



Effect of Dietary Protein, Fibre and Lipotropic Factor on the Management of Canine Obesity

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ABSTRACT

The study formulated and evaluated different therapeutic diets *viz.*, high protein high fibre (T₂), high protein medium fibre (T₃) and choline supplemented diet (T₄) for the management of canine obesity against the control (normal adult dog maintenance diet, T₁) in 24 Labrador retriever obese dogs selected on the basis of their body condition score (BCS) and body weight and randomly distributed into 4 groups and fed therapeutic diets for a period of four months. The change in BCS, body weight, dry matter intake and caloric intake were recorded at fortnightly intervals. Dogs on T₂ diet (21.90 % CP and 11.28 % CF diet) recorded loss 30.3 g/d while on T₃ diet (21.73 % CP and 8.23 % CF diet) lost 17.67 g/d. Body condition score was reduced 5.04 and 3.03 per cent in T₂ and T₃, respectively. Thus, the result indicated increase of 21% protein and 11% fiber in diet helped to improve weight loss 5 to 8% in dogs in 4 months period.

HIGHLIGHTS

- Formulation of diet for canine obesity.
- Supplementation of 21% protein and 11% fiber in diet helped to improve weight loss 5 to 8% in dogs in 4 months period.

Keywords: Therapeutic food, canine obesity, weight-loss, high protein high fibre, choline

Obesity has now become the most common nutritional disorder affecting dogs and cats worldwide. The positive energy balance induced by excessive energy intake or inadequate energy utilization results in obesity. In global scenario, nearly 56 % of dogs and 60 % of cats are suffering from obesity (APOP, 2017).

The conventional weight loss regimen for pets involved severe calorie restriction which drives the animal to begging and scavenging activity due to hunger and ultimately leads to owner's non-compliance in the weight-loss programme. Recent studies showed that increasing the level of dietary protein and fibre improves satiety and promotes weight loss to achieve ideal body weight. Based on this hypothesis, the present study was aimed to evaluate the newly-formulated therapeutic pet food in managing obesity in client-owned obese dogs.

MATERIALS AND METHODS

The experiment was conducted between the period of March and June 2018. 24 Labrador retriever obese dogs of more than three years age of either sex brought to Madras Veterinary College Teaching Hospital assessed by BCS and body weight were selected. All the dogs were client-owned and the owners of the participating animals gave written consent. Dogs included in the study had normal total thyroxin (TT₄) and triiodothyronine (TT₃) levels and had no significant abnormalities on hematological and serum biochemical parameters.

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Diet groups

The effect of dietary protein, fibre and lipotropic factor on the management of canine obesity was studied by conducting a feeding trial for four months (March to June) in 24 obese dogs randomly divided into four treatments with six animals in each treatment. T₁ was kept as control and fed with recommendation for adult dog maintenance (AAFCO, 2014); T₂, T₃ and T₄ were fed with high protein high fibre (HPHF), high protein medium fibre (HPMF), and control diet supplemented with choline chloride, respectively. The proximate principles of the therapeutic diet are presented in Table 1. Metabolizable energy (ME) was calculated according to NRC (2006). The dogs were free access to drinking water throughout the trial.

Body condition scoring and body weight changes

Body condition scoring was used to measure obesity in animals. A 9-point scale (WSAVA, 2013) was employed to assess the body condition of the animal fortnightly during the feeding trial. Body weights of dogs were recorded at fortnightly intervals using an electronic digital weighing scale of 150 kg capacity with 100 g accuracy.

Food intake and calorie intake

All the dog owners were advised to feed their dogs, a weighed quantity of food *ad libitum*. The residual food available on next day was also weighed to calculate the actual quantity of food consumed per day by the dogs. The

food was offered once or twice in a day as per the owner's practice. Based on the food intake, the calorie intake of the animal were calculated and expressed on kcal/kg^{0.75}/day.

STATISTICAL ANALYSIS

The bi-weekly observations on BCS and body weight were analysed for statistical analysis as per the guidelines of Snedecor and Cochran (1989) using statistical analysis system (SPSS, version 20.0 for windows).

RESULTS AND DISCUSSION

The present study demonstrated that the high protein high fibre diet improved weight loss in obese dogs. The outcome of weight loss on different therapeutic diets was summarized in Table 2. The body weight loss was greater in dogs fed high protein and fibre diet (T₂) than dogs fed on high protein medium fibre diet (T₃). An overall bi-weekly weight loss of 1.08 per cent of initial body weight observed in this study was in confirmation with Laflamme and Hannah (2005) and Brooks *et al.* (2014).

German *et al.* (2010) observed a loss of 64.2 g/day of body weight in dogs fed high protein high fibre diet (30 % CP, 17.5 % CF) in 182 days and loss of 33 g/day in dogs on high protein medium fibre diet (34 % CP and 11.50 % CF) in 172 days. We observed body weight loss of 30.71 g/day on T₂ diet having 21.90 % CP and 11.28 % CF. Our results proved that even with diets having calorie to protein ratio of 13.78 137.70 level of calorie: protein ratio, obese dogs were lost weight. The body weight of dogs in T₁ and T₄

Table 1: Nutrient composition (%) of the therapeutic pet foods (Mean ± SE) prepared for the obese dogs

Nutrients (%)	Control (T ₁)	HPHF (T ₂)	HPMF (T ₃)	Choline supp. Diet (T ₄)
Dry matter	90.10±0.22	90.20±0.51	89.80±0.17	89.16±0.17
Crude protein	15.74±0.04	21.90±0.18	21.73±0.25	15.72±0.04
Crude fibre	4.09±0.06	11.28±0.16	8.23±0.17	3.99±0.12
Ether extract	14.40±0.41	15.77±0.05	13.91±0.03	14.43±0.88
Total ash	7.83±0.20	6.43±0.12	8.33±0.12	8.16±0.17
Nitrogen-free extract	57.92±0.18	44.60±0.12	47.78±0.28	57.68±0.82
Organic matter	92.16±0.20	93.56±0.12	93.20±0.17	91.83±0.17
ME* (kcal/kg)	3518.00	3018.00	3029.00	3518.00
Ingredients included	Maize, wheat bran, soybean meal, sunflower oilcake, Poultry by-products, vegetable oil, iodized salt, vitamin and mineral premixes, feed additives			

Each value is a mean of triplicates; * calculated according to NRC (2006).

Table 2: Outcome of Weight Loss on Different Diets

Criterion	Control (T ₁)	HPHF (T ₂)	HPMF (T ₃)	Choline supp. Diet (T ₄)
Initial body weight ^{NS} (kg)	41.06±2.33	41.08±1.76	41.51±2.07	41.80±2.23
Final body weight ^{NS} (kg)	41.88±2.41	37.64±1.76	39.53±2.04	42.00±2.15
Weight loss or gain* (%)	+ 1.99	- 8.37	- 4.76	+ 0.47
Weight loss or gain per day (g)	+ 7.32	- 30.71	- 17.67	+ 1.78
Initial BCS ^{NS}	8.16±0.27	8.33±0.27	8.25±0.21	8.41±0.20
Final BCS ^{NS}	8.16±0.27	7.91±0.23	8.00±0.18	8.41±0.20
Initial DM intake ^{NS} (g/day)	463.33±18.01	438.33±9.45	446.66±8.81	460.00±23.52
Final DM intake (g/day)	485.00 ^b ±16.27	378.33 ^a ±7.92	415.00 ^a ±8.46	481.66 ^b ±23.72
Initial calorie intake (kcal/kg ^{0.75})	100.72 ^b ±2.23	82.16 ^a ±2.84	83.36 ^a ±2.91	98.89 ^b ±3.82
Final calorie intake (kcal/kg ^{0.75})	104.09 ^b ±2.37	75.57 ^a ±2.50	80.39 ^a ±3.34	102.94 ^b ±3.92

Results presented as mean ± SD for body weight, BCS, DM intake and calorie intake and each value is a mean of six observations; Mean bearing different superscripts within a row differs significantly (p<0.05); *Expressed in percentage of initial body weight.

did not lost any body weight rather maintained their body weight for the whole trial period (Fig. 1).

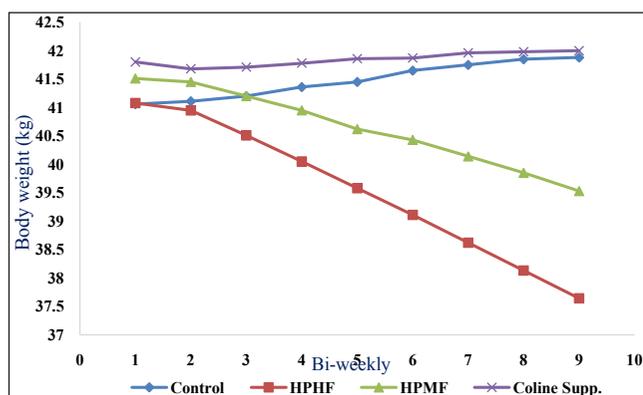


Fig. 1: Bi-weekly body weight (kg) of obese dogs on different therapeutic diets

In HPMF diet, the body weight reduction was only 17.67 g/day with the calorie:protein ratio of 13.94. Feeding such diet (T₃) would require more number of days to achieve ideal body weight loss. A difference of 3% higher CF in T₂ diet could improve 75% more weight loss. It could be due to increased protein ingestion and increased energy expenditure compared to equal calories from carbohydrate or fat (Weber *et al.*, 2007). The other possible reason could be the increased fibre level help to attain the early satiety by distention of stomach and fiber may also affect the digestion of other nutrients (Jackson and Laflamme, 1997).

There was no significant difference (p>0.05) in the body condition score of the dogs fed with different therapeutic diets. However, 5.04 and 3.03 % reduction in BCS was observed in T₂ and T₃, respectively. Dorsten and Cooper (2004) observed 6.5 to 7.2 per cent change in body weight for each incremental change in body condition score. However, the results of the present study showed only 0.42 increment change in BCS by 8.37 per cent reduction in body weight. The less pronounced BCS change might be due to the slow reduction in body weight (30.71 g/day).

In this study, there was significant reduction (p<0.05) in the dry matter intake of dogs in T₂ and T₃ from the third fortnight. The mean food intake was reduced greatly in T₂ from 438.33 to 378.33 g/day in 4 months. The thermic effect of dietary protein and the high fibre in the diet improved satiety and reduced the voluntary dry matter intake of dogs, which reflected the body weight loss of the animal. According to Conterno *et al.* (2011), reduction in energy density of food, increased chewing, gastric distention, reduction in energy absorption are the reasons for high dietary fibre related weight loss. The overall reduction of dry matter intake observed in this study was 13.68 % in T₂ and 7.08 % in T₃. It was also observed by Bosch *et al.* (2009) that dogs consumed less food when fed with high fibre diet, due to increased feeling of satiety. No significant difference (p>0.05) in diet intake was found in T₁ and T₄ throughout the trial period.

In the present study, the calorie intake per day was not restricted. But, the calorie intake on metabolic body

weight basis showed significant difference ($p < 0.05$) between treatments. It ranged from 98.89 to 104.09 in T_1 and T_4 , respectively and from 83.36 to 75.31 in T_2 and T_3 , respectively. The results obtained found that the dogs in T_2 and T_3 were consuming 13.68 and 7.08% less caloric intake than other treatments. The reduced voluntary calorie intake could be due to attaining the early satiety on fibrous diet (Jackson and Laflamme, 1997). Tvarijonavičiute *et al.* (2013) also reported energy intake of obese dogs ranged from 44 to 74 kcal/kg^{0.75}/day on high protein high fibre diet. As opined by Laflamme (2012), although the animals in T_2 and T_3 consumed lower calories compared to T_1 and T_4 , protein was higher and diets were included with essential nutrients to avoid deficiency. Intake of calories at 10 to 20 % less than the maintenance energy requirement was sensible and safe during weight loss (Baldwin *et al.*, 2010).

CONCLUSION

The current study revealed that increasing the protein and fibre in the diet has improved weight loss in obese dogs.

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