

Effect of a Weight Loss Program on biochemical and immunological profile, serum leptin levels and cardiovascular parameters in obese dogs (Piantedosi et al., 2020)¹

Introduction

Obesity is a common disease among animals and humans. **Human and canine obesity** seems to grow concomitantly in the western world, with a recently reported **prevalence in dogs up to 59%** in 2017, and progressively increasing over the years.

Different **environmental and socio-economic factors** may influence the risk of suffering from obesity. A recent European survey showed that age, poor physical activity and unhealthy diet are common factors associated with obesity in both owner and dog. Epidemiological studies also reported **risk factors for canine obesity** such as genetic predisposition, breed (i.e. Labrador Retrievers present higher risk of obesity), and neuter status.

Being overweight can predispose or exacerbate a wide number of pathological disorders affecting the **quality of a dog's life and decreasing their lifespan**. Similar to humans, obese dogs may show **cardiovascular disorders**, such as increased systolic blood pressure and left ventricular concentric remodelling. Furthermore, the biochemical profile of obese dogs often shows **dyslipidemia** with an increased risk of **pancreatitis**, gastrointestinal disorders and an increased risk of suffering from an **obesity-related metabolic dysfunction (ORMD)**.

In dogs, several reports indicated that the level of **leptin** in serum correlates with obesity scale, meanwhile the behaviour of other inflammatory markers during weight loss is still unclear.

Canine obesity is a condition that is difficult to treat in veterinary practice and weight loss is often not easy to maintain. Therefore, to achieve the goals of a **weight loss program (WLP)**, an appropriate communication and cooperation between veterinarians and owners is needed.

The present study investigated the effects of a WLP on biochemical and immunological profile, blood leptin level, and cardiovascular parameters in a cohort of dogs with naturally occurring obesity, in order to address the effects due to the imbalance of these aspects on the clinical presentation and management of canine obesity.

Study design

11 obese, but otherwise healthy dogs, were included in a **6-month WLP study** together with a control group of 11 healthy dogs at ideal body condition. During a baseline week, obese dogs gradually switched their diet to a therapeutic weight-loss diet (PURINA® PRO PLAN® VETERINARY DIETS Canine OM Obesity Management™) to avoid gastrointestinal disturbances. **The therapeutic diet was high in protein but low in fat and carbohydrates** to encourage steady and effective fat loss while maintaining muscle mass. The diet was also high in complex carbohydrates and fibers to promote satiety and help even out blood sugar levels throughout the day and stimulating resting metabolic rate.

At the time of enrolment, the diet of all the control dogs was a high-quality commercial adult maintenance dry food. The total amount of daily food was divided into two meals for all the dogs in both groups.

Different measures were evaluated at the enrolment time (**T0**) and after the 6 months of the WLP (**T1**). Each recruited dog was classified according to a nine-point scale **body condition score (BCS)**. Animals with $BCS \geq 7$ were included in the obese group, while animals with a $BCS \leq 5$ were regarded as a healthy weight and included in the control group. Morphometric measurements, cell blood count (**CBC**), serum biochemical panel, and urinalysis were also determined.

Results

Obese dogs showed clinical improvement after the WLP. The **mean of BCS recorded in the obese group at T0 was 8.18**. At the end of the WLP (T1), all the dogs, with the exception of one that remained BCS 7, showed a **reduction of BCS (mean BCS: 6.8)**. The fat mass (**FM**) values, body fat percentage (**BFP**), were also significantly reduced at the end of the WLP (**Figure 1**).

After 6 months of dietary treatment, 10/11 owners reported their dogs were **more active**, and the **quality of their life** was notably improved. The **haircoat** was shinier and softer in 7/11 obese dogs. Other health benefits included a **reduction of tachypnea** (9 dogs) and **breathing difficulties** (1 dog), and **improvement of joint and locomotor problems** (2 dogs).

Compared to control group, at T0 **obese dogs expressed higher serum leptin concentrations** that significantly decreased after weight loss. Furthermore, obese dogs showed considerably **lower levels of regulatory T cell (Treg)**, but they did not change after weight loss at T1.

In obese dogs, **tumour necrosis factor (TNF)- α and interleukin (IL)-6** concentrations were significantly reduced at T1. The ratio of interventricular septal thickness in diastole to left ventricle internal diameter in diastole (**IVSd/LVIDd**) was significantly greater in obese dogs at T0 than control group and it decreased after weight loss. **Troponin I** level significantly

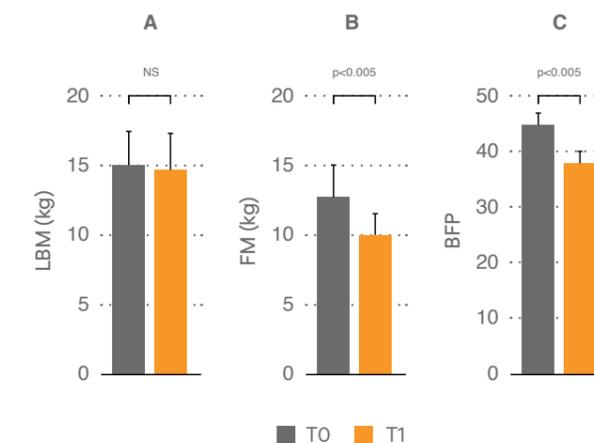


Figure 1. Morphometric equations in enrolled dogs. (A) LBM, lean body mass; (B) FM, fatmass; (C) BFP, body fat percentage. Obese dogs at T0, grey column; obese dogs at T1, orange column. Statistics: Wilcoxon matched-pairs signed-rank test was used for T0 and T1 comparison in obese dogs. NS means not significant difference.

decreased in obese dogs after with weight loss, while **endothelin-1** level did not differ statistically.

Regarding the **cardiovascular parameters**, only one obese dog was hypertensive at T0, and systolic blood pressure values showed no significant differences at the end of the WLP.

Conclusions

Weight loss was associated with an **improvement in both activity and global life quality** of dogs. Furthermore, the **metabolic status** of obese dogs, with particular regard to dyslipidemia, improved after WLP.

Regarding the **immunological status of obese dogs**, results indicated that a 6-month WLP with a calorie-restricted diet can modify the immune structure and, in some aspects, an **overall homeostatic recovery** of the canine immune response can be induced.

A more complete **immune-regulation** restoration could be obtained by a greater reduction in fat mass and a longer-term WLP.



¹Piantedosi D, Palatucci AT, Giovazzino A, Ruggiero G, Rubino V, Musco N, Carriero F, Farina F, Attia YAEW, Terrazzano G, Lombardi P and Cortese L (2020) Effect of a Weight Loss Program on Biochemical and Immunological Profile, Serum Leptin Levels, and Cardiovascular Parameters in Obese Dogs. Front. Vet. Sci. 7:398. doi: 10.3389/fvets.2020.00398