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Effectiveness of a new dietetic weight management food to achieve weight loss in client-owned obese cats

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Abstract

Objectives The aim of the study was to evaluate weight loss and maintenance parameters in cats fed a novel weight management food and to assess the owner's perception of the cat's quality of life.

Methods This study was designed as a prospective, uncontrolled/unmasked clinical trial. One hundred and thirty-two overweight/obese, otherwise healthy, client-owned cats were enrolled. Initial evaluation included physical examination, nutritional assessment, ideal body weight determination and weight-loss feeding guidelines development. Follow-up evaluations (monthly for 6 months) encompassed determination of body weight, body condition score, body fat index, muscle condition score and feeding practices. Quality of life assessment by owners included the cat's level of energy, happiness, appetite, begging behavior, flatulence, stool volume and fecal score.

Results Eighty-three percent of the cats lost weight, with an average ± SEM weight loss of 11.0 ± 1.8% over 6 months and an average ± SE weekly weight loss rate of 0.45 ± 0.02%. The mean ± SEM duration of weight loss was 134.0 ± 4.8 days. Fourteen percent of cats achieved an ideal body weight. Seventy-nine percent of cats ate more calories from novel weight management food than the recommended daily energy requirement for weight loss, and the majority of these cats still lost weight. Body condition score and body fat index decreased over time compared with baseline from weeks 12–24 and from weeks 8–24, respectively. Owners perceived an increase in energy and happiness (>week 12) in the cats that lost weight, without changes in appetite or begging behavior.

Conclusions and relevance This study confirmed the effectiveness of the novel weight management food in achieving weight loss in overweight/obese client-owned cats. Owners reported significant improvements in their cat's quality of life without negative side effects.

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Introduction

Excess adiposity has become one of the most frequent medical issues in domestic cats with a reported prevalence ranging from 22–57% (http://www.petobesityprevention.org/2012-national-pet-obesity-survey-results/).[1–5] The adverse effect of obesity on quality of life in pets is well known and so is its role as a risk factor for the development of other diseases.[1,6] Excess body fat represents a serious health condition predisposing affected cats to a variety of disorders, including insulin resistance, diabetes mellitus, dyslipidemia, lameness, dermatopathies, oral disease and lower urinary tract disease.[4,7,8] However, there is only a limited number of peer-reviewed reports in the scientific literature that document effective weight loss protocols in client-owned overweight/obese cats.[9,10] The guidelines for weight management in dogs and cats issued by the American Animal Hospital Association include the following steps for the development of a weight-loss program: determination of ideal body weight (IBW), calculation of the caloric restriction needed for

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the desired weight loss, selection of a food appropriate for the animal and owner, establishment of a feeding and activity plan, and scheduling of regular follow-up visits.[11] Weight loss management in cats is often more challenging than in dogs. Starvation or significantly decreased food intake in cats carries the risk of hepatic lipidosis.[12] Cat behavior associated with feeding may be misinterpreted as begging and leads to decreased owner compliance with feeding instructions.[10] Finally, physical activity in many pet cats is limited and neutered cats appear to have maintenance energy requirements (MER) below the 2006 National Research Council recommendation.[13,14]

Weight loss is difficult to attain in client-owned cats because IBW may be overestimated, weight loss is often hampered by a lack of compliance with feeding instructions, and weight regain during the weight maintenance phase is a common issue.[11,15,16]

A novel weight management food (NWMF) (Hill's Prescription Diet Feline Metabolic Advanced Weight Solution, dry [caloric distribution: protein = 39%, fat = 31%, carbohydrate = 30%]) was designed as a reduced calorie, reduced fat, increased fiber food containing a synergistic blend of ingredients/nutrients based on nutrigenomic technology and formulated for both weight loss and long-term weight maintenance (see Tables 1a and 1b in the supplementary material). This food was previously shown to modify gene expression (ie, genes that play a key role in amino acid, glucose and fat metabolism) in overweight/obese cats during weight loss and maintenance in experimental settings.[17] A weight loss rate of 1.2% of body weight (BW) per week was achieved by feeding the food to obese cats in two experimental studies and maintenance of the new weight was promoted.[17,18] Using the same food in a short in-home weight loss study (155 overweight/obese cats) led to weight loss in 81% of cats and a weight loss rate of 0.5% of initial BW per week.[19]

The purpose of the present study was to determine the effectiveness of an NWMF in achieving weight loss and maintenance in overweight/obese client-owned cats under typical household conditions. The objectives were (1) to evaluate weight loss and maintenance parameters in cats fed an NWMF and (2) to assess the owner's perception of the cat's quality of life.

Materials and methods

Eligibility criteria

Cats were recruited through private and university practices from 20 different European countries participating in the study (see Table 2 of the supplementary material). Cats were eligible for inclusion in the study based on physical examination and nutritional screening evaluation.[20] Inclusion criteria for cats were as follows: (1) at least 1 year of age, (2) considered generally healthy and (3) overweight or obese with a body condition score (BCS) >3 (on a five-point scale).[21]

Cat owners submitted their written consent to participate in the study and had to give their agreement (1) to feed the recommended amount of the NWMF dry food for the duration of the study, (2) to return to the clinic for re-check evaluations at monthly intervals for 6 months and (3) to report any relevant health issues during the study period.

Cats were not eligible for the study if they (1) were pregnant or lactating or expected to become pregnant during the study, (2) had a history of adverse reactions to food, (3) required urinary acidifiers during the study, (4) needed another dietetic pet food, (5) were expected to undergo surgery during the study or (6) participated in another clinical study.

Study protocol

The study was designed as a prospective, uncontrolled, unmasked clinical trial.

Initial evaluation of cats enrolled in the study was comprised of physical examination, nutritional assessment screening evaluation and determination of BW, BCS, body fat index (BFI; see Table 3 of the supplementary material), muscle condition score (MCS; see Table 4 of the supplementary material) and feeding practices. IBW was estimated using Hill's BFI risk chart or an online Healthy Weight Protocol tool (http://www.hillsvet.co.uk). Daily energy requirement (DER) for weight loss was calculated as DER = 0.8 × resting energy requirements (RER) = 0.8 × (70 × $IBW_{kg}^{0.75}$), the amount of NWMF to be fed was calculated, and owners were instructed to weigh the amount of food to be fed each day.[11]

The importance of a healthy weight and the health risks for an overweight/obese cat were discussed with owners. The owners were instructed to feed the NWMF and to avoid excess of additional treats, pet foods or human foods. However, specific recommendations or restrictions on the amount and type of additional foods were not given. The expected rate of weight loss and target date for reaching IBW were reviewed with the owner (based on the initial BW and a weight loss rate of 0.5–2.0% of initial BW per week). Once the cat reached IBW, owners were instructed to adjust the feeding amount to maintain the new weight using a caloric allocation, calculated as DER = 1.2 × RER = 1.2 × (70 × $IBW_{kg}^{0.75}$).[22] The NWMF was dispensed with feeding instructions, including the recommended amount of the dry food allocation in grams per day, and how to gradually introduce the new food during a 1 week period. After the 7 day transition period, owners were instructed to feed the NWMF exclusively to their pet for 6 months and to avoid feeding unhealthy snacks such as table scraps.

Follow-up assessments (monthly for 6 months) encompassed evaluation of BW, BCS, BFI, MCS and review/readjustment of feeding practices. At each follow-up visit, the initial feeding recommendation was adjusted as needed to achieve the desired weight loss and not to exceed a weekly weight loss rate of 2% of starting body weight. Owners were asked to describe their cat's quality of life on initial and follow-up visits using a newly developed questionnaire that allowed scoring of different

criteria using a Likert-type rating scale. Owners scored their cat's level of energy, happiness, appetite, begging behavior, flatulence and stool volume on a 10-point scale. For energy levels, a score of 0 was considered lethargic, whereas a score of 10 was attributed to hyperexcited cats. Happiness scores ranged from sad (0/10) to very happy (10/10). Appetite scores extended from inappetent (0/10) to ravenous appetite (10/10), with 5/10 being normal. Begging behavior could vary from no begging (0/10) to constant begging (10/10). Similarly, flatulence scores extended from no flatulence (0/10) to severe flatulence (10/10), and stool volume levels ranged from small (0/10) to very large (10/10). A five-point scoring system was used for fecal scores, with 1/5 being watery feces and 5/5 being hard and dry stool (Gastrointestinal grading sheet. Adopted from Jergens et al).[23] The owners were asked to evaluate the fecal score daily using the visual fecal score chart and to provide a memory recall of an average fecal score at the monthly visit.

Statistical analysis

At each follow-up time point, percentage weight loss was computed as ([baseline BW–current BW]/baseline BW) × 100. For each animal, a scatter plot of percentage weight loss or weight gain vs weeks of follow-up was inspected to verify that the relationship was linear, followed by regression analysis. Animals with a positive slope were considered to have lost weight, those with a negative slope to have gained weight, while those with a slope of 0 were classified as cats with no change in weight. Slopes were collated and summarized as mean ± SD. Other weight-related continuous outcomes, including duration of weight loss, average time that cats were followed-up for, average time between visits, time to achieve IBW, BW at start and end of study and percentage of BW lost (total) were also summarized as mean ± SD or median (range) as appropriate. Weight-related categorical outcomes, including cats that achieved IBW (defined as a weight within IBW ± 9.9%*IBW) (this value represents the smallest change in IBW that is known to be clinically perceptible) and cats that still lost weight despite eating more than the DER were summarized as binomial proportions with a 95% confidence interval (CI). To assess changes in scores (BCS, BFI, MCS, energy, happiness, appetite, begging, flatulence, stool volume and fecal consistency) over time, least squares means (LSM) at each time were compared using mixed model analysis of variance with animal identification as a random effect. Statistical significance was set at $\alpha = 0.05$. All analyses were performed using SAS version 9.3 (SAS Institute, Cary, NC, USA).

Results

Cats

One hundred and forty cats were enrolled in the study and 132 cats were used for data analysis (data from eight cats were not included in the analysis as either only one data point was present or baseline data were missing). Some of the animals were lost to follow-up and part of the records had missing data with regard to one or more of the parameters to be assessed.

Table 1 Breed, sex and age of cats

Cats	n
Breed	
Purebred	13
Mixed breed	117
Unknown	2
Sex	
Females (neutered)	72 (69)
Males (neutered)	54 (54)
Unknown	6
Age	
Mean (range)	6.6 (1.0–14.0)

Thirteen different purebred cats, 117 mixed-breed cats and two cats of unknown breed participated in the study (see Table 5 of the supplementary material). Seventy-two cats were female (of which 69 were neutered) and 54 cats were neutered males (see Table 1). Sex was not reported for six of the animals. The median age of the cats was 6 years (range 1–14 years).

There was a decrease in the number of cats for which data were available over the course of the study. The overall decrease in available data was due to a lack of owner compliance in maintaining monthly re-check appointments, whereas variation in the data available per month (minimum–maximum) was due to unrecorded or missing data. For weight loss and quality of life-related parameters, data were available for 125–132 cats at the initial evaluation (minimum–maximum); this number dropped to 121–130 cats at week 4, 109–123 cats at week 8, 91–98 cats at week 12, 73–82 cats at week 16, 58–64 cats at week 20 and 33–35 cats at week 24.

Diet history prior to the study

Eighty-two cats were fed exclusively dry cat food and only four received strictly wet food. A mixture of dry and wet food was offered to 45 cats. Dietary information was unavailable for three cats. Thirty-six cats received a dietetic weight management food, 25 cats were fed a non-dietetic weight management food and the rest of the cats were fed a variety of other cat foods. Additional treats, foods or supplements were distributed to 34% of the cats.

Weight loss

Cats participated in the study on average (± SEM) for 134.0 ± 4.8 days with approximately 32.0 ± 0.5 days between visits. The majority of cats (83.3%; n = 110) in the study lost weight, while a small percentage of the cats gained weight (12.1%; n = 16) and six cats

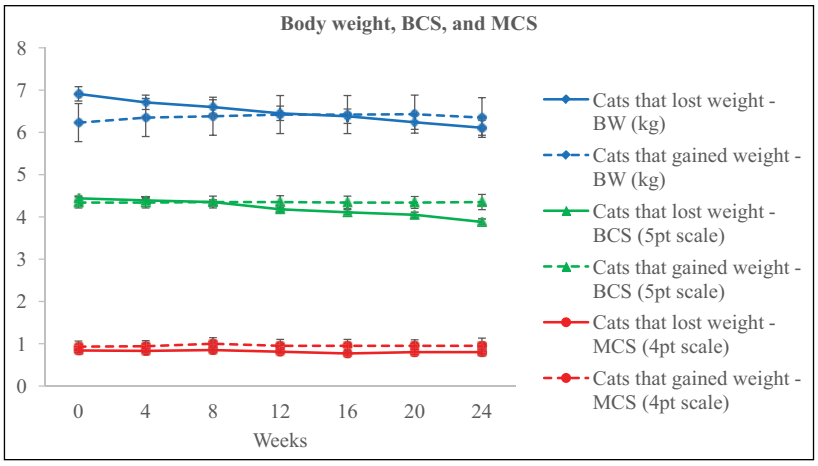

Figure 1 Body weight (BW; blue), body condition score (BCS; green) and muscle condition score (MCS; red) changes in cats that lost weight (solid lines) and cats that gained weight (dashed lines). Data are presented as least squares means and standard error. For BCS, 3 = ideal weight, 4 = overweight and 5 = obese. For MCS, 0 = no muscle wasting, 1 = mild muscle wasting, 2 = moderate muscle wasting and 4 = severe muscle wasting

maintained their weight. The weekly weight loss rate (± SE) for cats that lost weight was 0.45 ± 0.02%, using a linear regression model of the average percentage of weight loss by weeks enrolled in the study. Using the same type of analysis, the weekly weight gain rate was 0.10 ± 0.04% for the cats that gained weight, and the overall weight loss rate for all cats was 0.38 ± 0.01%.

The starting weight of the cats that lost weight (calculated as LSM) was 6.9 kg and the weight at the end of the study was 6.1 kg (Figure 1; Table 6 of the supplementary material). The weight achieved each month differed significantly from the weight at baseline. In the group of cats that gained weight no significant difference was present between baseline weight and the weight achieved at each month of the study (6.2 kg baseline BW vs 6.4 kg BW at the end of the study). Cats that lost weight lost 0.3–0.5% of BW per week and reached a final weight loss of 11.0% at the end of the study, whereas cats that gained weight gained 0.0–0.5% of BW per week, with a final weight gain of 2.6% compared with baseline (data presented in Table 6 of the supplementary material). A high percentage (79%) of cats consumed more than the DER for weight loss (~6.4% above DER). While the majority of these cats (80.8%; 95% CI 70.3–88.8) lost weight, a small number of these cats gained weight (15.4%; 95% CI 8.2–25.3).

Seventeen cats (14.3%; 95% CI 8.5–21.9) achieved their IBW. It took, on average (± SEM), 90 ± 11 days to attain IBW. From the cats that achieved IBW, nine maintained their IBW, on average, for 47 days (range 28–132 days), whereas the other eight cats achieved their IBW at the end of their participation in the study. A significant decrease in BCS compared with baseline was seen from weeks 12–24 of the study in the group of cats that lost weight (Figure 1; Table 6 of the supplementary material). The BCS decreased by approximately 0.6 scores from the beginning to the end of the study. BCS did not change significantly over time in the group of cats that gained weight. A progressive decrease in the BFI was observed over time compared with baseline in the group of cats that lost weight, and this decrease became statistically significantly by weeks 8–24 compared with the starting score (Figure 2; Table 6 of the supplementary material). The BFI decreased by approximately 6% from the beginning to the end of the study. BFI did not change significantly over time in the group of cats that gained weight. No significant changes were present in the MCS in any of the groups of cats (Figure 1; Table 6 of the supplementary material).

Quality of life

Owners perceived a significant increase in energy scores over time compared with baseline in the group of cats that lost weight (Figure 3; Table 7 of the supplementary material). The energy scores improved by 1.4 scores from the beginning compared with the end of the study. Happiness scores in cats that lost weight were significantly higher from weeks 12–20 compared with the starting score (Figure 3; Table 7 of the supplementary material). The energy and happiness scores did not change significantly over time in the group of cats that gained weight. Appetite scores, begging behavior scores, flatulence score, stool volume score and fecal consistency score overall did not change significantly over time compared with baseline in either groups of cats (Table 7 of the supplementary material).

Discussion

The majority of client-owned obese/overweight cats in our study effectively lost excessive BW while being fed the NWMF formulated based on nutrigenomic technology. Weight loss of cats was accompanied by increased levels of energy and happiness, as perceived by owners.

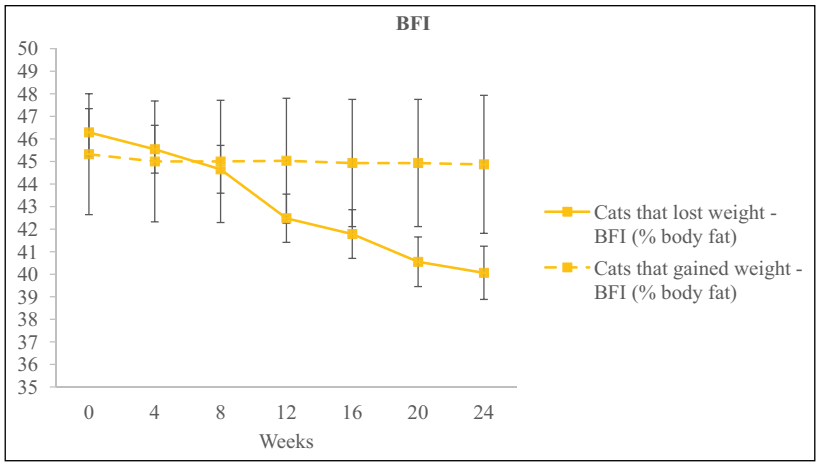

Figure 2 Body fat index (BFI) changes in cats that lost weight (solid line) and cats that gained weight (dashed line). Data are presented as least squares means and standard error. A BFI of 15–25% represents a normal amount of body fat

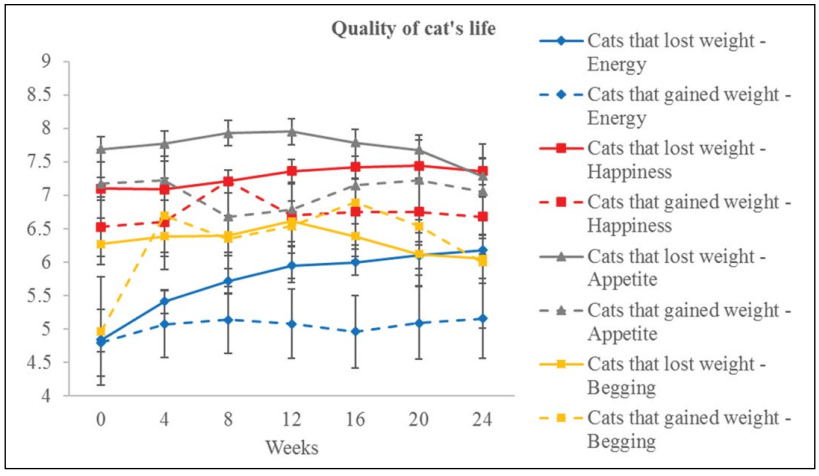

Figure 3 Owner's assessment of quality of life of cats that lost weight (solid lines) and cats that gained weight (dashed lines). Data are presented as least squares means and standard error. Energy (blue) = lethargic 0/10 to hyperexcited 10/10; happiness (red) = sad 0/10 to very happy 10/10; appetite (gray) = inappetent 0/10 to ravenous appetite 10/10; begging (yellow) = no begging 0/10 to constant begging 10/10

No negative effects were observed on the cat's appetite or begging behavior.

The target weekly weight loss rate in obese/overweight cats is generally considered as 1–2%.[11] Clinical studies in client-owned obese cats have generally shown lower weight loss rates of 0.5–0.8% per week.[9,10,24–27] Bissot et al evaluated three different dietary strategies for weight loss in client-owned obese cats (n = 70, duration 20 weeks) and reported weekly weight loss rates of 0.5–0.6% for the three foods.[9] Results from our study were comparable with those of Bissot et al,[9] and also with those of a shorter in-home weight loss study (2 months' duration) using NWMF in 155 overweight/obese cats.[9,19] Weight loss in the present study was influenced by a number of factors related to the patient, the food and feeding, the owner, the environment and the veterinarian. Cats in our study were from a variety of breeds, neutered cats were over-represented and the age of cats enrolled in the study ranged from 1–14 years. Neutering in cats increases energy intake and MER decreases with age in cats through to approximately 11 years of age.[28,29] These factors may have affected the rate of weight loss by altering the individual cat's caloric restrictions needed to achieve weight loss and also by influencing the behavior related to feeding. Owner compliance likely influenced the outcome in individual cats. Seventy-nine percent of owners fed more than the recommended amount of food and 34% of the cats received additional treats. Similarly, housing conditions (ie, space, activities and opportunities for play/exercise) differed between the cats and the degree of veterinary supervision was also variable.

The number of cats that achieved IBW in our study was not adequate to reliably assess the effectiveness of the NWMF for weight maintenance. A study with a longer duration and follow-up would be needed to assess weight maintenance accurately.

Cats in our study achieved weight loss, even though a number of cats were fed more than the recommended

amount of food for weight loss and despite them receiving additional treats. Lack of compliance, feeding more than the recommended daily calories and imprecision when measuring extruded dry kibbled food are thought to contribute to failure of weight management programs for obese animals.[30] Results from our study indicate that for a subgroup of cats it was less critical to feed a precise amount of food to achieve weight loss. Of note, average energy requirements for cats published in the literature can vary from ~70% to ~150%, depending on the source. Thus, we speculate that the higher caloric intake for cats in our study was still within the range of energy requirements that was sufficient to induce a negative energy balance.[14]

In addition, we hypothesize that the nutritional formulation used in the NWMF curtailed the decrease in energy expenditure typically seen in individuals undergoing weight loss and supported weight loss despite consumption of a higher than recommended amount of calories. Results from a recent report showed that obese colony cats fed NWMF for weight loss and weight maintenance (4 months each) consumed 34.5–55.0% more calories per kg IBW during the last 2 months of the trial compared with their adiposity-matched controls fed a variety of foods for maintenance of obese weight.[31] This report emphasized that metabolic rate following weight loss was increased as body weight was preserved despite an increased caloric intake. This phenomenon was attributed to the nutritional formulation of the food (reduced calorie, high fiber content with added coconut oil, L-carnitine, lysine and leucine) designed to support fat-metabolizing pathways in overweight or obese cats.[31] The NWMF was developed using nutrigenomics technology, by identifying nutrients that influence gene expression profiles in obese and lean animals. The feline nutrigenomic studies with the NWMF showed that at days 112 and 224, 424 and 1391 genes were differentially expressed vs day 0 at statistically significant levels, respectively.[17] Some of the affected genes play key roles in amino acid, glucose and fat metabolism.[17]

Energy and happiness scores significantly increased in cats that lost weight. Questionnaires for the assessment of quality of life or wellbeing in cats were developed in recent years for diseases such as cancer, diabetes mellitus and cardiac disease.[32–34] German et al reported an increase in vitality in dogs that completed a weight loss program.[35] Similarly, Bissot et al described increased activity levels in cats using a particular weight loss food.[9] To our knowledge, the present study is the first to report a consistently higher level of energy in client-owned cats on a weight loss food. Neither appetite scores nor begging behavior scores changed significantly in the studied cats. Begging behavior driven by poor satiety and increased appetite is a common negative side effect of the food volume restriction. Previous studies have shown that begging behavior may differ depending on the type of weight loss food fed.[9]

The present study had a number of limitations. The study was an observational, uncontrolled, unmasked clinical trial and was therefore prone to bias. This effect may have been reduced by the fact that the study comprised a large number of cats from a variety of veterinary clinics. A randomized, controlled, blinded clinical trial would be necessary to evaluate the effectiveness of the NWMF compared with other foods. Owing to the number of different veterinarians and practices participating in the study, there were variations in the assessment of weight loss related parameters (ie, different scales to weigh animals, different veterinarians attributed BCS, BFI, MCS). Despite this drawback, these conditions reflect those encountered in clinical practice and are therefore particularly conducive to evaluate dietary effectiveness rather than efficacy. Quality of life questionnaires were not validated but enabled owners to judge perceived positive or negative effects of the food on their cats. Not all cats included in the present study completed the study, which is a problem frequently encountered in clinical practice and allowed us to assess effectiveness rather than efficacy of the NWMF.

Conclusions

This clinical study confirmed the effectiveness of the NWMF formulated to modify gene expression in achieving weight loss in overweight/obese client-owned cats in spite of a higher than recommended caloric intake. Owners reported significant improvements in their cat's quality of life specifically in regard to perceived levels of energy and happiness, without negative side effects such as changes in appetite or begging behavior.

Supplementary material Tables providing further information about the food used, body fat index and muscle condition score utilized, cats recruited for the study, and results for weight loss and quality of life-related parameters.

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Conflict of interest The study was sponsored by Hill's Pet Nutrition Europe, and I Bečvářová and HP Meyer are employees of Hill's Pet Nutrition. U Christmann and S Werre received financial compensation as consultants on behalf of Hill's Pet Nutrition for their involvement in this study.

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