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Diet-Associated DCM: Research Update

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the scientific study of pet nutrition by veterinary nutrition specialists and experts.

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in All About Pet Food, General, Pet Nutrition Basics, Petfoodology Blog, Pets with Health Conditions, Trending Topics in Pet Nutrition

A lot has happened in the world in the last year and a half, but it hasn't stopped research on diet-associated dilated cardiomyopathy (DCM). In addition to the two original peer-reviewed research publications on this disease from late 2018 (Kaplan et al, 2018) and early 2019 (Adin et al, 2019), five new research studies have been published in the last year, helping us to better understand this unusual form of DCM and getting us closer to identifying the specific cause.

A quick recap about this disease: DCM is a severe disease of heart muscle that affects dogs (and other species, including cats, humans, and even whales). It's not a new disease; in fact, DCM is the second most common heart disease affecting dogs, occurring primarily in

dogs of certain large or giant breeds, such as Doberman Pinschers, Great Danes, and Irish Wolfhounds. DCM causes the heart to enlarge and pump weakly, which can result in coughing, difficulty breathing, collapse, or even sudden death. It is a disease that, even with medications, does not usually improve and continues to progress.

In 2018, the United States Food and Drug Administration (FDA) published an alert that they were investigating a potential connection between diet and DCM (FDA, 2018). What is different about diet-associated DCM is that it seems to be able to affect any breed of dog and it can improve significantly when the diet is changed. Diets fed to the dogs reported to the FDA were commonly grain-free commercial dry diets that often contained peas, lentils, or potatoes/sweet potatoes (studies often refer to this category of diet as, "non-traditional"; FDA, 2018; FDA, 2019a; FDA, 2019b). As of July, 2020, the FDA had received more than 1100 reports of dogs with DCM (Solomon, 2020).

Two of the new research publications were retrospective studies – summaries of data from dogs seen in recent years at two different veterinary hospitals (Freid et al, 2021; Walker et al, 2021). Both studies confirmed results from the previous studies – that atypical breeds could be affected but also breeds commonly associated with DCM. And, like the original two studies, dogs' enlarged hearts got smaller after changing from a non-traditional to traditional diet (or from a grain-free to a grain-inclusive diet as the diets were defined in one study) – something that is very unusual in typical DCM. These two new retrospective studies also added important new information: Dogs eating non-traditional or grain-free diets that changed diets also lived longer than dogs with the typical form of DCM (Freid et al, 2021; Walker et al, 2021).

In addition, results from two other studies are intriguing because they suggest that non-traditional diets might have early, more subtle negative effects on the heart. In one study of apparently healthy Golden Retrievers, the dogs that were eating non-traditional diets had larger hearts with weaker contraction compared to those eating traditional diets (Ontiveros et al, 2020). In the second study of apparently healthy dogs, four different breeds were included: Golden Retrievers, Doberman Pinschers, Whippets, and Miniature Schnauzers (Adin et al, 2021). The dogs in this study eating grain-free diets had higher levels of troponin than dogs eating grain-inclusive diets. Troponin is a protein measured in the blood that reflects heart muscle damage.

It is important to note that the studies thus far have used slightly different definitions of diets associated with this problem. This is not unexpected as the definition continues to be refined over time as researchers gain a better understanding of this disease. Identifying the specific cause of diet-associated DCM will help to determine the optimal classification of diets, ingredients, and individual nutrients and other compounds and how to prevent negative effects in animals.

Our research group at Tufts University recently published a study that was a step towards the goal of identifying the cause of diet-associated DCM (Smith et al, 2021). In this study, we used a sensitive method of analyzing diets associated with DCM and more traditional diets. We found more than 100 different biochemical compounds that differed between the two types of diets, with most of them being higher in diets associated with DCM. The amount of taurine in diets, which has been proposed to play a role in the problem, was not different between diet groups. The analysis also narrowed down the top compounds that distinguished the two diet groups. These results have helped us to target next steps in identifying the specific cause by looking more closely at some of these compounds, as well as measuring these same compounds in dogs with DCM eating different diets.

The FDA has shown leadership in addressing and studying this problem to help protect dogs' health. Their data has been very valuable, including data they presented at a conference in September, 2020 on dogs that had full or partial recovery from diet-associated DCM (FDA, 2018; FDA, 2019a; FDA, 2019b; Jones et al, 2020). This issue also has spurred research that has provided information on the effect of different diets and ingredients on taurine and other amino acids in dogs (Donadelli et al, 2020; Pezzali et al, 2020; Quilliam et al, 2021; Reis et al, 2021). Thus far, taurine deficiency does not appear to play a primary role in this current investigation into diet-associated DCM, although it could still have a secondary role (especially in some breeds).

Despite a great deal of work on the part of numerous investigators, the specific cause of diet-associated DCM has not yet been identified and dogs continue to be diagnosed. However, each new published research study adds another piece of the puzzle and researchers remain hard at work to solve this ongoing challenge to dogs' health.

Peer-Reviewed Research Studies on Diet-Associated DCM

1. Kaplan JL, Stern JA, Fascetti AJ, et al. Taurine deficiency and dilated cardiomyopathy in golden retrievers fed commercial diets. PLoS One 2018;13(12): doi: 10.1371/journal.pone. 0209112.
2. Adin D, DeFrancesco TC, Keene B, et al. Echocardiographic phenotype of canine dilated cardiomyopathy differs based on diet type. J Vet Cardiol 2019;21:1-9.
3. Ontiveros ES, Whelchel BD, Yu J, et al. Development of plasma and whole blood taurine reference ranges and identification of dietary features associated with taurine deficiency and dilated cardiomyopathy in golden retrievers: a prospective, observational study. PLoS One 2020;15(5): doi: 10.1371/journal.pone.0233206.eCollection 2020.
4. Freid KJ, Freeman LM, Rush JE, et al. Retrospective study of dilated cardiomyopathy *in dogs*. J Vet Intern Med 2021;35:58-67.

5. Adin D, Freeman LM, Stepien R, et al. Effect of diet type on circulating taurine concentrations, cardiac biomarkers, and echocardiograms in four dog breeds. J Vet Intern Med 2021;35:771-779.
6. Walker AL, DeFrancesco TC, Bonagura JD, et al. Association of diet with clinical outcomes in dogs with dilated cardiomyopathy and congestive heart failure. J Vet Cardiol (Online, ahead of print). doi: 10.1016/j.jvc.2021.02.001.
7. Smith CE, Parnell LD, Lai C-Q, Rush JE, Freeman LM. Investigation of diets associated with dilated cardiomyopathy in dogs using foodomics analysis. *Sci Rep* 2021;11:15881. doi: 10.1038/s**********-2.

Related Peer-Reviewed Research Studies

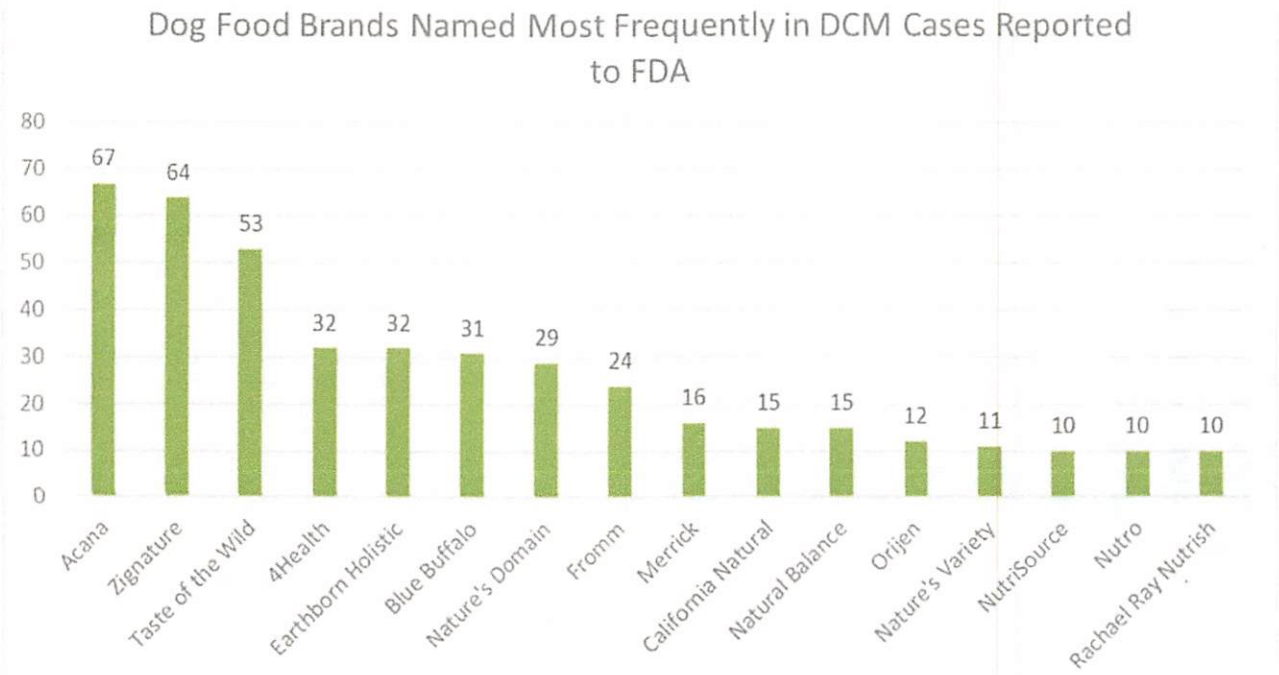
1. Donadelli RA, Pezzali JG, Oba PM, et al. A commercial grain-free diet does not decrease plasma amino acids and taurine status but increases bile acid excretion when fed to Labrador Retrievers. Transl Anim Sci 2020;4:1-12.
2. Pezzali JG, Acuff HL, Henry W, et al. Effects of different carbohydrate sources on taurine status in healthy Beagles. J Anim Sci 2020;98:1-9.
3. Quilliam C, Ren Y, Morris T, Ai, Y, Weber LP. The effect of 7 days of feeding pulse-based diets on digestibility, glycemic response and taurine levels in domestic dogs. Front Vet Sci 2021: https://doi.org/10.3389/fvets.2021.654223.
4. Reis LG, Morris T, Quilliam C, et al. The effect of fermentation of high- or low-tannin fava bean on glucose tolerance, body weight, cardiovascular function, and blood parameters in dogs after 7 days of feeding: Comparison with commercial diets with normal vs. high protein. Front Vet Sci 2021: https://doi.org/10.3389/fvets.2021.653771.

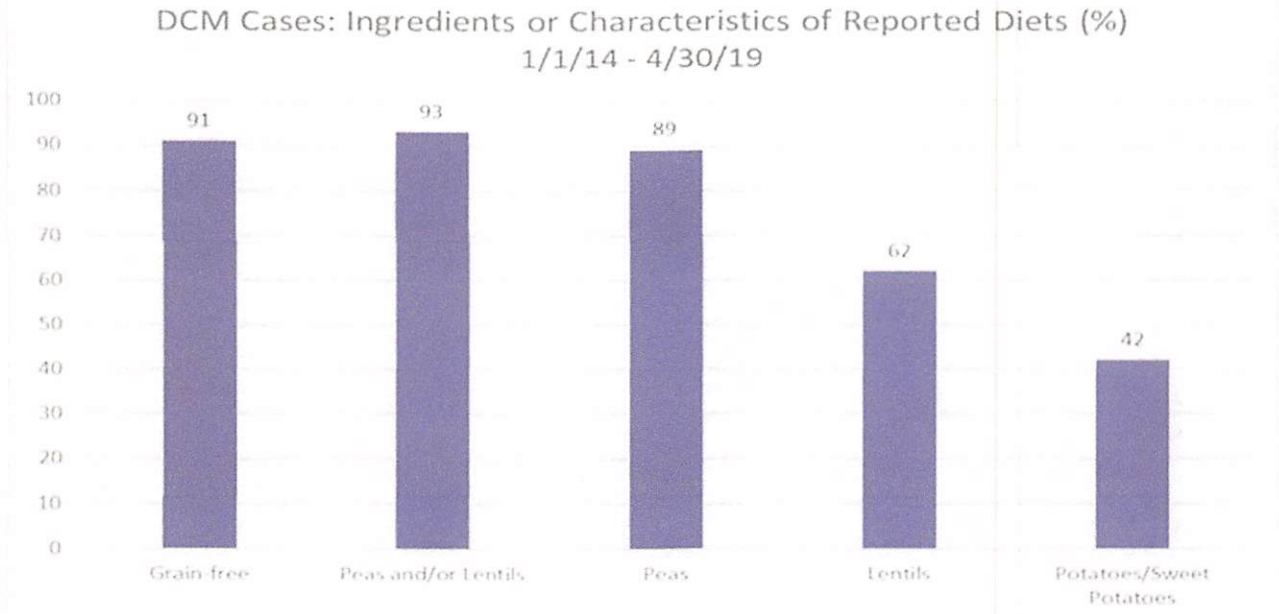
FDA Alerts/Updates

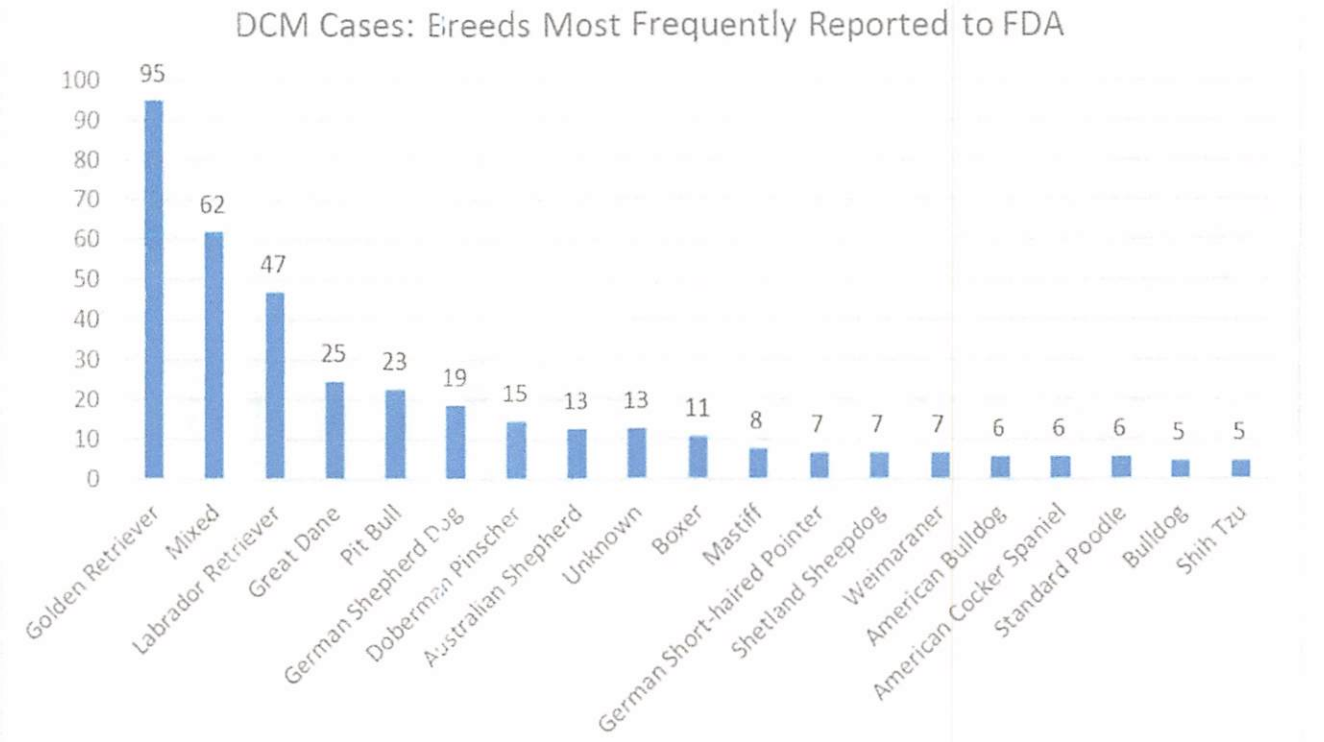
1. United States Food and Drug Administration. FDA investigating potential connections between diet and cases of canine heart disease. July 12, 2018.
2. United States Food and Drug Administration. FDA investigation into potential link between certain diets and canine dilated cardiomyopathy – February 2019 update.
3. United States Food and Drug Administration. FDA investigation into potential link between certain diets and canine dilated cardiomyopathy. June 27, 2019.

Conferences

1. Solomon S. Opening remarks and Jones J, Carey L, Palmer LA. FDA update on dilated cardiomyopathy. Scientific Forum Exploring Causes of Dilated Cardiomyopathy in Dogs, Kansas State Veterinary Diagnostic Laboratory, Manhattan, KS. September 29, 2020.


Dog Food Brands Named Most Frequently in DCM Cases Reported to FDA
80
70
60
50
40
30
20
10
0
67
64
53
32
32
31
29
24
16
15
15
12
11
10
10
10
Acana
Zignature
Taste of the Wild
4Health
Earthborn Holistic
Blue Buffalo
Nature's Domain
Fromm
Merrick
California Natural
Natural Balance
Orijen
Nature's Variety
NutriSource
Nutro
Rachael Ray Nutrish


DCM Cases: Ingredients or Characteristics of Reported Diets (%)
1/1/14 - 4/30/19
100
90
80
70
60
50
40
30
20
10
0
91
93
89
62
42
Grain free
Peas and/or Lentils
Peas
Lentils
Potatoes/Sweet Potatoes


DCM Cases: Breeds Most Frequently Reported to FDA
100
90
80
70
60
50
40
30
20
10
0
95
62
47
25
23
19
15
13
13
11
8
7
7
7
6
6
6
5
5
Golden Retriever
Mixed
Labrador Retriever
Great Dane
Pit Bull
German Shepherd Dog
Doberman Pinscher
Australian Shepherd
Unknown
Boxer
Mastiff
German Short-haired Pointer
Shetland Sheepdog
Weimaraner
American Bulldog
American Cocker Spaniel
Standard Poodle
Bulldog
Shih Tzu