Sherry Lynn Sanderson, DVM, PhD, Diplomate ACVIM & ACVN, University of Georgia

Obesity Management in Dogs

Profile

Definitions

- *Overweight* dogs are 10% to 20% above ideal body weight.[1]
- *Obese* dogs are > 20% above ideal body weight.
- *Resting energy requirement* is the energy requirement for a normal but fed animal at rest in a thermoneutral environment.[2]
- *Maintenance energy requirement* is the energy requirement of a moderately active adult animal in a thermoneutral environment.
- *Malnutrition* is any disorder of nutrition with inadequate or unbalanced nutrition.[3]
  - Includes both nutrient deficiencies and nutrient excesses.
  - Most common cause in dogs is overnutrition or excessive intake of nutrients.
- *Weight rebound* is the propensity to regain weight after a successful weight loss program due to adaptive downregulation of resting energy requirement.[4]
- *Dietary thermogenesis* (also called specific dynamic action of food) refers to the energy needed by the body to digest, absorb, and assimilate nutrients.[5]

Incidence/Prevalence

- Obesity is the most common nutritional disorder seen in dogs.
- An estimated 25% to 44% of dogs in the United States are overweight or obese.

Genetic Implications

Genes associated with obesity have been found in humans and rodents but not dogs; however, because certain breeds are at greater risk for obesity than others, there is probably a genetic component to obesity in some dogs.

Signalment[1,6]

- Certain breeds of dogs are predisposed to obesity, including Labrador retriever, dachshund, sheltie, cocker spaniel, beagle, basset hound, Cavalier King Charles spaniel, and cairn terrier dogs. The incidence of obesity in dogs increases after 2 years of age and plateaus at about 6 to 8 years of age.
- Obesity is more common in females than males.

Causes

Imbalance between energy intake and energy expenditure: intake exceeds expenditure.

Risk Factors

- Overeating: due to internal and external factors; external factors include
  - Availability and improved palatability of pet foods
  - Competition for food from other animals present at the time of feeding
  - Begging at the table
  - Receiving high-fat treats
- Lack of exercise: parallels trend in humans.
- Breed: certain breeds are at greater risk (see breed predilection section above).
- Age
  - Aging is associated with a decrease in lean body mass and metabolic rate.
  - Aging is often associated with medical conditions, such as degenerative joint disease, that interfere with the ability to exercise.
  - Middle-aged and older dogs tend to be less active than very young dogs.
- Neutering: gonadectomy increases the frequency of obesity in males and females.
- Endocrine disorders, such as hypothyroidism and hyperadrenocorticism (It is important that the pot-bellied appearance of some dogs with hyperadrenocorticism not be misdiagnosed as obesity.)
- Drugs that increase appetite, such as corticosteroids and phenobarbital.

Pathophysiology

- There are two types of obesity identified in humans and rodents and which probably occur in dogs;[6] the age at which obesity first occurs determines the type:
  - *Hypertrophic* obesity is characterized by enlargement of fat cell size. It is generally seen with adult onset of obesity. Overfeeding during adulthood increases the size but not the number of fat cells.
  - *Hyperplastic* obesity is characterized by an increase in both size and number of fat cells. It is generally seen

continues

with onset of obesity during growth and puberty.
  - Once fat cells develop, they usually do not disappear, even with successful weight loss, but rather remain as a stimulus to regain weight.
  - Pets with this type of obesity are generally more difficult to treat and have a poorer long-term prognosis.
- Health risks associated with obesity in dogs; the term "epidemic" is being applied to the high prevalence of obesity in humans and their pets.
- Conditions caused or complicated by obesity:
  - Decreased life expectancy[7] (A longevity study in dogs showed that obese dogs have a 2-year decrease in life expectancy compared with nonobese paired littermates.)
  - Increased incidence of hip dysplasia and degenerative joint disease[7–10]
  - Pulmonary and cardiovascular disease[11,12]
  - Reduced immunity[13]
  - Exercise and heat intolerance[14,15]
  - Hyperlipidemia and dyslipidemia
  - Increased incidence of pancreatitis[16]
  - Dystocia and possibly decreased fertility
  - Hypertension[17–19]
  - Increased incidence of mammary tumors and transitional cell carcinoma of the urinary bladder[20]
  - Diabetes mellitus
  - *Malassezia* dermatitis and skinfold dermatitis
  - Difficulty with performing surgical procedures
  - Increased morbidity and mortality during and after anesthesia (Many anesthetics are fat-soluble, so obese animals may take longer to recover from anesthesia; complications associated with ventilation during anesthetic procedure may occur.)

Dx Diagnosis

History

- Histories may vary, but owners often report that the dog is lethargic, cannot tolerate exercise or heat, or has orthopedic problems.

Physical Examination

- Routine physical examination should include body weight and a body condition score (BCS); body weight recorded without being correlated with some kind of index of body condition is often difficult to interpret.
- BCS is a subjective assessment of body fat and, to lesser extent, protein stores.[13]
  - Is accurate when used by properly trained individuals.
  - Two BCS scales can be used. **See Tables 1 and 2.**

Tx Treatment

Step 1–Acknowledge that obesity is present.

- On physical examinations, veterinarians often note BCSs that are consistent with obesity, yet fail to acknowledge obesity as a problem.[21]

Step 2–Obtain a thorough diet history from the owner.

- Interviewing client about what and how the pet is fed provides important information about caloric intake and sources of calories.
- It also helps identify potential problems in advance (eg, multipet households, indulgent owners, beggars).

Step 3–Form a partnership with the owner.

- Short- and long-term success of a weight loss program largely depends on the client's accepting the need for weight loss and doing his or her part to achieve success.
- Clients must understand the risk factors of obesity.
- Clients must feel good about the lifestyle changes needed to address obesity and prevent its recurrence.

Step 4–Correct or control any underlying diseases.

- Rule out endocrine disorders and appropriately treat any diseases diagnosed.

Step 5–Induce a negative energy balance.

- The most effective way to induce a negative energy balance is to combine energy restriction with exercise, an all too often forgotten component of a weight loss program.
- The severity of obesity or concurrent orthopedic problems in some dogs prevents them from safely going on walks **(Figures 1 and 2)**.
  - Consider enrolling these patients in an underwater treadmill exercise

Table 1. BCS Scales for Dogs*

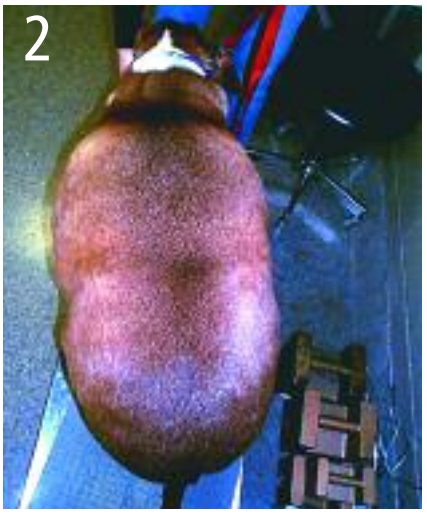
Body Condition	1–5 scale	1–9 scale
Very thin	1	1
Ideal weight	3	4–5
Obese	5	9

*It doesn't matter which scale you use as long as it is noted in the record (ie, BCS = 4/5 or BCS = 4/9).

Table 2. Parameters Used to Assess BCS

Body Condition	Ribs	Overhead View	Side View	Tail Base
Very thin	Ribs easily felt with no fat cover; prominent visibility of individual ribs in dogs with short hair coats	Accentuated hourglass shape	Severe abdominal tuck	Bones are raised with no tissue between the skin and bone
Ideal	Ribs easily felt with slight fat cover; individual ribs not visible	Well-proportioned lumbar waist	Abdominal tuck present	Smooth contour but bones can be felt under a thin layer of fat
Obese	Ribs difficult to feel under thick fat cover	Lumbar waist not visible	No abdominal tuck present; fat hangs from abdomen	Thickened and difficult to feel under promi nent layer of fat; dimple may be visible at the tail base

A 4-year-old castrated male springer spaniel mix that weighed 187 pounds. The dog had repeated work-ups for endocrine disorders; none was ever found. The dog spent most of his time in lateral recumbency. He had great difficulty standing and could stand for only brief periods. The owner could not walk the dog because of its morbid obesity.



Another view of the 4-year-old castrated male springer spaniel mix that weighed 187 pounds. The dog is wider than the scale used to weigh it.

program to decrease weight so the owners can walk them at home.
  - These programs allow low-impact exercise and are well tolerated by even the most obese dogs **(Figures 3 and 4)**.

Step 6–Calculate caloric requirements. (See *Obesity Management Calculation Sheet*, page 33.)

- Initial caloric calculations are only starting points; they may need to be modified according to the dog's individual response.
- Should you use "ideal" or "current" body weight in your calculations? Both methods have shown success. Advantages of using "current" body weight include the following:
  - Takes the guesswork out of determining "ideal" body weight for each patient.
  - Less chance of immediately restricting caloric intake to a level that downregulates thyroid hormone production and results in downregulation of metabolic rate.[4]
  - Reduces the likelihood of "weight rebound" after successful weight loss;[4] rebound is more likely when severe caloric restriction is used during the weight loss program.
- In very obese patients, an exception to

continues

using "current" body weight in your calculations for caloric intake may need to be taken. Fat does not contribute significantly to metabolic rate; therefore, caloric requirements can be overestimated in very obese patients. In these patients, underestimate how much weight the patient should lose to reach an ideal body weight so that you do not adversely affect the metabolic rate.

Step 7–Choose an appropriate diet for weight loss.

- Most pet food companies that make therapeutic diets foods that can be used in a weight loss program; these diets provide reduced calories and adequate levels of all nutrients.
- Avoid using a standard maintenance diet for a weight loss program.
  - Such diets are formulated to meet the nutritional needs of pets consuming "reasonable quantities" of food; they are not formulated for weight loss.
  - By restricting caloric intake using a standard maintenance diet, all the other nutrients are also restricted; standard maintenance diets are not formulated for this purpose.
  - The volume of food will be very small and may lead the dog to beg for food.
- Avoid starvation diets.
  - Starvation restricts not just calories but also every nutrient. Dogs, like humans, have daily requirements for certain nutrients, and starvation fails to provide these nutrients.
  - Starvation results in loss of more lean body tissue than does reduced caloric intake.
  - Starvation decreases intestinal mass and surface area and increases the risk for infection and absorption problems.
  - Outcomes from starvation weight loss programs versus restricted caloric intake programs reveal that the net weight loss with starvation is roughly equivalent to that with restricted caloric intake, but it comes at a much higher cost to the patient.
  - Starvation during a weight loss program adversely affects metabolic rate and predisposes the animal to weight rebound once the weight loss program is completed.
  - Starvation is perceived as inhumane by most clients (and veterinarians), and destroys the partnership between the client and the veterinarian that is needed for successful weight loss; if clients do not feel good about the weight loss program for the dog, they will probably refuse to participate in one or discontinue it prematurely.

The same dog as in Figures 1 and 2 six months after starting an obesity management program (commercial diet formulated for weight loss and underwater treadmill exercise sessions 3 times a week). The dog's weight had decreased to 137 pounds, and his quality of life was dramatically improved. In addition to the underwater treadmill exercise sessions, the owner could now take the dog on short walks at home.

The same dog as in Figures 1 through 3 after losing 71 pounds (weight 116). After losing 50 pounds, the dog's attitude and energy level were dramatically improved. The treadmill sessions were eventually discontinued, and the dog's weight loss program was modified to include 0.5-mile walks every day by the owner. The therapeutic weight loss diet was continued.

Step 8–Divide total daily caloric intake into 2 meals.

- Meal size and frequency influence postprandial thermogenesis in dogs[22] (ther-

mogenesis is increased by feeding multiple small meals rather than 1 large meal [ie, it takes calories to digest food]).
- Two smaller meals may provide better satiety than 1 large meal.

Step 9–Allow treats to be given if this is part of the human-animal bond that the owner and dog have.
- Provide alternative low-calorie treat options (therapeutic weight loss biscuits, canned green beans, carrots and celery sticks, rice cakes, the pet's own weight loss diet).
- Limit the amount of treats the owners can give to the dog to < 10% of the dog's total caloric intake (most treats are not complete and balanced; if treats make up too much of the animal's diet, nutrient imbalances may occur).

Step 10–Decide on the rate of weight loss.
- Because of the lack of "uniform" sizes of dogs, it is better to recommend a percentage loss of body weight per week than a standard generic quantity for all patients; a weight loss rate of 1% of body weight per week is safe.

Step 11–Weigh the dog at least once every 2 weeks.
- This schedule allows early detection of weight loss that is occurring too slowly or has plateaued; if weight loss has plateaued, consider increasing exercise or recalculating caloric intake using the dog's newer and leaner body weight.
- It is often difficult to appreciate weight loss in a dog the owner sees every day; biweekly weigh-ins allow clients to appreciate the amount of weight the dog is losing and allows the veterinarian to give positive feedback to and celebrate success with the client.

Step 12-Consider medical therapy for animals that do not respond to traditional methods of management, such as caloric restriction and increased exercise.
- Dirlotapide (Slentrol, Pfizer Animal Health; www.pfizerah.com) has recently been approved by the FDA for management of canine obesity. It is an additional tool to assist with effective and reliable weight loss.
- Dirlotapide is a selective microsomal triglyceride transfer protein (MTP) inhibitor that blocks the assembly and release of some of the lipoproteins from enterocytes into the bloodstream.
- Microsomal transfer proteins are found in the intestines and the liver; in vitro studies show that dirlotapide selectively inhibits MTP in intestinal cells.
- Dirlotapide does not completely block the release of all triglycerides into the bloodstream. Some triglycerides get trapped in enterocytes and end up in the feces when cells are sloughed.
- Dirlotapide works primarily by decreasing food intake. Acting locally in the small intestine to decrease lipid absorption, dirlotapide increases levels of chemical mediators such as neuropeptides PYY and GLP-1 in dogs.
- Dirlotapide is not a pancreatic enzyme inhibitor and therefore does not interfere with fat digestion in the gastrointestinal tract. Fat is broken down normally in the gastrointestinal tract and undergoes normal absorption into the enterocytes. Thus, the drug does not cause problems associated with pancreatic enzyme inhibitors (undigested fat passed through the gastrointestinal tract as oily anal discharge).
- 85% to 90% of dirlotapide's effect in promoting weight loss is due to a reduction in food intake; the remaining 10% to 15% of the effect is due to loss of fat trapped in enterocytes.
- Dirlotapide is administered orally Q 24 H.
- The most commonly reported side effects with dirlotapide are vomiting, diarrhea, and lethargy. Mild to moderate elevations in hepatic transaminases (ALT/AST) that return to normal after the discontinuation of drug therapy have been observed in dogs treated with dirlotapide.
- Dirlotapide is contraindicated in cats, as well as in dogs with liver disease or dogs receiving long-term corticosteroid therapy.
- The safe use of dirlotapide has been studied for one year.
- Dirlotapide does not promote weight loss in every dog. Weight rebound is a problem in some patients once therapy is stopped. Successful long-term management of weight loss requires ongoing management in the form of caloric restriction and exercise after dirlotapide therapy has been completed.

Tx at a glance

- Restrict calories using diet formulated for weight loss
- Prescribe program of regular exercise
- Calculate treats, as indicated by client, as part of overall caloric intake
- Consider dirlotapide for obese dogs that do not respond adequately to above

Relative cost of weight loss program
- Cost varies depending on the size of the dog.
- Yearly cost of therapeutic weight loss diets is generally less than that of repairing a ruptured cruciate ligament in an obese dog.
- Underwater treadmill programs are becoming more popular in referral practices and institutions. Many sites will have a weekly rates for multiple sessions.

See Aids & Resources, back page, for references, contacts, and appendices.

Canine Obesity Management Sheet

Obesity Management Calculation Sheet

1. Calculate resting energy requirement (RER)

RER = $70(BW_{kg}^{0.75})$ → $70(\_\_\_\_\_{}_{kg}^{0.75})$ = _____ kcal/d

2. Calculate maintenance energy requirement (MER)

Adult dogs

MER (intact adult): 1.8 × RER = _____ kcal/d

MER (neutered adult): 1.6 × RER = _____ kcal/d

3. Calculate obesity management energy requirement (OM)

Adult dogs OM: 60%(MER) = _____ kcal/d*

4. Choose a weight loss diet

Name of dry diet _____ ____ kcal/cup = _____ cup(s)/day *(divide into 2 meals)*

Name of canned diet _____ ____ kcal/can = _____ can(s)/day *(divide into 2 meals)*

5. Treats (limit to < 10% of total kcal intake/d)

Name of treat _____ _____ kcal/treat = treats allowed/day

6. Rate of weight loss

1% of body weight per week: _____ pounds to lose per week *(Please weigh your pet once every 2 weeks.)*

7. Exercise is strongly encouraged

- The most successful weight loss programs combine caloric restriction with exercise.
- Start out any exercise program for your pet *slowly*.

8. How can you tell when the pet has achieved an optimal weight?

- You should be able to *feel ribs* but not see them when pet is standing.
- Pet should have an *hourglass figure* when viewed from top.†
- Your veterinarian can also help you determine when your pet has reached an optimal weight.

* Keep in mind that these are starting levels for kilocalorie intake. They may require modification throughout weight loss program. Some pets may require fewer kilocalories than calculated here.

† If pet has thick hair coat, it is important to rely on hands-on assessment of pet, not visual assessment.