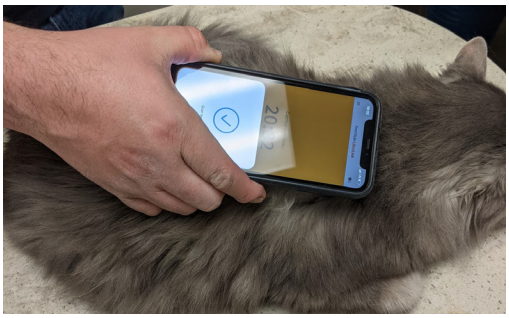
The FreeStyle Libre® Glucose Monitoring System

The FreeStyle Libre® Glucose Monitoring System includes a sensor and a scanner. Sweeping the scanner in front of the sensor glued to the cat's skin provides his blood sugar level. The device records 4 glycemias per hour during an 8 hour period. Each sensor works for 14 days.

This instrument is designed for humans, but it is used more and more in animals. The sensor is generally well tolerated and no pricking is required. In addition, it automatically generates the blood glucose curve, records daily data and provides weekly summaries in easily readable graphs.

How does the FreeStyle Libre® Glucose Monitoring System work?

The sensor is glued to the cat's skin.



The person sweeps the scanner in front of the sensor.

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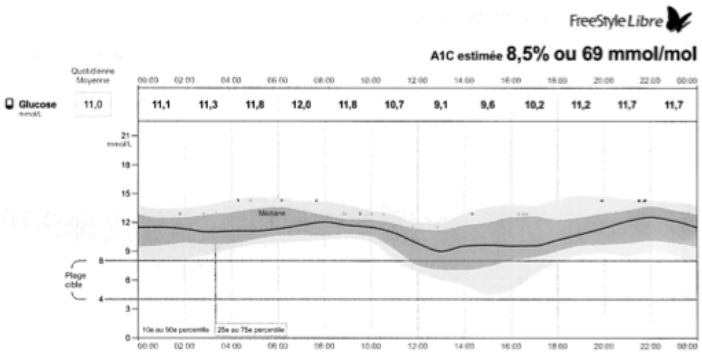
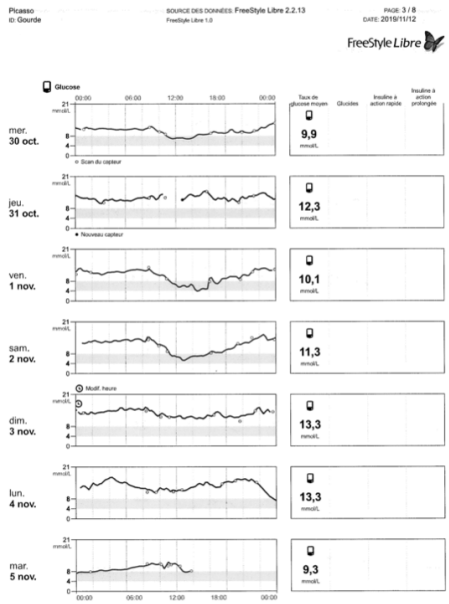
The blood glucose level shows up in the scanner's window.



Example of a typical blood glucose curve.



Example of a typical weekly data summary.

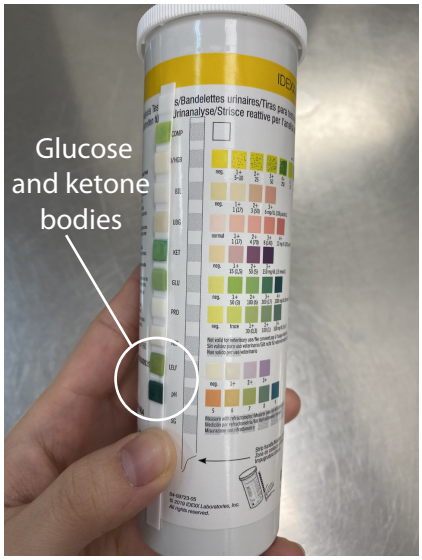
Fructosamine

Checking fructosamine levels after starting treatment can help determine if the diabetes is under control or not. However, several measures need to be taken and compared to correctly interpret the results. Indeed, fructosamine levels can be normal, even if glycemia is very high many times during the day.

Urine glucose

When blood glucose exceeds a certain limit, it ends up in urine. Thus, checking the cat's urine for glucose regularly at home might give a clue as to the quality of his diabetes control. Large and persistant amounts of glucose in urine suggests that it is not under control. In that case, the veterinarian must be informed.

It is important not to change the insulin dosage without first getting his or her approval.



Urine test strip showing the presence of glucose and ketone bodies.

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Additional exams

It is important for a veterinarian to examine the cat and perform blood and urine tests twice a year after starting treatment. To make sure that his or her patient has not developed any condition that could interfere with the action of insulin. Even if he is doing well or is in remission.

Anesthetizing diabetic cats

Even cats with diabetes sometimes need to be anesthetized. Additional precautions are necessary to ensure their safety during anesthesia:

- **Fasting from food.** Six hours maximum vs. 12 hours for non diabetic cats.
- **Intravenous fluids.** With added sugar.
- **Measurement of blood glucose before anesthesia.** Depending on the result, no insulin or only half the dose is given.

The final word

Diabetes is common in cats, especially when they are obese. The best way to avoid this disease is to keep them from getting fat. Specifically, this means giving them limited amounts of food and making them exercise. Fortunately, the remission rate is good when we treat them early on in the course of the disease with insulin and diabetic food, control their weight and enrich their environment.

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Insulin handling

Keep the vial in the refrigerator.

Invert the vial a few times to mix the product. Don't shake it.

Draw the liquid and tap the syringe's end to expel the air bubble that entered it during sampling.

Lift the skin on the side of the cat's thorax to form a small "tent" and insert the needle at its base. If it is well positioned under the skin, and not in its thickness, it should move freely.

Slightly withdraw the plunger. If no blood comes, inject the insulin.

Change the injection site and syringe each time. Do not throw it in the trash. Rather, bring it back to us. We will dispose of it safely.

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Recommendations

Diabetes monitoring recommendations for_____

Diabetes monitoring							
Date (DD-MM-YYYY)	Insulin / Syringe	Posology and route of administration	Food	Amount of food and number of meals per day	Weight Body score	Prescribed by Dr.	Procedures to be done

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