

Symposium 2: Nutrition and Chronic Disease – Part B

Diet in the prevention of diabetes and obesity in companion animals

JS Rand, HA Farrow, LM Fleeman, DJ Appleton

Centre for Companion Animal Health, School of Veterinary Science, The University of Queensland, St Lucia, QLD 4072

Background - Diabetes in dogs occurs predominantly via a type 1 mechanism, whereas in cats, type 2 diabetes is most common. Investigations of diet in the prevention of diabetes and obesity in companion animals has focused on the calorie density of food; the ratio of carbohydrate, fat, and protein; the carbohydrate source; the source and amount of fibre; and dietary supplements. Prevention of diabetes has mostly focused on dietary manipulations in cats that minimise insulin and glucose concentrations, thus reducing the demand on beta cells to produce insulin.

Review - Dietary carbohydrate content has the greatest effect on blood glucose and insulin concentrations. In healthy cats, a high carbohydrate diet (carbohydrate 47%, protein 25%, fat 26% of calories) is associated with 20-32% higher peak postprandial glucose concentrations than a moderate carbohydrate, high protein diet (carbohydrate 27%, protein 46%, fat 26% of calories).¹ In diabetic cats, the insulin dose was reduced, and in some cats eliminated, when the diet was changed from moderate carbohydrate (23% of calories), high fibre (10.7% DM) to a low carbohydrate (6.5% of calories), high protein (46% of calories) diet.²

Dietary fat content affects insulin sensitivity in cats. A high fat diet (>46% of calories) is associated with higher insulin-to-glucose ratios, indicative of lower insulin sensitivity, than diets lower in fat (<25% calories). Evidence suggests that low fat diets may improve insulin sensitivity by decreasing non-esterified fatty acid and betahydroxybutyrate concentrations, which inhibit insulin action.³ Carbohydrate source and processing methods influence postprandial insulin concentrations. In cats and dogs, certain carbohydrates, including rice, have been shown to have higher glycaemic indices than others, such as sorghum or corn; that is, they produce a larger postprandial glucose and insulin rise.⁴

Although increased dietary fibre was initially shown to be beneficial in dogs and cats, several recent studies have shown no benefit compared to moderate fibre diets typical of most commercial foods.⁵ Several other dietary manipulations aimed at preventing or treating obesity and diabetes have recently been investigated in cats and dogs with promising results. These include vitamin A, chromium, and carnitine supplementation.

Conclusion - Consumption of diets with low carbohydrate, high protein, and moderate fat content may be advantageous for prevention and management of obesity, impaired glucose tolerance, and diabetes in cats and dogs. Use of low glycaemic index carbohydrates and supplementation with carnitine, chromium, and vitamin A may also be advantageous.

References

1. Farrow HA *et al.* The effect of high protein, high fat or high carbohydrate diets on postprandial glucose and insulin concentrations in normal cats (Abstract). Annual Veterinary Medical Forum of the American College of Veterinary Internal Medicine (ACVIM), 2002. Dallas, USA.
2. Frank G *et al.* Use of a high-protein diet in the management of feline diabetes mellitus. *Veterinary Therapies*, 2001; 2 (3): 238-246.
3. Farrow HA *et al.* Low fat diets reduce plasma non-esterified fatty acid and betahydroxybutyrate concentrations in healthy cats (Abstract). Charlotte, USA: ACVIM, 2003.
4. Bouchard GF, Sunvold GD. Implications for starch in the management of glucose metabolism. In *Current perspectives in weight management*. Denver, USA: ACVIM, 2001.
5. Fleeman, LM, *et al.* Diets with high fiber and moderate complex carbohydrate are not advantageous for diabetic dogs compared to a commercial diet with moderate fiber and low complex carbohydrate (Abstract). Charlotte, USA: ACVIM, 2003.