

# Nutrition Assessment in a Dog with Osteoarthritis & Obesity

Maryanne Murphy, DVM, PhD, DACVN  
Tamberlyn D. Moyers, LVMT, VTS (Nutrition)  
University of Tennessee

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**Gregg K. Takashima, DVM**  
WSAVA Global Nutrition Committee Series Editor

**Kara M. Burns, MS, MEd, LVT, VTS (Nutrition)**  
Academy of Veterinary Nutrition Technicians

## THE CASE

An 8-year-old neutered male pug was presented for a weight-loss plan 2 weeks after bilateral cranial cruciate ligament (CCL) repair; the surgeon had suggested the weight-loss plan to aid in healing and long-term health. The owners reported that, before CCL repair, the dog was reluctant to walk, seemed stiff, and spent the majority of most days in a recumbent position.

CCL = cranial cruciate ligament



On presentation, the dog weighed 71.9 lb (32.6 kg), with a BCS of 9 out of 9 and adequate muscle mass. Body fat percentage was estimated at 65% based on palpation and a body fat index chart.<sup>1</sup> He was able to walk only a few steps at a time with substantial sling support, which had not been necessary before surgery. The owners had been instructed to maintain crate rest because of the CCL repair until otherwise directed by the surgeon.

CBC, serum chemistry profile, urinalysis, and T4 results were within normal limits. Bilateral stifle radiographs obtained before surgery showed periarticular osteophytes on both patellae and trochlear ridges, bilateral effusion, and bilaterally compressed fat pads.

### Dietary History

The dog was reportedly fed once daily in the evening. A typical meal consisted of either 2 hot dogs, half a grilled boneless skinless chicken breast, or a grilled hamburger and one to 2 chocolate chip cookies. He also had access to an adult dry feline maintenance diet, which was always available for the 5 cats living in the home. No commercial dog food was included in his diet. Based on the USDA National Nutrient Database for Standard Reference, the human foods contributed approximately 374 to 566 calories per day.<sup>2</sup> The owners were unable to identify the manufacturer of the feline diet or estimate the dog's daily consumption of this diet, so additional caloric contribution could not be determined.

## DIAGNOSIS: OSTEOARTHRITIS & OBESITY

### Treatment

Based on the dog's weight on presentation and estimated body fat percentage, the dog's ideal body weight (IBW) was approximately 31.5 lb (14.3 kg).<sup>3,4</sup> Using this IBW, his resting energy requirement (RER) was estimated to be 515 kcal/day, and maintenance energy requirement (MER) was 412 kcal/day using a 0.8 life stage factor (see *How to Calculate IBW, RER, & MER*).<sup>5</sup> A life stage factor of 0.8 to 1.0 is recommended for weight loss; the lower factor was chosen in this case due to the patient's high BCS. These calculations mirrored similar caloric recommendations reported in other weight-loss regimens.<sup>6</sup> If a treat allowance is required, reserving 10% MER for this purpose is generally recommended.

Of this patient's 412-kcal/day MER, 377 kcal/day was allocated to the selected maintenance diet and 35 kcal/day to treats. One and two-thirds cups (375 kcal) per day of a dry therapeutic weight-loss diet formulated to meet the nutrition requirements established by the Association of American Feed Control Officials (AAFCO) Dog Food Nutrient Profiles for maintenance was prescribed. The owners were given a list of various human foods—and their associated caloric content—that could be used for the dog's 35-kcal/day treat allowance. He was also started on eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) provided via a liquid fish oil product (see *Suggested Reading*, page 65). Each teaspoon contained 690 mg of EPA, 414 mg of DHA, and 41 kcal, which was not factored into the dog's weight-loss plan due to concerns about owner compliance (see *Owner Education*). The owners were instructed to remove access to the feline dry food.

## HOW TO CALCULATE IBW, RER, & MER<sup>3</sup>

- ▶  $IBW = [\text{current body weight in kg} \times (100\% - \text{body fat percentage})] \div 80\%$   
 $[32.6 \text{ kg} \times (1.0 - 0.65)] \div 0.8 = 14.3 \text{ kg}$
- ▶  $RER = 70 \times (\text{ideal body weight in kg})^{0.75}$   
 $70 \times (14.3 \text{ kg})^{0.75} = 515 \text{ kcal/day}$
- ▶  $MER = RER \times \text{life stage factor}$   
 $515 \text{ kcal/day} \times 0.8 = 412 \text{ kcal/day}$

## Outcome

The dog's progress was rechecked once weekly for the first month of the weight-loss plan, then every 4 weeks over the next year. Once he was cleared for activity by the surgeon who performed the CCL repair, the owners were instructed to start 5-minute leash walks twice daily, with an eventual increase to 20 minutes twice daily. Daily feeding amounts were periodically adjusted to maintain a weight-loss rate of 1% to 2% of the dog's current body weight per week. As he lost weight, the owners reported it was easier for him to rise from a sitting position and that he seemed less stiff when walking as compared with before CCL repair. When the dog achieved his ideal weight and BCS, the owners reported return to an apparent normal gait. He no longer had difficulty rising and was able to take 30-minute daily leash walks with at least one 60-minute walk per week.

## Owner Education

The owners were feeding an unbalanced diet consisting of human food of low nutritional value. Part of the initial weight-loss consultation included discussing the challenges the owners may have faced when switching the dog from a human-food-based diet to an extruded kibble-based diet. The owners were instructed to introduce the new diet by adding a small portion of the new diet to the evening meal and removing a portion of the human food items. The owners were also instructed to stop feeding chocolate chip cookies. Over approximately 4 to 7 days, the kibble portion was increased while the human food portion was decreased. If they could not make this transition within that time frame, a balanced homemade diet plan could be considered.

The owners were concerned about continued begging for food. Specific scenarios and suggested responses were discussed. For example,

when the dog would beg for food, the owners could initiate an activity (eg, playing with toys, going for a leash walk); however, due to the CCL repair and the osteoarthritis, all activity also had to be based on this dog's ability and with the approval of the referring surgeon.

Ideally, the calories provided from supplements, including fish oil, are included in a daily treat allowance. In this case, however, the owners felt the recommended treat allowance was too low, and the veterinary team was concerned about plan adherence if fish oil was the only allowed daily treat. Because total caloric intake—including diet, treats, and supplements—was assessed at each weight recheck, treat allowance could be adjusted based on rate of weight loss. This information was used to further educate the owners about the effect excess calories can have on weight-loss success. If fish oil needed to be incorporated as part of the treat allowance, a reasonable alternative would have been to reserve some of the daily portion of the complete and balanced kibble as a treat.

## Conclusion

This case illustrates the importance of nutritional management for weight loss and pain management to improve clinical signs associated with osteoarthritis. It also demonstrates the importance of owner education and compliance.

AAFCO = Association of American Feed Control Officials

CCL = cranial cruciate ligament

DHA = docosahexaenoic acid

EPA = eicosapentaenoic acid

IBW = ideal body weight

MER = maintenance energy requirement

RER = resting energy requirement

Continues ►

## ASK YOURSELF ...

### QUESTION 1

**What is the recommended EPA and DHA dose for osteoarthritis management in dogs?**

- A. 100 mg/kg
- B. 200 mg/kg
- C. 310 mg/kg<sup>0.75</sup>
- D. 50 mg/kg<sup>0.75</sup>

MOST ACCURATE ANSWER: C

Omega-3 fatty acids have the ability to reduce pro-inflammatory cytokine production. EPA and DHA, both omega-3 fatty acids found in fish oil, are a commonly recommended source. Based on available data, a combined dose of 310 mg/kg<sup>0.75</sup> per day, with an upper limit of 370 mg/kg<sup>0.75</sup>, has been suggested.<sup>7,8</sup> An acceptable fish oil supplement should include no greater than 50%-60% EPA and no greater than 40%-50% DHA.<sup>8</sup> Because GI side effects (eg, soft stool, overt diarrhea) may result from fish oil use, this dog was started on half the recommended osteoarthritis dose, which is similar to a general anti-inflammatory dose of 125 mg/kg<sup>0.75</sup> (see **Suggested Reading**). If he tolerated this initial dose, increasing to the full osteoarthritis level could be considered. Doses are calculated based on IBW. It is also important to factor in the EPA and DHA content of the diet, as well as any other supplements, when increasing to the higher dose.

### QUESTION 2

**What other supplements could be added to manage this patient's osteoarthritis?**

- A. Polyunsaturated fatty acids and curcumin
- B. Glucosamine and chondroitin sulfate
- C. Avocado and soybean unsaponifiables and undenatured type II collagen
- D. All of the above

MOST ACCURATE ANSWER: D

All of the above components have at least limited published data in the treatment of canine osteoarthritis (see **Suggested Reading**). Polyunsaturated fatty acids in the form of omega-3 fatty acids are anti-inflammatory. Curcumin has antiapoptotic and anti-inflammatory effects in chondrocyte signaling pathways and can

increase type II collagen synthesis. Glucosamine and chondroitin sulfate are preferred substrates for glycosaminoglycan chain production and have anti-inflammatory and anticatabolic effects. Avocado and soybean unsaponifiables have anticatabolic and anti-inflammatory effects, and undenatured type II collagen contains high levels of glycine and proline, amino acids involved in stability and regeneration of cartilage. Although these compounds show promise in the treatment of canine osteoarthritis, further research is needed, especially in regard to individual component bioavailability, safety, and efficacy.

### QUESTION 3

**When should a supplement that provides energy be included in the treat allowance?**

- A. Every time a weight-loss plan is designed
- B. When owners are compliant with a weight-loss plan and other treat recommendations, but the dog is not losing weight at an appropriate rate
- C. When the contribution from supplements alone exceeds the 10% treat allowance
- D. All of the above

MOST ACCURATE ANSWER: D

Any of the above answers are appropriate when a pet receives a supplement with caloric content. Manufacturers of orally provided oils, soft chews, and chewable tablets should be contacted to determine the caloric content of the individual product if not clearly declared on supplement packaging. In this case, fish oil was deemed an important component of the dog's treatment plan, but it was suspected that owner adherence to the weight-loss plan would diminish if human-food treat options were not included. As the weight-loss plan continued, the dog's human-food treat allowance was reduced, and the owners were encouraged to use a portion of the dog's daily kibble allowance as treats to maintain an appropriate weight-loss rate. This allowed for maintenance of the higher osteoarthritis fish oil dose while still providing the owners with an option to continue providing treats via a controlled method. Alternatively, diets that already include this fish oil component as an ingredient could be considered for the weight-loss plan.

#### QUESTION 4

#### What is the most important reason to recommend weight loss as part of the treatment plan for this patient?

- A. Weight loss can reduce the risk for cruciate repair failure
- B. Weight loss can dramatically improve clinical signs related to osteoarthritis
- C. Weight loss can increase lifespan in overweight patients
- D. All of the above

MOST ACCURATE ANSWER: D

Maintaining an ideal weight and BCS has been shown to increase longevity by approximately 2 years and delay clinical signs and treatment of osteoarthritis in dogs.<sup>9</sup> It was also important to institute weight loss to improve this dog's clinical signs related to osteoarthritis because his quality of life was being negatively impacted by his inability to ambulate without significant sling support. Once he lost weight, the owners reported he was better able to rise from a sitting position and that he seemed less stiff when walking. This is likely directly related to the decreased body mass, which caused a reduction in proinflammatory cytokines and excess forces placed on joints and articular cartilage. ■

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#### Suggested Reading

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DHA = docosahexaenoic acid

EPA = eicosapentaenoic acid

IBW = ideal body weight