

Home-monitoring of blood glucose at dogs and cats with diabetes mellitus

Easy to learn with a tremendous profit

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Blood glucose monitoring and documentation of blood glucose profiles by the pet owner are valuable tools to improve therapy of diabetic dogs and cats on a long-term basis. Regularly performed in therapy of human diabetics, numerous studies have clearly proofed also the benefit in insulin-dependent pets.

A remission rate at cats of more than 80% is possible through tight blood glucose control by the pet owner (Roomp und Rand, 2009, 2012). All studies done up to now have shown, that measurements at the ear (Wess und Reusch, 2000, Casella et al., 2002, 2003, Van de Maele et al., 2005) or at the paw (Zeugswetter et al., 2010, Borin-Crivellenti et al., 2012) are well tolerated by most of the dogs and cats and pet owners don't have no reason to worry they would injure their pets or to cause pain to them. Occurrence of hematomas is principle possible but is not seen frequently (Casella et al., 2002).



getting a blood sample for a measurement at the ear

Whereas the blood glucose test by means of old glucometers has been difficult due to the high need of the blood sample volume of > 1 µl and led to many failed attempts, new devices require not more than 0,5 µl blood. The pinhead-sized drop can be gained within some seconds after a short massage or warming of the ear/paw. Sometimes two punctures are useful to get enough blood volume

(Zeugswetter et al., 2010, Borin-Crivellenti et al., 2012).

The operation of the new lancing devices and glucometers is easy and can be learned by most pet owners without any problem (Van de Maele et al., 2005). If the pet is nervous a second person might be helpful to keep the pet quiet (Casella et al., 2004, Van de Maele et al., 2005). The correct performance of the measurement has to be trained and especially in the beginning some patience is required.

Pet owners are willing to perform regular blood glucose tests over years (Kley et al., 2004, Reusch et al., 2006). The study of Kley et al (2004) proofed that the option of home-monitoring of blood glucose – given that the pet owner received a good training and support from the veterinarian doctor – led to a clear increase of self-confidence of the pet owner in taking care for a diabetic pet.

The documentation of daily blood glucose profiles allows judgment of power and duration of the action of insulin and will help to detect hypoglycemic episodes prior to occurrence of clinical symptoms.

To avoid hypoglycemia therapy will be started with a low insulin dose (mostly 0,25 I.E./kg/injection) and every 3-4 days dose will be increased in little steps. The adjustment of the dose is primarily performed due to the lowest blood glucose result during one day, the Nadir.

Comparison studies between daily blood glucose profiles under clinic or home conditions have surprisingly shown that results measured in the clinic at diabetic dogs (Casella et al., 2003) and cats (Casella et al., 2005) have been with some exceptions significantly lower than the results measured at home. This outcome was especially surprising at cats as false high results would have been expected due to stress-related hyperglycemia. As a main reason decreased intake of food and changed activity habits are discussed.

The results measured under clinic conditions from the study of Casella et al. (2005) would have led to an opposite dosage recommendation at least at every third cat. An additional problem at hospitalized patients is the strong day-to-day variability even when food and insulin dosage stay constant (Fleeman and Rand, 2003).

Due to the above mentioned reasons measurements should be – so far as possible - performed at home and through the pet owner (AAHA Diabetes Management Guidelines, Rucinsky et al., 2010).

Especially at cats with a disease similar to human type 2 diabetes, the need of insulin can change rapidly within a short timeframe.

The start of the therapy with insulin and diet leads to a recovery of the exhausted insulin-producing β -cells and the lowered concentration of glucose and lipids in blood lead to less damage of the insulin receptors. 3-4 days after

start of the therapy first hypoglycemic episodes can occur even when insulin dosage stays the same. A similar rapid decrease of the need of insulin can be seen at diabetic female dogs after



Blood measurement at the cat's ear

castration or after the youngs are casted (Fall et al., 2008).

Symptoms like mydriasis, nervosity or stagger (hypoglycemic cramps occur only rarely) can often be detected only when intensively surveyed and will lead then to a strong hormonal counter regulation, the so-called Somogyi phenomenon (Feldman und Nelson 1983, 2004).

During this phase hormones like glucagon, adrenalin, noradrenalin, cortisol and growth hormones are produced which will lead to an insulin resistency lasting up to some days. If the pet is presented at the veterinarian doctor short time after a hypoglycemia, blood glucose concentration is mostly high again and no reaction to insulin can be seen. As episodes of hypoglycemia last only for a short time and the following hyperglycemia will stay long-term, glucose can be detected in the urine and the long-term parameter "Fructosamin" will be high.

The veterinarian doctor faces now the problem not to be able to see, if the dose of insulin is too high or too low. In this case overdosing of insulin can be detected only by a significant reduction of the dose (mostly > 50%) in combination with home-monitoring. Significant reduction of the insulin dose will lead then to a paradox improvement of the blood glucose level.

Hypoglycemia often occurs at cats with loss of appetite, kidney problems and contemporary treated hyperthyreosis. At dogs hypoglycemic episodes

often occur at contemporary other diseases with poor food intake or food denial.

When evaluating a daily blood glucose profile it is difficult to distinguish between a Somogyi phenomenon and too short insulin action. This can be seen frequently at cats when treated with Lente insulins (e.g Caninsulin®). After a significant decrease of glucose blood sugar level will rise rapidly and will reach the initial value after a few hours. A single blood glucose test in the evening or in the morning will lead to the wrong diagnose "insulin resistency". Dangerous increase of the insulin dosage are the consequence.

Even if regular blood glucose testing and documentation in form of daily profiles is recommended by all endocrinologists there is no general protocol. This uncertainty results from the lack of prospective studies.

The guidelines of the American Animal Hospital Association (Rucinsky et al., 2010) recommend the documentation of daily blood glucose profiles at persisting polyurea/polydypsia, signs of hypoglycemia, symptoms of bad clinical control, 2 weeks after a dose adjustment and once a month. At the start of the therapy experts recommend additional weekly measurements at the cat (6-8 hours after insulin injection) and weekly blood glucose daily profiles at the dog (measurement every 2 hours). These statements refer especially to the use of Lantus® at the cat and Caninsulin® at the dog. The target for dogs and cats is a Nadir between 80 and 150 mg/dl.

It is important to use validated glucometers. Many meters developed for human use measure significantly too low values and could eventually lead to a chronic underdosing of insulin (Zeugswetter et al., 2007).

If this Nadir cannot be achieved by insulin doses of 1-1,5 I.E./kg/injection, this means „insulin resistancy“ and further investigation is necessary. At cats one has to consider if the reason is acromegaly in such cases.



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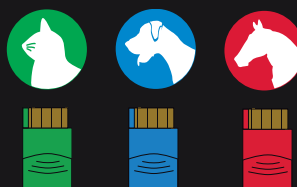


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