

TREATMENT OF DIABETIC CATS WITH INSULIN AND DIET – A REVIEW

INSULINOTERAPIA E DIETA NO TRATAMENTO DE FELINOS DIABÉTICOS – REVISÃO DE LITERATURA

K. P. APTEKMANN^{1*}, U. C. GUBERMAN², W. G. SUHETT²

SUMMARY

Diet and several types of insulin have been used for the treatment of diabetic cats to achieve a good glycemic control. A long-acting insulin analogue, glargine, is reported to be associated with substantially improved diabetes remission rates in cats, mostly associated with diets containing high protein and low carbohydrate.

KEY-WORDS: Diabetes. Feline. Management.

RESUMO

A dieta e diversos tipos de insulina são utilizados no tratamento de gatos diabéticos para a obtenção de um bom controle glicêmico. A insulina glargina, considerada um análogo da insulina de longa ação, tem apresentado resultados muito satisfatórios, podendo induzir à remissão da doença, principalmente quando associada à dieta contendo altos níveis protéicos e baixos níveis de carboidratos.

PALAVRAS-CHAVE: Diabetes. Gatos. Terapia.

¹ Professora Adjunta do Departamento de Medicina Veterinária do Centro de Ciências Agrárias da Universidade Federal do Espírito Santo, Alegre – ES. Caixa Postal 16, Guararema, Alegre – ES, CEP: 29.500-000. E-mail: kapreising@yahoo.com.br

² Acadêmico do Curso de Medicina Veterinária do Centro de Ciências Agrárias da Universidade Federal do Espírito Santo, Alegre – ES.

INTRODUCTION

Diabetes mellitus is a common endocrine disease in cats whose most frequent clinical signs are polydipsia, polyuria, polyphagia and weight loss (FELDMAN, 2004). Type 2 diabetes accounts for 80% to 95% of cases in diabetic cats (RAND & MARSHALL, 2005) and is related to the process of insulin resistance, characterized by an impaired ability in the secretion and/or action of this hormone (RAND & MARSHALL, 2005).

The goals while treating diabetes include reducing postprandial hyperglycemia, controlling weight, improving peripheral insulin sensitivity, preventing therapy complications, keeping nutrient support and coordinating peak of nutrient use and insulin activity (MARTIN, 2000).

Insulin also offers the most effective form of treatment of diabetic cats (NELSON, 2005; MARSHALL, et al., 2008) and when associated with a proper diet improves glycemic and body weight control, which can result in remission (FRANK, et al., 2001; MAZZAFERRO, et al., 2003; KIRK, 2006). Remission may occur by the return of the β pancreatic cells to function, resulting from the reversal of the toxicity caused by hyperglycemia and/or an improvement of peripheral insulin resistance (RUCINSKY et al., 2010). Fifty to sixty percent of the diabetic cats adequately treated can have remission of diabetes (BENNETT, et al., 2006; MARSHALL, et al., 2009).

This review presents a discussion on the use of insulin and diet to treat diabetes in cats, in order to assist the veterinarian in the management of diabetes and to help increase disease remission rates.

LITERATURA REVIEW

Insulin therapy

Many types of insulin are used to treat diabetic cats, including PZI (*Protamine Zinc Insulin*), Ultralente, Lente, NPH (*Neutral Protamine Hagedorm*) and glargine (RAND & MARTIN, 2001; MARSHALL, et al., 2009). Recently, however, the treatment guide of diabetic cats of "American Animal Hospital Association" (AAHA) recommends the use of long-acting insulin such as glargine and PZI (RUCINSKY et al., 2010). The Ultralente insulin is no longer commercially available and PZI is not marketed in Brazil.

Short action insulin, such as NPH and Lente, do not provide a good glycemic control and increase the risk of hypoglycemia in cats (RAND & MARSHALL, 2005; MARSHALL, et al., 2008). Although the veterinary formulation of Lente insulin (Caninsulin®; Intervet) has proven to be effective on glycemic control, this action is short lived and has little control of the clinical signs in most diabetic cats (MARTIN & RAND, 2001; MARTIN & RAND, 2007).

Insulin glargine is an analogue of the long-acting insulin (NELSON, 2005). The first reports of its use in cats were published in 2004 and 2005 (MARSHALL &

RAND, 2004b; MARSHALL & RAND, 2005), however, after four years glargine has become widely used to treat diabetic cats, especially in the USA (APTEKMANN, et al., 2009). Despite being indicated for humans, Lente insulin long action is associated with higher diabetes remission rates in cats compared to other types of insulin used (MARSHALL et al., 2009; ROOMP & RAND, 2009). Average time needed for remission, after treatment begins associated with dietary management, ranges from one to four months (MARSHALL & RAND, 2004a; MARSHALL, et al., 2009).

Although a study by Weaver et al. (2006) showed no difference in efficacy between Lente insulin and glargine, another study has shown that glargine was more effective in inducing remission of diabetes in cats (MARSHALL, et al., 2009). Glargine was administered once a day in the first study (WEAVER et al., 2006) and every 12 hours in the second (MARSHALL et al., 2009). Therefore, administration every 12 hours appears to be important to increase effectiveness of insulin and improve glucose control, as observed in other studies (RAND & MARSHALL, 2005; MARSHALL, et al., 2008).

The recommended dose of glargine is 1 U per cat every 12 hours. If after beginning therapy, the clinical signs improve and absence of ketonuria is observed, the initial dose should be maintained. If blood glucose level is lower than 150 mg/dL, the dose should be diminished to 0.5 U per cat every 12 or 24 hours. To determine whether there was remission of diabetes, glargine administration may be discontinued, clinical signs should be closely monitored and presence of glycosuria should be verified. If clinical signs persist or worsen after initiation of therapy, the dose should be increased to 2 U per cat every 12 hours (RUCINSKY et al., 2010).

The assessments for the subsequent dose adjustment should be made based on clinical signs, presence or not of glycosuria and/or ketonuria, blood glucose values determined six to eight hours after glargine administration and serum fructosamine (RUCINSKY et al., 2010).

Although the reports on the use of glargine are quite recent, it should be noted that its effectiveness and easiness to find in the market, has made this type of insulin treatment, the treatment of choice for diabetic cats.

Dietary treatment

Cats are carnivore and protein is considered the main energy source for the species. Therefore, they have higher quantities of the enzymes necessary to obtain the energy present in the protein sources, and less of the enzymes used to convert glucose into energy, which makes the hepatic metabolism of carbohydrates for energy insufficient (KIRK, 2000).

Diabetic cats should be fed *ad libitum* or with multiple small meals throughout the day, depending on the food habits of the species and reduction of postprandial hyperglycemia (MARTIN & RAND, 1997; KIRK, 2000).

Obesity in cats is considered to be a risk factor for developing type 2 diabetes (McCANN, et al., 2007; PRAHL, et al., 2007), due to the development of insulin resistance and consequent hyperinsulinemia. This process is reversible, so diet to control weight is very important in the management of diabetes in obese cats (APPLETON, 2001).

The dietary therapy is recommended for all diabetic cats regardless of body condition or other type of treatment applied (RUCINSKY et al., 2010). The diet should be directed to minimize postprandial hyperglycemia and correct obesity (NELSON, 2005). Diets containing high levels of fibers and moderate levels of carbohydrates (BENNETT et al., 2006; KIRK, 2006) or high protein and low carbohydrate (BOARI et al., 2008; RUCINSKY et al., 2010) are recommended for diabetic cats.

The use of high-fiber diets for glycemic control in diabetic cats is based on studies in human medicine that show a decrease of intestinal carbohydrates and altered insulin sensitivity in peripheral tissues (COSTACOU & MAYER-DAVIS, 2003). Fiber-rich diets have been more effective in lowering blood glucose compared to those low in fiber, but no difference was noted in the concentration of glycated hemoglobin and insulin requirement (NELSON, et al., 2000).

Diets with low carbohydrate and high protein levels were more effective in reducing dependence on exogenous insulin administration and improving glycemic control in diabetic cats compared to diets containing high levels of fibers and moderate levels of carbohydrates (FRANK, et al., 2001; MAZZAFERRO, et al., 2003; BENNETT, et al., 2006).

Diabetic cats may show loss of amino acids in the urine, low uptake of amino acids and increased protein catabolism by hepatic gluconeogenesis; however, these patients may be favored by the consumption of high protein diets (KIRK, 2006).

Diets containing low levels of carbohydrates may optimize glycemic control in Type 2 diabetes by decreasing hyperglycemia and assisting in the recovery of glucose toxicity in cats (MAZZAFERRO, et al., 2003). Studies show that diabetic cats fed low carbohydrate moist diets had lowered blood glucose and serum fructosamine levels, thus the required exogenous insulin also decreased (FRANK, et al., 2001; MAZZAFERRO, et al., 2003).

Studies conducted with newly-diagnosed diabetic cats treated with glargine and fed diet containing high protein and low carbohydrate levels resulted in high remission rates (MARSHALL & RAND, 2004a; BOARI, 2008; ROOMP & RAND, 2009).

CONCLUSIONS

Based on this information, it can be suggested that the use of glargine combined with diet containing high protein and low carbohydrate levels should be considered as the preferred treatment for diabetic cats because of their effectiveness in disease remission rates.

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