



MATTER OF THE HEART

Nutritional intervention can play a role in improving the quality of life for cats with hypertrophic cardiomyopathy.



NUTRITION NOTES

Feline Hypertrophic Cardiomyopathy and the Role of Nutrition

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Abstract

Feline hypertrophic cardiomyopathy (HCM) is the most common heart disease in cats. This review article takes an in-depth look at the role of nutrition as part of effective multimodal management of HCM, examining specific nutrients that aid in improving the quality of life for cats with HCM. Effective treatment requires a multifaceted approach, of which therapeutic nutrition is an important component. The purpose of this article is to review the signs of HCM in feline patients, the tenets of a proper nutritional assessment, and the keys to creating dietary recommendations for cats with HCM.



Take-Home Points

- The most common heart disease in cats is hypertrophic cardiomyopathy (HCM), which is characterized by a gradual thickening and weakening of the heart muscle.
- Disease-causing mutations have not been identified in most cats with HCM, except for the myosin-binding protein C mutation in Maine coon and ragdoll cats.
- Management of cats with HCM is limited to a combination of medication and diet.
- Optimizing the cat's body composition, preventing deficient or excessive intake of various nutrients, and avoiding nutritionally unbalanced diets may help to slow progression of disease and improve quality of life.
- In addition to diet, the veterinary team must ascertain if treats or supplements are being given. Cats may be eating a recommended therapeutic cat food but may also be receiving large amounts of sodium from treats or table food.
- Ask owners how they administer medications to their cat, as this may reveal issues that result in too much of a certain nutrient or the unbalancing of a diet and are not understood by the owner.
- The veterinary team should communicate the use of appropriate foods, such as the canned version of the therapeutic diet, to administer medications or provide as a treat.
- Reductions in food intake may indicate the need for dietary modifications but also may be an early sign of decompensation of the cardiac disease or the need for medication adjustment. Body weight, body condition score, and muscle condition score should be monitored carefully at every visit and the diet reassessed to ensure it remains optimal for the cat's stage of disease, laboratory values, and clinical signs.
- Cardiac cachexia is a major concern in patients with cardiac disease. Recommend to pet owners that they feed patients a therapeutic food containing adequate calories and high-quality, highly digestible protein.
- Veterinary nurses need to remind clients that pets should be offered unrestricted access to fresh, clean water.

Heat disease is a common cause of illness in domestic cats, with up to 20% of the feline population estimated to be affected.^{1,2} In addition, studies have found cardiac murmurs in roughly 20% of apparently healthy cats.^{3,4} Cardiomyopathies are the principal cause of cardiovascular morbidity and mortality in cats, and hypertrophic cardiomyopathy (HCM) is the most common of these disorders.^{5,6}

HCM is characterized by a gradual thickening and weakening of the heart muscle. Left ventricular hypertrophy, impaired diastolic filling, and, often, secondary left atrial enlargement result. As the muscle thickens, there is less room for blood to fill the heart, and the muscle is less able to pump blood effectively as it weakens. There are 2 primary forms of HCM: A genetically linked form that is often early onset in breeds, such as Maine coons, ragdolls, rexes, and sphynxes, and a sporadic form that may occur in any cat at any age.

Congestive heart failure (CHF) and arterial thromboembolism (ATE) are common clinical manifestations of HCM in cats, with ATE reportedly developing in up to 48% of affected cats.^{7,8} The median survival time for cats with HCM is less than 2 years,

with cats presenting for CHF or ATE having even shorter survival times.^{7,8} Disease-causing mutations have not been identified in most cats with HCM, except for the myosin-binding protein C mutation in Maine coons and ragdolls.^{7,9,10} At this time, management of cats with HCM is limited to a combination of medication and diet.

SIGNS OF HYPERTROPHIC CARDIOMYOPATHY

Early signs of heart disease in cats are easy to miss, as they are so subtle and nonspecific that they are rarely noticed by owners, if they exist at all. In addition, cats appear to know their own capabilities and limitations and thus restrict their level of activity, which can further mask clinical signs. A serious and life-threatening consequence of HCM is the formation of blood clots in the heart. These clots may result in a thromboembolism.

RISK FOR HYPERTROPHIC CARDIOMYOPATHY

Certain breeds are predisposed to cardiomyopathies (**BOX 1**), and 2 breeds—Maine coons and ragdolls—each have at least 1 identified genetic cause of HCM.^{9,10}

**BOX 1****Breeds Predisposed to Cardiomyopathies¹¹**

- Sphynx
- Norwegian forest cat
- American shorthair
- Scottish fold
- Persian
- Siamese
- Abyssinian
- Himalayan
- Birman

Risk factors for causing or complicating cardiovascular disease include breed, sex, obesity, renal disease, drug therapy, and endocrinopathies.

Heart disease in cats is seldom curable. Management is focused on medical and nutritional therapy.

NUTRITIONAL ASSESSMENT

The veterinary team should not wait until later stages of cardiac disease to begin nutritional management. Rather, nutritional therapy should be instituted early to benefit the cat in the longer, more common, earlier stages of cardiac disease. Optimizing body composition, preventing deficient or excessive intake of various nutrients, and avoiding nutritionally unbalanced diets may help to slow progression of disease and improve quality of life.

A nutritional assessment aids in determining if specific modifications might benefit a cat with heart disease. The assessment includes an evaluation of the cat and its current diet and consists of a nutritional history, body weight, body condition score (BCS), and muscle condition score (MCS).

Nutritional History

When taking the nutritional history, it is important to ask open-ended questions to facilitate discussion of everything the cat is being fed, including treats and supplements as well as the cat's regular diet. This information can uncover potential sources of excess

nutrients. For example, a cat may be eating a recommended therapeutic cat food aimed at managing cardiac disease but may also be ingesting large amounts of sodium from treats or table food. One study showed that more than 30% of cats with heart disease received treats.^{12,13} Asking owners about how they administer medications can reveal further issues (e.g., using high-sodium foods such as cheese or lunch meats to hide pills).

Body Composition

Changes in body composition are common in cats with heart disease and can negatively affect the outcome and quality of life. BCS assessment should be performed at least weekly. Teaching the owner how to perform this assessment and report it to the veterinary team can facilitate careful monitoring.

The MCS evaluates muscle mass. Cats can be very obese and have severe muscle loss. Conversely, cats can be thin but have normal muscle mass. Evaluation of muscle mass includes visual examination and palpation over the temporal bones, scapulae, lumbar vertebrae, and pelvic bones. Assessing MCS is important in cats with heart disease, as they primarily lose muscle and may develop cachexia, a complex syndrome characterized by severe, chronic, undesired, and progressive weight loss and muscle wasting, with or without loss of fat mass.¹⁴ This syndrome is associated with an underlying disease, anorexia, inflammation, insulin resistance, and increased lean muscle breakdown. The rate of loss of lean body mass with cardiac cachexia exceeds that attributable to anorexia alone and indicates excessive caloric expenditure caused by the increased work of respiration and elevated heart rate.

Monitoring and Adjustment

Voluntary reductions in food intake by the cat may indicate the need for dietary modification but also may be an early sign of decompensation of the cardiac disease or the need for medication adjustment. Body weight, BCS, and MCS should be monitored carefully at every visit and the diet reassessed to ensure it remains optimal for the cat's stage of disease, laboratory values, and clinical signs.



DIETARY CONSIDERATIONS IN MANAGING HYPERTROPHIC CARDIOMYOPATHY

Owner Education

Managing a cat with HCM involves creating an overall dietary plan that supports the cat as well as the human–animal bond. Because so many owners like to give their cats treats, it is important to include appropriate treats in the plan. Communicating the use of appropriate foods, such as the canned version of the therapeutic diet, to administer medications or provide as a treat is beneficial. It is also important to address the use of supplements with owners, who commonly consult the internet for alternative treatments for cardiac disease. The veterinary team must educate owners that dietary supplements do not require proof of safety, efficacy, or quality control before being marketed. Being familiar with various brands of supplements and having a plan to make recommendations based on a specific brand with researched and confirmed concentrations of the supplement in question can help owners who are seeking this kind of treatment for their pet.

Key Nutrients

Sodium and Chloride

Retention of sodium, chloride, and water is associated with CHF. Whereas healthy cats easily excrete excess sodium in their urine a few hours after ingestion, patients in early cardiac disease may lose this ability. As heart disease worsens and CHF develops, the ability to excrete excess sodium is further diminished. Historically, sodium retention was primarily implicated in the pathogenesis of CHF and some forms of hypertension. Chloride may also act as a direct renal vasoconstrictor.

According to the National Research Council, the minimum recommended allowance for sodium and chloride in foods for adult cats is 0.068% and 0.096% dry matter (DM), respectively.^{15,16} Sodium levels in foods designed to manage cats with cardiovascular disease should meet the recommended allowance but not exceed 0.3% DM. Recommended chloride levels are typically 1.5 times sodium levels. Avoiding excess sodium and chloride in cat foods is more difficult than in dog foods because ingredients used to meet the higher protein requirement of cats also contain sodium and chloride and thus increase the amount of these nutrients in cat food.

Taurine

Taurine is an essential amino acid in cats, and taurine deficiency has been linked to myocardial failure in this species. However, the mechanism of heart failure in taurine-deficient cats is not well understood. Taurine may play a role in free radical inactivation, osmoregulation, and calcium modulation; it is known for its direct effects on contractile proteins.¹⁶ Other factors may also contribute to the development of myocardial failure in cats with taurine deficiency. Therefore, a minimum recommended allowance for taurine—0.04% DM—is necessary in cat foods.^{15,16} Foods for cats with cardiovascular disease should contain levels of taurine at least 0.3% DM. Levels of taurine typically found in supplements that may be used in feline cardiovascular patients (250 to 500 mg taurine/day) provide approximately twice that much.^{15,16}

Phosphorus

Patients with cardiac disease often have concurrent disease conditions. It is understood that phosphorus is a nutrient of concern in patients with concurrent chronic kidney disease and that kidney disease is one of the more prevalent diseases seen concurrently with cardiac disease. The recommended amount of phosphorus in nutritional management of cardiac disease is 0.3% to 0.7% DM in cats.^{15,16}

Potassium and Magnesium

Another concern in cardiac patients is the metabolism of potassium and magnesium. Hypokalemia, hyperkalemia, and hypomagnesemia are all potential complications when medication therapy is introduced in patients with cardiovascular disease. Veterinary team members should be aware that potassium or magnesium homeostasis abnormalities can:¹⁶

- Produce cardiac dysrhythmias
- Lessen myocardial contractility
- Create profound muscle weakness
- Potentiate adverse effects from cardiac glycosides and other cardiac drugs

The amounts of potassium and magnesium recommended for adult maintenance in cats (0.52% DM potassium, 0.04% DM magnesium) should be the minimum amounts included in nutritional management of CHF.^{15,16}



Protein

Cardiac cachexia is a major concern in patients with cardiac disease. Many patients with cachexia present with concomitant disease (e.g., chronic kidney disease), which also significantly affects nutrient requirements. Profound anorexia enhances protein–energy malnutrition in patients with cachexia. To help avoid cachexia, patients should be encouraged to eat a therapeutic food that contains adequate calories and high-quality, highly digestible protein.

Omega-3 Fatty Acids

The cytokines tumor necrosis factor and interleukin-1 have been implicated as pathogenic mediators in cardiac cachexia. Fish oil has been shown to alter cytokine production, and research involving fish oil suggests fish oil–mediated alterations in cytokine production may help dogs with CHF. It is believed that cachectic CHF patients may benefit from these alterations through omega-3 fatty acid supplementation.¹⁷ Other effects of omega-3 fatty acids that help prevent cachexia may include improved appetite and antiarrhythmic effects.

Omega-3 fatty acids have other effects, such as the potential to alter immune function. This alteration may contribute to their cardiovascular effects. Omega-3 fatty acids also reduce platelet aggregation resulting from the production of thromboxane B₂, which might be of benefit in cats with cardiac disease and those at risk for thrombus formation.¹⁶ It is important to be mindful of this effect when using omega-3 fatty acids in animals with coagulopathies.

Additional studies and discussion are needed, but it is believed that dogs and cats with cardiac disease may benefit from omega-3 fatty acid supplementation. No optimal dose of omega-3 fatty acids has yet been established for humans, cats, or dogs. The current recommendation from veterinary nutritionists studying fatty acids and cardiac disease is a dose of 40 mg/kg eicosapentaenoic acid (EPA) and 25 mg/kg docosahexaenoic acid (DHA) for both dogs and cats.^{7,16} To meet these levels, a manufactured food would need to contain between 80 and 150 mg/100 kcal EPA + DHA, and the size of the pet and the amount of food consumed would need to be considered.

Fish oil supplements vary widely in the amount of EPA and DHA they contain; therefore, supplement recommendations should be made with caution.

As with other supplements, the veterinary healthcare team should be familiar with various brands and plan to make a recommendation based on a specific brand with researched and confirmed concentrations of EPA and DHA.

The veterinary healthcare team should educate owners that most benefits of omega-3 fatty acids occur after peak plasma and tissue concentrations have been achieved. Although plasma concentrations may increase significantly in the first week of omega-3 fatty acid supplementation, 4 to 6 weeks are typically required to reach peak plasma concentrations.

Water

Veterinary team members must remember to talk with clients about the importance of water for all pets and remind them that pets should be offered fresh, clean water *ad libitum*. Healthcare teams must also keep in mind that water quality varies considerably, even within the same community. Water can be a significant source of sodium, chloride, and other minerals. Veterinary healthcare teams should be familiar with the mineral levels in their local water supply. Water samples can be submitted to state or other government laboratories for analysis. Also, municipal water companies can be contacted to ask about mineral levels in local water supplies. Distilled water or water with less than 150 ppm sodium is recommended for patients with advanced heart disease.¹⁶

SUMMARY

The most common heart disease in cats is HCM. Heart disease in cats is seldom curable, with management focused on medical and nutritional therapy. Good client communication is important for achieving desired outcomes in cats with cardiac disease. Discussion of diet; the role of specific nutrients, treats, table food, and dietary supplements; and effective medication administration is beneficial for both the owner's and the cat's quality of life. Educate the client regarding nutrition and the role it plays in managing HCM so that recommendations can address the cat's preferences, as well as the client's time, lifestyle, and financial limitations. **TVN**

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NexGard[®]

(afoxolaner) Chewables

Brief Summary: Before using NexGard[®] (afoxolaner) Chewables, please consult the product insert, a summary of which follows.

CAUTION: Federal (USA) law restricts this drug to use by or on the order of a licensed veterinarian.

Description: NexGard is a soft chewable for oral administration to dogs and puppies according to their weight. Each chewable is formulated to provide a minimum afoxolaner dosage of 1.14 mg/lb (2.5 mg/kg).

Indications: NexGard kills adult fleas and is indicated for the treatment and prevention of flea infestations (*Ctenocephalides felis*), and the treatment and control of *Ixodes scapularis*, *Dermacentor variabilis*, *Amblyomma americanum*, and *Rhipicephalus sanguineus* infestations in dogs and puppies 8 weeks of age and older, weighing 4 pounds of body weight or greater, for one month. NexGard is indicated for the prevention of *Borrelia burgdorferi* infections as a direct result of killing *Ixodes scapularis* vector ticks.

Dosage and Administration: NexGard is given orally once a month, at the minimum dosage of 1.14 mg/lb (2.5 mg/kg). See full product insert for dosing table and details.

Warnings: Not for use in humans. Keep this and all drugs out of the reach of children. In case of accidental ingestion, contact a physician immediately. Keep NexGard in a secure location out of reach of dogs, cats, and other animals to prevent accidental ingestion or overdose.

Precautions: Afoxolaner is a member of the isoxazoline class. This class has been associated with neurologic adverse reactions including tremors, ataxia, and seizures. Seizures have been reported in dogs receiving isoxazoline class drugs, even in dogs without a history of seizures. Use with caution in dogs with a history of seizures or neurologic disorders.

The safe use of NexGard in breeding, pregnant or lactating dogs has not been evaluated.

Adverse Reactions: In a well-controlled US field study, which included a total of 333 households and 615 treated dogs (415 administered afoxolaner; 200 administered active control), no serious adverse reactions were observed with NexGard.

Over the 90-day study period, all observations of potential adverse reactions were recorded. The most frequent reactions reported at an incidence of > 1% within any of the three months of observations are presented in the following table.

Table 1: Dogs with Adverse Reactions.

	Treatment Group			
	Afoxolaner		Oral active control	
	N ¹	% (n=415)	N ²	% (n=200)
Vomiting (with and without blood)	17	4.1	25	12.5
Dry/Flaky Skin	13	3.1	2	1.0
Diarrhea (with and without blood)	13	3.1	7	3.5
Lethargy	7	1.7	4	2.0
Anorexia	5	1.2	9	4.5

¹Number of dogs in the afoxolaner treatment group with the identified abnormality.

²Number of dogs in the control group with the identified abnormality.

In the US field study, one dog with a history of seizures experienced a seizure on the same day after receiving the first dose and on the same day after receiving the second dose of NexGard. This dog experienced a third seizure one week after receiving the third dose. The dog remained enrolled and completed the study. Another dog with a history of seizures had a seizure 19 days after the third dose of NexGard. The dog remained enrolled and completed the study. A third dog with a history of seizures received NexGard and experienced no seizures throughout the study.

Post-Approval Experience (July 2018): The following adverse events are based on post-approval adverse drug experience reporting. Not all adverse events are reported to FDA/CVM. It is not always possible to reliably estimate the adverse event frequency or establish a causal relationship to product exposure using these data.

The following adverse events reported for dogs are listed in decreasing order of reporting frequency for NexGard: Vomiting, pruritus, lethargy, diarrhea (with and without blood), anorexia, seizure, hyperactivity/restlessness, panting, erythema, ataxia, dermatitis (including rash, papules), allergic reactions (including hives, swelling), and tremors.

Effectiveness: See full product insert for details regarding Effectiveness.

Animal Safety: In a margin of safety study, NexGard was administered orally to 8 to 9-week-old Beagle puppies at 1, 3, and 5 times the maximum exposure dose for a total of six treatments. There were no clinically-relevant effects related to treatment on physical examination, body weight, food consumption, clinical pathology (hematology, clinical chemistries, or coagulation tests), gross pathology, histopathology or organ weights. Vomiting occurred throughout the study, with a similar incidence in the treated and control groups, including one dog in the 5x group that vomited four hours after treatment.

In a well-controlled field study, no adverse reactions were observed from the concomitant use of NexGard with other medications.

Contact Information: For a copy of the Safety Data Sheet (SDS) or to report suspected adverse drug events, contact Boehringer Ingelheim Animal Health USA Inc. at 1-888-637-4251. For additional information about adverse drug experience reporting for animal drugs, contact FDA at 1-888-FDA-VETS or www.fda.gov/reportanimalae.

The information provided here is not comprehensive. The full FDA-approved product insert is available at www.nexgardfordogs.com. Consult your veterinarian for further information.

Product approved by FDA under NADA # 141-406

Marketed by: Frontline Vet Labs™, a Division of Boehringer Ingelheim Animal Health USA Inc. Duluth, GA 30096

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