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Impact of time-limited feeding and dietary carbohydrate content on weight loss in group-housed cats

Kathryn E Michel DVM, MS[1], **Amy Bader** VMD[2], **Frances S Shofer** PhD[1], **Claudia Barbera** MS, MBA[2], **Donna A Oakley** CVT[2], **Urs Giger** PhD, Dr MedVet, MS, FVH[1]

[1]*Department of Clinical Studies – Philadelphia, School of Veterinary Medicine, University of Pennsylvania, 3900 Delancey Street, Philadelphia, PA 19104-6010, USA*
[2]*Penn Animal Blood Bank, School of Veterinary Medicine, University of Pennsylvania, 3900 Delancey Street, Philadelphia, PA 19104-6010, USA*

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Twenty-four adult cats were transitioned to time-limited feeding and randomized to either a dry low carbohydrate diet (LC) or a dry reduced energy diet (HC). In Trial 1 the LC and HC groups received equal amounts of food (by weight) for 13 weeks. Both groups consumed all food offered, hence the LC group received more energy/day than the HC group. In Trial 2 all cats were fed the LC diet for 12 weeks, but each group received the energy that the opposite group had received in Trial 1. In Trial 1 only the overweight HC cats (body condition score > 6/9) experienced a significant change in body weight (-0.52 ± 0.08 kg). In Trial 2, LC/Low Calorie overweight cats lost 0.62 ± 0.10 kg, whereas, the LC/High Calorie normal weight cats gained 0.68 ± 0.05 kg. In conclusion, body condition and energy intake but not type of diet influenced weight in this cohort of group-housed cats.

Excessive weight gain is a major problem for the pet cat population and considered the most common nutritionally related disease in this species (Lund et al 1999). Two epidemiological studies conducted in the United States in the 1990s estimated that approximately 25% of the feline population was overweight or obese based on body condition scoring (BCS) (Scarlett and Donoghue 1996, Lund et al 1999). A number of factors are thought to contribute to weight gain in pet cats. Neutering, a common practice particularly in the United States, has been found by several investigators to predispose cats to gain weight due to a decrease in energy expenditure and an increase in food intake (Flynn et al 1996, Fettman et al 1997). Indoor confinement is also thought to lead to further decreased energy expenditure because of exercise restriction. The feeding of commercial pet foods has also been implicated, as pet food manufacturers have been successful in producing highly palatable commercial cat foods. Free choice feeding of dry (extruded) cat food is a common practice, especially in multi-cat households, as it facilitates the natural feeding behavior of the domestic cat, which is to eat many small meals dispersed throughout the day and night (Mungford and Thorne 1980, Kane et al 1981). Hence, the ad libitum availability of palatable, often energy-dense dry cat foods may allow cats to consume energy in excess of their actual needs leading to progressive weight gain. Furthermore, weight control in multi-cat households can be problematic as it is often not possible to feed cats separately. Thus, it is not feasible to feed different diets to different cats or control food intake on an individual basis.

Recently, there has been speculation that the relatively high carbohydrate content of dry cat foods, typically 30–40% of calories, could also be a contributing factor to weight gain in pet cats. Low carbohydrate diets as a means of promoting weight reduction for overweight people are currently receiving much attention although the efficacy of this approach remains unproven (Bravata et al 2003). While the actual mechanism

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by which carbohydrate intake would facilitate weight gain in cats has not been elucidated, it is well known that feline energy metabolism is uniquely adapted to a diet that contains little, if any, carbohydrate. Whether feeding a low carbohydrate diet would protect against weight gain in cats by inducing satiety or altering metabolism has not been demonstrated, although anecdotal reports suggest this might be the case.

This study was intended to investigate two interventions meant to prevent weight gain and promote weight loss in a colony of group-housed cats. The principal aim was to investigate the effect of feeding a dry therapeutic feline diet that contained less carbohydrate than typical commercial dry cat foods. A secondary aim was to investigate the feasibility of transitioning these group-housed cats from ad libitum feeding to time-limited feeding, where access to food was restricted to 4 h a day. The impact of these interventions on body weight (BW) and body condition was evaluated.

Materials and methods

The Animal Blood Bank of the University of Pennsylvania maintains a colony of adult cats who donate blood on a monthly basis for feline patients at the Ryan Veterinary Hospital of the University of Pennsylvania. At the time of this investigation, the colony was composed of 24 male neutered domestic shorthaired cats. Eighteen of these cats ranged in age from 3 to 4 years and had been members of the colony for approximately 2 years. Another six male cats, who were approximately 1 year of age and had been neutered in the past month, were introduced into the colony at the commencement of this study. The cats had free run of two adjoining rooms encompassing approximately 33.5 m^2 and were maintained on a 12-h day/night cycle. One of the rooms had floor to ceiling dividers that allowed it to be subdivided and permitted the feeding of two separate groups of cats. The study protocol was approved by the institutional animal care and use committee of the University of Pennsylvania.

The cats had been fed a commercial HC, high fiber cat food (HC: Hill's Science Diet Feline Light Adult-Dry, Hill's Pet Nutrition) (Table 1) and water ad libitum. Food was offered in multiple large bowls to provide ample access to all cats. The cat colony was gradually transitioned over 2 weeks to have food access restricted to 4 h/day. Initially, this process involved making food available in the morning and then removing any remaining food 12 h later. After 4 days, food availability was limited to 8 h/day for another 4 days before the final transition to 4 h/day access. After the cats were acclimatized to 4 h/day food access, they were randomized into two groups of 12 each based on BW, BCS and length of time in the colony. The cats in the HC group were continued on the reduced energy, high fiber diet while the cats in the LC group were transitioned to a dry therapeutic low carbohydrate cat food (LC: Purina DM Feline Formula Dry, Nestle-Purina Co) over the course of 3 weeks (Table 1). The two groups of cats were allowed to mingle except during the feeding periods. During both transition periods and throughout the study, all cats were monitored to insure that they were eating and not losing weight at a too rapid rate (>3% BW/week).

Table 1. Nutrient composition of study diets[a]

Diet	Protein (g/kg)	Fat (g/kg)	NFE[b] (g/kg)	Crude fiber (g/kg)	Energy (MJ/kg)
HC[c]	333	87	378	58	13.4
LC[d]	533	165	138	11.5	17.2

[a] Manufacturer's data.
[b] NFE; Nitrogen-free extract
[c] Hill's Science Diet Feline Light Adult-Dry, Hill's Pet Nutrition, Inc, Topeka, KS.
[d] Purina DM Feline Formula Dry, Nestle-Purina Co, St. Louis, MO.

Immediately following the transition period, Trial 1 was begun. Both groups of cats were offered equal amounts of food, by weight, each morning at approximately 08.00 and any remaining food was removed 4 h later and weighed on a gram scale. Daily food intake for each group was the difference between the food offered and the food remaining after 4 h of access. Each cat was weighed on a calibrated scale before feeding at the same time once a week. Each cat was also assigned a BCS using a 9-point system based on assessment of body silhouette and adipose tissue by palpation at the time of weighing (Laflamme 1997). The amount of food the cats had consumed on a daily basis prior to the initiation of this investigation was unknown as they had been fed ad libitum and also the number of cats in the colony was increased by six just before the study began. Therefore, the amount of food the cats were offered each day was based on the quantity they had consumed in the 12-h period