

# Importance of Follow-Up to Success of Weight Management

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## Abstract

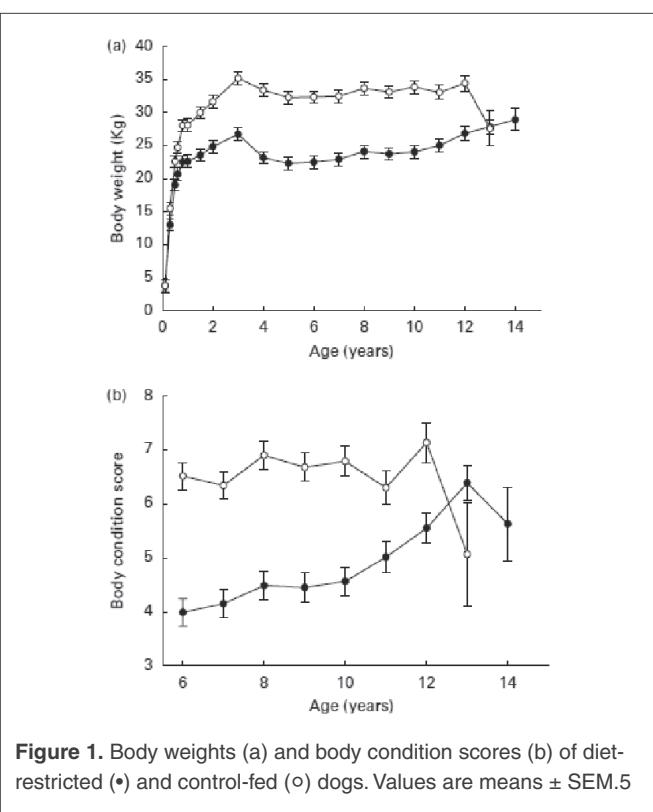
The dismal long-term effectiveness of obesity therapy, as measured by prolonged maintenance of lost weight, implies that other approaches to attainment and maintenance of a healthy body weight are needed. Recent evidence for the roles of early life experience and environmental enrichment on body weight suggests that programs initiated early in life may help animals maintain healthy body weights later in life.

Obesity occurs relatively commonly in client-owned cats and dogs and has been associated with some adverse health outcomes. Although the general severity of risk for obesity-related disorders seems to be lower for dogs and cats than for humans, it may be significant in individual cases. This perspective has led to recommendations that overweight pets lose weight. Though such recommendations are easy to "prescribe," the available evidence suggests that effective obesity therapy has been difficult to implement in both human and veterinary<sup>1</sup> medicine. The observation, made in 1959, that "most obese persons will not stay in treatment, most will not lose weight, and of those who do lose weight, most will regain it"<sup>2</sup> still seems to apply to humans as well to veterinary patients.

Obesity has been conceptualized in many ways and currently is viewed by many in human medicine as a chronic, recurring, relapsing medical disorder requiring lifelong management to maintain lost weight. For humans, successful weight-loss maintenance has been defined as intentional loss of at least 10 percent of initial body weight and maintenance of the loss for at least one year. The 10-percent threshold was initially suggested because weight loss of this magnitude had been associated with clinically relevant improvements in lipid ratios, blood-glucose homeostasis and risk of heart disease. The one-year criterion for the definition of successful weight-loss maintenance was based on information from the Institute of Medicine.<sup>3</sup>

The research literature related to obesity (142,990 entries in *PubMed.gov* on 2/11/2011) is absolutely bewildering. In contrast, the extant literature on weight-loss maintenance is more modest. For example, a recent paper<sup>4</sup> reported conducting a literature search using standardized search terms to identify research articles related to weight-loss maintenance in four databases (Medline, PubMed, PSYCinfo and Ebscohost) that were published in English after February 1988 and reported a randomized controlled trial of a long-term weight-loss maintenance intervention in adults that included a weight-loss trial and >1 year of intervention. Nineteen articles met their criteria. Of these 19, only three articles (16%) addressed any indicators in the maintenance dimension; they were behaviors assessed after the completion of the weight-loss maintenance intervention (16%) and percent attrition at that assessment (16%). The authors concluded: "Despite the research focus on weight maintenance, weight-loss maintenance studies did not often report on the sustainability of effects once the intervention was complete, attrition, or potential for the programs to be sustained in regular practice. This issue would be of significant interest to practitioners. Thus, it would be beneficial for weight-loss maintenance research studies to include follow-up assessments after the intervention is complete to determine the sustainability of weight-loss maintenance and other lifestyle behaviors beyond the actual intervention period." Thus, the available evidence suggests that the importance of follow-up to the success of weight management may be an unanswered question, despite its allure.

Given the limited resources available to veterinarians and the available evidence for ineffectiveness of obesity therapy, one wonders where the most appropriate focus on weight management might be directed. One possibility is a more aggressive approach to prevention of obesity by early intervention to maintain a healthy body weight. A landmark study of lifetime diet restriction in laboratory-housed dogs found that Labrador retrievers restricted



**Figure 1.** Body weights (a) and body condition scores (b) of diet-restricted (●) and control-fed (○) dogs. Values are means  $\pm$  SEM.5

to  $\sim$ 75% of the food consumed by dogs fed *ad libitum* for 15 minutes each day beginning at 8 weeks of age resulted in dogs weighing about 25% less (so food intake on a gram per kilogram body weight basis was not different), and living about two years longer (Figure 1).<sup>5</sup> One potential implication of these results is the hypothesis that a more formal focus on (evidence-based) programs to implement effective weight-management strategies during the period of growth might be worthy of some investigation.

One possibility would be to base such a program on the American College of Veterinary Nutrition's "Circle of Nutrition," as recommended in the recent American Animal Hospital Association's "Nutrition Assessment Guidelines."<sup>6</sup> The "Circle of Nutrition" portrays an iterative process that explicitly considers the animal, the diet, feeding management, and environmental factors that might influence nutritional recommendations.

Animal-specific factors could include the breed, history and opportunities for activity. Canine breed predispositions for obesity have been described,<sup>7</sup> so owners of these breeds might benefit from additional counseling. Based on studies in other species, a history of adverse early experience, such as orphaning or early weaning, also might result in a predisposition to obesity.<sup>8</sup> This association seems to be related to epigenetic modulation of gene expression, which occurs as a result of activation of the central threat response system in some

individuals exposed to personally salient stressors. Of course, resilience factors may mitigate this occurrence, so the individual risk is difficult to predict. Data also suggest that implementation of environmental enrichment after the experience may help reduce the risk of development of later health problems,<sup>9</sup> possibly including obesity.<sup>10</sup>

Diet factors specifically pertinent to dogs and cats during early (including prenatal<sup>11</sup>) growth have not yet been thoroughly investigated but could include many variables, such as ingredients, nutrient content and balance, and form. Identified influences of diet on gene expression may make this period particularly sensitive to dietary factors.<sup>12</sup>

Feeding-related factors include frequency, timing, location and method of feeding, as well as over- or underfeeding and excessive provision of treats or "unconventional" foodstuffs. Feeding factors also interact with other puppy-related client activities such as "house-training," as well as environmental enrichment (infra vide). For confined animals, feeding may be an important cognitive activity, and alternatives to the "old standard" of feeding discrete meals on the floor from a bowl may benefit from investigation of the use of alternative approaches, such as foraging devices. Environmental factors include housing, general husbandry and enrichment practices, as well as interactions with other humans and animals. While comprehensive, sequential investigation of each of the factors described in the "Circle of Nutrition" might result in optimal recommendations, which then could be revised in light of the outcome of the recommended changes. Such an approach might well be overwhelming, and potentially excessive for many clients and clinicians.

Young animals are cared for by veterinary clinicians three or four times during the first two years of life (Table 1).

Because of the large amount of information to be imparted, there currently is little time to be devoted

**Table 1. Recommended Puppy Care at OSU Community Practice**

Visit	Age (months)	Duration (minutes)	Topics
1	2	30	Behavior, Vaccination, Parasites, Heartworms
2	3	15	Behavior, Vaccination Booster
3	4	30	Behavior, Neutering, Heartworms, Microchip
4	6		Neuter Visit
5	16	15-30	Annual Evaluation

to the factors in the “Circle of Nutrition.” (Given the amount of information provided to clients of new puppies, some consideration also might be given to prioritizing the information based on the contribution to the long-term health and welfare of the pet. For example, despite the focus on heartworm prevention, the prevalence of heartworm disease in the U.S. has been reported to be ~1% [with significant geographic diversity].<sup>13</sup> Such considerations might be worth investigating during program development.)

An alternative might be to incorporate a “mini-circle” approach. This approach would include provision of information to owners of all neonatal animals beginning at the first visit and would focus on the desired outcome of a body condition score (BCS) of 2/5 during the period of growth. This skill can be taught quickly (less than 1 minute) to clients and checked frequently during the critical period of early rapid increase and decline in growth rate that occurs during the first two years of life. BCS training could be reinforced by provision of a tailored growth curve for the pet, with instructions to plot the pet’s growth on a regular basis (maybe weekly) and inform the clinic if the growth exceeds predetermined range limits. Diet factors might be reduced to the recommendation of the practice’s preferred (based on successful local experience) growth diet. Body condition scoring also could be taught and reinforced during puppy or kitten classes,<sup>14-15</sup> which would permit more practice and provide some “social reinforcement.” Individualized feeding and environmental recommendations also could be provided during these classes through collaboration with our behavior colleagues.

Available evidence in the human literature permits some hope that such an approach might lead to better outcomes than therapeutic efforts implemented later in life, although a recent systematic review of the literature on interventions to prevent obesity in 0- to 5-year-old humans concluded that current research “approach appears to be piecemeal, and likely reflects the current way research is funded.”<sup>16</sup> In mice, a recent study<sup>10</sup> found greater benefits of environmental enrichment instituted in neonates than in adults on leptin sensitivity. Leptin is a hormone secreted by peripheral fat cells that signals the status of body energy stores. In normal individuals, leptin release decreases food intake and promotes energy expenditure to maintain body weight. In obese individuals, however, leptin resistance may be present, suggesting that methods to increase leptin sensitivity might be beneficial. Additionally, early environmental enrichment resulted in improved glucose tolerance. These studies led the authors to conclude that “diet-independent changes in lifestyle occurring early in life are able to modulate leptin sensitivity and leave meta-

bolic and synaptic imprints. This may have important implications for the use of leptin and behavioral therapy in treatment and especially for the prevention of obesity.”

One also could ask how such an approach might benefit the economics of primary-care veterinary practices. If the study by Kealy et al.<sup>5</sup> can be extrapolated to client-owned animals, pets sustained at a moderate body condition might be able to receive an additional two years of care. Moreover, given the current level of attrition from obesity therapy programs, one wonders how many clients are lost to the practice after a “therapeutic failure” who could be retained if obesity had not occurred. Behaviorists have recognized the benefits of early prevention over later treatment efforts in reduction of surrender of dogs for behavior problems<sup>17</sup> and have developed programs to implement their recommendations. It may be possible for nutritionists to enjoy some success in efforts to slow the “obesity epidemic” by emulating their example.

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