Effect of 12-week, intentional caloric restriction, using a novel veterinary diabetic diet suitable for weight reduction, on remission and glycemic control in overweight, insulin-treated diabetic cats: a dual-center, prospective and randomized control trial.

Discover a novel diet aimed at supporting diabetic patients through weight loss and more. Meet **GLYCOADVANCED™**, a diet formulated with an **INCREASED NUTRIENT-TO-CALORIE RATIO** and designed to enable **SAFE CALORIC RESTRICTION IN OVERWEIGHT DIABETIC CATS**, with **REDUCED STARCH CONTENT** to promote glycemic control and improve the likelihood of diabetic remission.

OBJECTIVE

The purpose of this study was to assess the **IMPACT OF CALORIC RESTRICTION WITH A PURPOSE-FORMULATED DIABETIC DIET** on remission and glycemic control in overweight diabetic cats.

TRIAL PROTOCOL

A dual-center, prospective and randomized control trial involving overweight (body condition score [BCS] ≥ 6/9), client-owned, insulin-treated cats with diabetes mellitus (DM).

STUDY SITES

- University of Copenhagen, Denmark
- Royal Veterinary College, London, UK

SELECTION CRITERIA

INCLUSION CRITERIA AT SCREENING

- ✓ Adult cat (>1 year of age) with BCS ≥ 6/9
- ✓ Duration of DM >4 weeks and <24 months
- ✓ Treated with protamine zinc insulin for at least 3 weeks
- ✓ If previously in remission, relapse and insulin dependent >1 month
- ✓ Not deemed to be repeatedly cycling between remission and relapse
- ✓ Not deemed to be at risk of complications (e.g. diabetic ketoacidosis (DKA), hypoglycemia)
- ✓ No glucocorticoid treatment within 4 weeks prior to diagnosis or between recruitment and inclusion
- ✓ No concurrent uncontrolled hyperthyroidism, pancreatitis or gastrointestinal signs
- ✓ No evidence of liver disease, adrenal disease, hypersomatotropism or food intolerance
- ✓ If present, chronic kidney disease IRIS stage ≤2

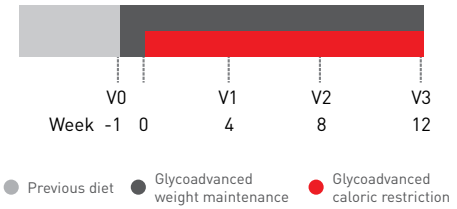
EXCLUSION CRITERIA POST INCLUSION

- × Cat not eating the novel diet
- × Lacking owner compliance
- × Cat is fearful or anxious with handling
- × Severe clinical signs of illness

STUDY DESIGN

- **Both groups were fed ROYAL CANIN® GLYCOADVANCED™**, a diet purpose-formulated to support the regulation of blood glucose and to be suitable for weight reduction and weight maintenance in cats with diabetes.
- **The control group was fed for weight maintenance, and the intervention group underwent caloric restriction** aiming to achieve weight reduction of 2% body weight weekly.

STUDY DESIGN (CONTINUED)



- Inclusion visit (V0) at week -1; full clinical examination by participating veterinarian, including hematology, biochemistry, T4, fPLI, IGF-1 and urine analysis, and completion of diabetic clinical score (DCS; presence of clinical signs related to diabetes mellitus)[1] and quality of life questionnaires[2] by owner.
- Cats randomized to control or intervention groups, both fed ROYAL CANIN® GLYCOADVANCED™ as wet, dry or mixed, based on cat and owner preference.
- Maximum 10% of daily energy allocation as pre-approved treat options.
- One-week food adaptation where both groups fed for maintenance of body weight, followed by 12-week intervention period:
  - Control group fed for maintenance of initial body weight.
  - Intervention group fed for restricted caloric allocation with a target of 2% weekly weight reduction.
- Calorie allocation revised weekly based on at-home weight checks using electronic cat scales provided to all owners.
- Revisit consults at weeks 4 (V1) and 8 (V2) by principle investigator or cat's own veterinarian and 12 (V3) by principal investigator; clinical examination as per inclusion visit with the exception of IGF-1.

OUTCOME	ASSESSMENT
DIABETIC REMISSION	Defined as either: a) Serum fructosamine <350 µmol/L (6.31 mg/dL) or blood glucose <7.5 mmol/L (135 mg/dL), measured ≥28 days after withdrawing insulin; or b) Continuing cessation of insulin therapy for at least 3 months after stopping, with absence of clinical signs of DM
WEIGHT REDUCTION	• Weighed weekly at home • Body and muscle condition scoring by veterinarians at weeks 1, 4, 8 and 12 using standardized scoring systems
GLYCEMIC CONTROL	• Defined by the DCS, insulin dose, serum fructosamine concentration, glycemic variability (GV; calculated as the standard deviation [SD] of blood glucose curve readings) and quality of life • 12-hour blood glucose curves at home at weeks 4, 8 and 12, and 1-2 weeks after any insulin adjustment
SAFETY	• Abnormal physical examination findings, clinically relevant laboratory abnormalities, or other relevant clinical observations were recorded

References: 1. Niessen SJM, Bjornvad C, Church DB, et al. Agreeing Language in Veterinary Endocrinology (ALIVE): Diabetes mellitus - a modified Delphi-method-based system to create consensus disease definitions. *Vet J.* 2022;289:105910. **2.** Niessen SJ, Powney S, Guitian J, et al. Evaluation of a quality-of-life tool for cats with diabetes mellitus. *J Vet Int Med.* 2010;24:1098–1105.

Jørgensen FK, Mohanty A, Kieler IN, et al; submitted for publication.

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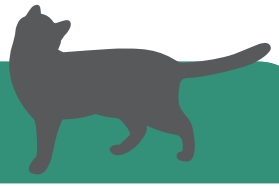
TRIAL RESULTS

CATS

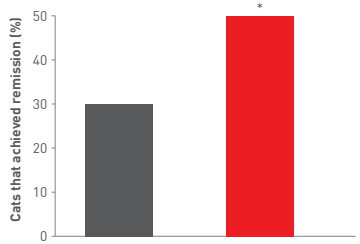
- **72 overweight, client-owned cats (BCS ≥ 6/9), median body weight 13.2 lb (9-23.6 lb)**
- **Median age 11 years (3–18 years), all spayed/neutered, predominantly domestic shorthair**
- **69% cats had BCS 6/9–7/9 and 31% had BCS 8/9–9/9**

REMISSION



Cats fed for caloric restriction were
2.1x MORE LIKELY TO ACHIEVE DIABETIC REMISSION
than cats fed for weight maintenance (P<0.05).

- By week 12, 50% of cats fed for caloric restriction went into remission, compared with 30% of cats fed for weight maintenance
- There was no difference in rates of remission between cats fed wet, dry or a combination of wet and dry

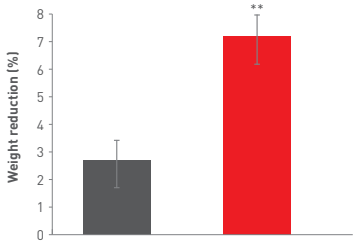


Weight maintenance
Caloric restriction

Percentage of overweight diabetic cats that achieved remission when fed ROYAL CANIN® GLYCOADVANCED™ for weight maintenance or caloric restriction for 12 weeks. *P<0.05.

WEIGHT REDUCTION

By week 12, cats fed for calorie restriction had lost on average 7.2% of initial body weight, compared with 2.7% in cats fed for weight maintenance (P<0.001).



Weight maintenance
Caloric restriction

Weight reduction in cats fed ROYAL CANIN® GLYCOADVANCED™ for weight maintenance or caloric restriction. **P<0.001.

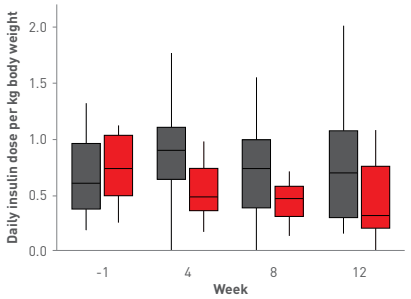
GLYCEMIC CONTROL

Even for cats that did not achieve remission, those fed for caloric restriction
ACHIEVED GREATER GLYCEMIC CONTROL AND A REDUCED INSULIN DOSE
compared with cats fed for weight maintenance.

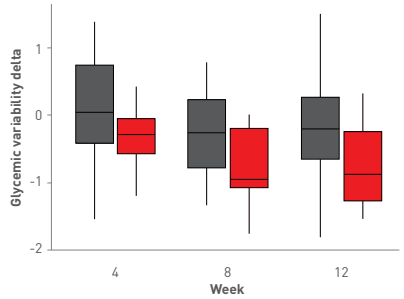
In cats that did not achieve remission by week 12:

- Insulin dose decreased by 36% in cats that underwent caloric restriction†
- Glycemic variability decreased by 45% in cats that underwent caloric restriction‡

(A)



(B)



Insulin dose (A) and glycemic variability (B) over the 12-week study in cats fed GLYCOADVANCED™ for caloric restriction or weight maintenance.

Weight maintenance
Caloric restriction

ADDITIONAL RESULTS

- **The Diabetic Quality of Life score improved over the 12-week period in both groups of cats, with no difference between groups.**
- Caloric allocation in the caloric restriction group was on average 60% of maintenance energy requirements, resulting in well-tolerated weight reduction with no cats developing DKA or hepatic lipidosis.
- Remission was more closely associated with the degree of caloric restriction than the rate of weight loss, and most cats that entered remission did so in the first 6 weeks. Proportion of wet diet consumed, body weight change during the intervention, age and sex did not affect the likelihood of achieving remission.

CONCLUSION AND CLINICAL RELEVANCE

✓ **Intentional caloric restriction with ROYAL CANIN® GLYCOADVANCED™ improves the likelihood of diabetic remission, improves regulation of blood glucose levels and promotes healthy weight when fed as part of a veterinary diabetic management program in combination with medical therapy.**

✓ Energy intake was significantly restricted in the caloric restriction group and feeding a standard diet under such caloric restriction could result in essential nutrient deficiencies; ROYAL CANIN® GLYCOADVANCED™ is purpose-formulated with an increased nutrient to caloric ratio for safe use during caloric restriction in diabetic cats.

†Compared with 28% increase in cats fed for weight maintenance (P<0.01).
‡Compared with 7% decrease in cats fed for weight maintenance (P<0.05).

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