

- **What is DCM?**
  - DCM (or dilated cardiomyopathy) is a serious and potentially lethal disease affecting the heart. It results in enlargement (and thinning) of the heart muscle, which causes weak and irregular beats/ rhythms. When prolonged, these abnormalities can lead to congestive heart failure (which results in fluid build-up in the lungs and/or abdomen), and ultimately to pet death.
  - In certain dog breeds (Doberman Pinschers, Boxers, Irish Wolfhounds, Great Danes), there is a potential genetic predisposition for the development of DCM.
  - However, DCM has also been associated with diet (see below).
  
- **Diet and DCM**
  - The development of nutrition-related DCM is unfortunately multifactorial in nature, involving both external and internal complexities. This means that determining the true cause can be complex and not straight forward.
  - Many (but not all) cases are associated with issues surrounding the amino acid taurine.
    - Taurine is a *non-essential* amino acid in dogs. This means that, given the appropriate precursors, all dogs *should* be able to effectively synthesize appropriate quantities for normal functions.
      - Taurine and taurine precursors are typically highly concentrated in animal-based protein sources (i.e. skeletal muscle, heart, etc.).
    - Taurine is an *essential* amino acid in cats. This means that they must consume adequate levels of taurine because they cannot synthesize or make their own.
      - Taurine deficiency in cats has been shown to result in DCM (among other things)
  
- **How do taurine deficiencies happen?**
  - Taurine deficiencies can occur for several reasons:
    - The diet is truly deficient in taurine precursors (typically the sulfur-containing amino acids, methionine and cysteine)
      - This *should not* occur, however if a diet is inappropriately formulated OR if there was an error in manufacturing it may.
    - The diet contains appropriate levels of taurine precursors, however, other ingredients (for example fiber) bind/ block these precursors from being absorbed/ utilized by the body (i.e. reduced bioavailability). This can happen when digestibility and bioavailability is not taken into consideration during formulation of a diet.
    - The pet has an inborn metabolic error for taurine synthesis. No matter the concentration of precursors, the body cannot effectively synthesize sufficient levels of taurine
      - Breeds that may have a genetic error of synthesis include: Golden Retrievers, Newfoundlands, St. Bernards, English Setters, Irish Wolfhounds, Cocker Spaniels, and Portuguese Water Dogs.
    - The diet is 100% appropriate, however, calorie (and thus nutrient) reduction results in nutrient deficiency.
      - This can be seen in obese patients that remain on an over-the-counter maintenance diet (rather than a prescription diet) but are calorie restricted with the goal of promoting weight loss.
  - The challenge is that cases can involve more than one of the above possibilities.

- **I heard grain-free is the cause**
  - The grain-free category has been implicated as a whole because this category is over-represented with cases of DCM
    - This may be because grain-free diets (typically kibble) use an alternate carbohydrate source to successfully produce the kibble shape and structure.
      - These alternate sources (ex: potatoes, lentils, cassava, tapioca, etc.) tend to be lower in taurine precursors and/or have fibers that reduce the bioavailability of nutrients and digestibility of the diet as a whole.
    - Many (if not most) of the implicated diets are over-the-counter and do not undergo feeding trials and digestibility studies. Rather, their formulations are based solely on mathematical quantification (which may not take ingredient interactions into consideration).
  - It is important to note that it is not the lack of grains that is the problem, but rather a) the nutrient profile of each ingredient, b) the way the ingredients (and their nutrients) interact together, and c) the patient's unique taurine metabolism
    - This means that the addition of grains to a grain-free diet will not, unfortunately, fix the problem. Rather, adding grains to a grain-free diet can further unbalance the diet by diluting out essential amino acids (among other nutrients)
  - While taurine is the most well-known issue in cases of DCM, there are many cases where it is not and/or where other nutrients are deficient.
    - This is because cardiac health relies on more than just taurine for normal function.
    - For example, choline, copper, L-carnitine, magnesium, thiamine, and vitamin E deficiencies can also be associated with heart disease and dysfunction
- **It isn't just grain-free; BEG diets have been implicated as well**
  - What is BEG?
    - BEG stands for boutique, exotic, and grain-free
  - Some BEG diets have been implicated or linked to DCM. Possible reasons include:
    - This could be due to ingredients used to replace grains. These alternate sources (ex: potatoes, lentils, cassava, tapioca, etc.) tend to be lower in taurine precursors and/or have fibers that reduce the bioavailability of nutrients and digestibility of the diet as a whole.
    - Exotic meats, fruits, and vegetables may impact overall nutrient profile due to difference in bioavailability and digestibility (and interactions with other ingredients)
    - Not all pet food manufacturers have the same level of quality control and nutritional expertise.
- **What can I do?**
  - If your pet is eating a BEG diet, but has no signs or symptoms of DCM:
    - Since we don't have a clear cause AND DCM is life-threatening, reconsider your pets' diet.
    - Consider contacting the manufacturer for additional information regarding quality control, analytical/feed/ and digestibility testing.
    - You *may* consider checking taurine levels OR preemptively supplementing with taurine, however not all patients are taurine deficient.
    - You *may* consider routine echocardiography (to image and evaluate the heart muscle), however this is expensive and not feasible for most pet-parents.
  - In cases where DCM is *diagnosed* AND there is a potential nutritional etiology, it is recommended to do the following:
    - Change the diet to one that is formulated by a reputable and long standing company (ideally one that has undergone feeding trials, digestibility, and nutrient analysis testing)
    - Your vet may recommend testing both whole blood and plasma taurine levels.
      - Consider full amino acid testing if able
    - Supplement with BOTH taurine and L-carnitine (doses dependent on patient size and severity)
    - Contact the FDA with patient and diet information
    - In the event the patient has evidence of heart failure/ reduced cardiac function, specific cardiac care and monitoring should be managed by board-certified cardiologist and/or primary veterinarian