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# Careful consideration of taurine as a conditionally essential supplement in pet food

*By Geert van der Velden, Innovation Manager at IQI Trusted Petfood Ingredients*

**Taurine is a sulfur-containing amino acid that is essential for the proper functioning of the bodies of mammals, such as cats and dogs. Unlike cats, which always need taurine as a food supplement, dogs are generally able to synthesize taurine from other amino acids in their diet. However, because of genetic differences between breeds, changing diets, health issues, or old age, dogs can suffer from taurine deficiency, which may lead to the heart condition dilated cardiomyopathy (DCM). Therefore, adding taurine as a supplement to pet food requires careful consideration by the industry.**

## **ESSENTIAL AMINO ACID**

Taurine is an amino sulfonic acid that occurs naturally in the bodies of mammals. High concentrations of taurine can be found in cardiac and skeletal muscle, the heart, brain and retina, while lower concentrations are present in almost every other tissue in the body. Taurine is involved in a number of physiological processes including conjugation of bile acids, osmoregulation, neuronal excitability, inflammatory reactions and glucose metabolism. This makes it essential for the health and well-being of pets, such as cats and dogs. Taurine ensures healthy development and function of skeletal muscle, the retina and vision, and the central nervous system. It also strengthens the heart, supports healthy blood flow, promotes reproductive health, and is found to have an antioxidant effect that supports healthy aging.

As high concentrations of taurine are found in muscle and other bodily tissues, taurine is plentiful in the diet of true carnivores. Processing of animal-based raw materials, however, may result in loss of taurine and low taurine levels in the final pet food products. For the majority of dogs this is generally not an issue, as they are able to synthesize sufficient amounts of taurine from dietary sulfur-containing amino acid precursors, namely cysteine and methionine, found in animal protein. Although this depends on their diet, genetic changes between breeds, health issues, and age. Unlike dogs, cats can't synthesize their own taurine in sufficient amounts. The rate of loss of taurine through fecal bile acids and urine is much greater than the rate of taurine synthesis from cysteine or methionine in their diet. Therefore, taurine is considered an essential nutrient of cats that needs to be supplemented in pet food.

## **THE EFFECTS OF TAURINE DEFICIENCY**

In cats, inadequate provision of dietary taurine clearly results in deficiency. This results in clinical diseases, such as feline central retinal degeneration, ultimately causing blindness, reproductive failure, and the heart condition dilated cardiomyopathy (DCM). Diet-associated DCM was first recognized in cats in the late 1980s. A landmark study published by Pion et al in 1987 established that DCM in cats was associated with taurine deficiency and could be reversed by providing supplemental taurine. The use of taurine supplementation has since become standard practice in cat diets and taurine deficiency-related DCM is now uncommon in cats.

Although dogs are normally able to synthesize sufficient amounts of taurine from their diet, some dogs may suffer from taurine deficiency. This can be either diet-related, while there is also thought to be a genetic component. In dogs, there are no specific symptoms related to taurine deficiency, but as taurine deficiency causes DCM the symptoms are usually related to this disease. Diet-associated DCM was first recognized in dogs in the mid-1990s. As they grow older, the taurine requirements of both cats and dogs increases. If these are not met, this may increase the risk of diet-associated DCM. In contrast to cats, the number of DCM cases in dogs has been increasing in recent years.

## DIET-RELATED DCM IN DOGS

DCM is a disease of the myocardium, a dog's heart muscle, that results in enlarged heart cavities, congestion and/or electrical dysfunction. As the heart and its chambers become dilated, this makes it harder for the heart to pump. As a result, heart valves may leak, leading to a build-up of fluids in the chest and abdomen. DCM often results in congestive heart failure which may lead to arrhythmias and sudden death.

In 2018, the US Food and Drug Administration (FDA) began investigating a potential link between unusual cases of canine DCM and taurine deficiency related to diet. Generally, large and giant breeds of dog, such as the Doberman Pinscher, Great Dane, or Irish Wolfhound, are more frequently affected by DCM than small and medium-sized breeds. However, the cases reported to the FDA included breeds not typically prone to DCM, such as Golden and Labrador Retrievers, Whippets, a Shih Tzu, a Bulldog, Miniature Schnauzers, as well as mixed breeds. Current research suggests that next to genetic factors there may be a group of dogs with diet-associated DCM specifically related to taurine deficiency, and one with DCM associated with separate, but yet unknown, dietary factors. In some of these cases, where dogs had low whole blood levels of taurine, the effects of DCM can be partially or completely reversed by taurine supplementation.



## SOURCES OF TAURINE

It has been suggested that when dogs are given low-sulfur amino acid diets, taurine may become limiting – potentially triggering diet-associated DCM. Therefore, the choice of ingredients for pet food is crucial to ensure both cats and dogs get enough taurine or, in the case of dogs, taurine precursors from their diet.

**Table 1: Typical levels of taurine (dry weight) in certain fresh raw materials**

<b>Raw material</b>	<b>Typical taurine content dry weight mg/kg (ppm)</b>
Beef, mechanically deboned (MDM)	197
Beef liver	2359 (1308-3511)
Beef lung	3938 (3300-5016)
Beef meat and bonemeal	405 (87-1109)
Chicken liver	4668
Poultry, by-product meal	3270 (1894-5352) (n=10)
Egg, dried	202 (154-270)
Pork liver	2455 (1770-3565) (n=9)
Fish, protein hydrolysate	8478
Mackerel, whole	9295 (6517-13279)
Salmon, meal	3485
Shrimp, meal	1172 (759-1854)
Tuna, meal	1309 (1077-1532)
Black soldier fly, larvae (Hermetia illucens)	190
Red seaweed (Mazzaella spp.)	4110

Taurine can be found naturally in animal tissue. Mollusks, such as mussels or squid, have very high taurine content, for example, but processing of raw materials can have a big impact on the difference in taurine concentrations between wet and dry weight. In dry weight, ingredients such as certain chicken, pork, beef, and fish products have very high taurine concentrations (see table 1). Vegetable and grain sources do not contain any measurable amounts of taurine, although certain plants such as seaweeds do contain some taurine with the exception of red seaweed, which has high taurine concentrations.

## ALTERNATIVE SOURCES OF TAURINE

There is increasing consumer awareness for healthy and nutritional pet food, as well as the importance of sustainable and natural ingredients. Traditional animal protein has the biggest ecological impact and therefore requires the most attention with respect to sustainability. When traditional animal protein is replaced by alternative sources of protein, it becomes crucial to identify

alternative sources of amino acids, including taurine, to help meet dietary requirements of cats and dogs. Cats in any case need a direct source of taurine. Dogs can normally synthesize sufficient amounts of taurine from cysteine and methionine found in animal protein, but this changes when animal proteins are replaced by alternative proteins in dog food.

Depending on what kind of alternative proteins are used, this requires careful consideration to ensure pet food for cats and dogs contains sufficient amounts of taurine or taurine precursors. A novel source of protein, which does come from animal origin but has a much lower ecological impact, is insects. The only insect species currently commercially viable for pet food applications is black soldier fly larvae, which in contrast to other species of insects has a very low taurine concentration. Taurine concentrations are high however in certain other novel ingredients, such as in certain species of red seaweeds. Preliminary research suggests that some marine algal species may be practical alternatives to both traditional protein and supplemental taurine sources in pet foods.

## THE EFFECT OF PET FOOD PROCESSING ON TAURINE PRESERVATION

Besides the choice of ingredient, the processing techniques are also of importance. Taurine has high water solubility, which means most of the taurine contained in tissues will be dissolved into water if exposed. Therefore, the way ingredients are processed into pet food affects the amount of taurine that is retained for consumption by the animal. Boiling results in the greatest taurine loss. Processing methods that minimize water loss, such as baking or frying, have higher rates of taurine retention.

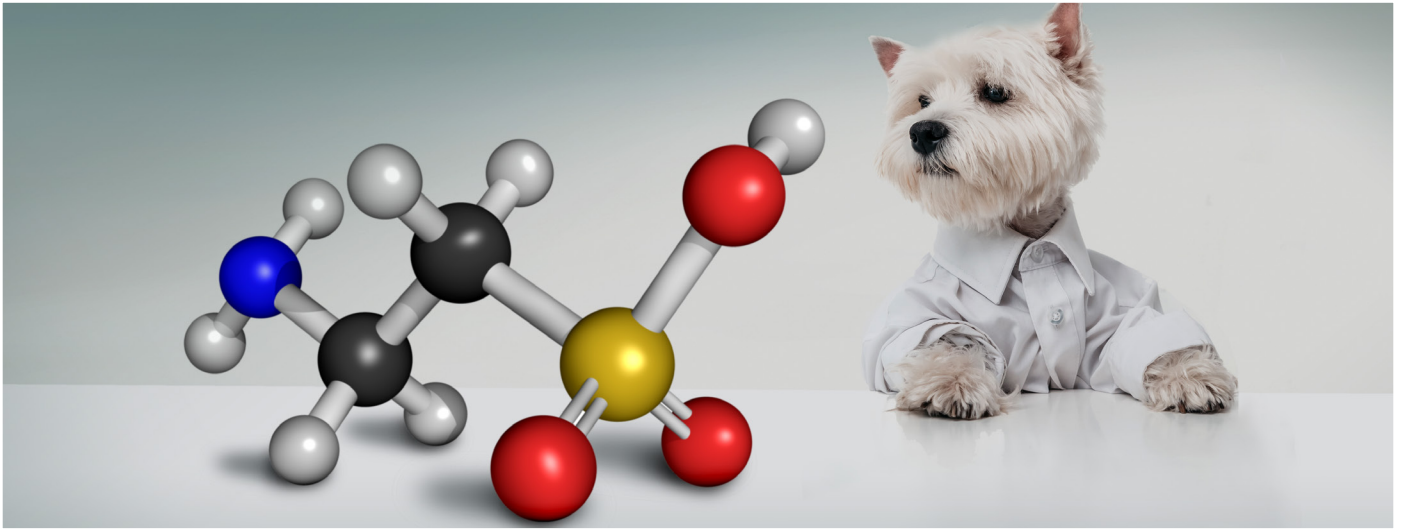
Heat processing of pet food ingredients results in lower taurine plasma levels and greater losses compared to the same food but frozen-preserved. During the sterilization process of canned wet pet food, approximately half of the taurine content is broken down. For this reason the recommendation for taurine in canned pet food is twice as high than that for extruded, dry food or purified diets (0.2% of taurine for canned pet food compared to a minimum of 0.1% of taurine for extruded pet foods).

## TAURINE SUPPLEMENTS

For cats the taurine requirement is 60 mg per MJ (ME) of extruded pet food. The Association of American Feed Control Officials (AAFCO) has established minimum dietary inclusion concentrations of taurine in cat foods for growth and reproduction as well as adult maintenance. These are set at a minimum of 0.1% of taurine for extruded pet foods and 0.2% of taurine for canned pet food.

The European Pet Food Industry Federation (FEDIAF) has established the minimum dietary inclusion concentrations of taurine in cat foods at 0.2-0.25%.

As taurine is not considered essential for dogs there are no taurine requirements available for dogs. The European Food Safety Authority (EFSA) concludes that a taurine inclusion level up to 0,2% is safe for all species and can be taken as a guideline for all breeds of dogs.



## TAURINE SOLUTION BY IQI

Together with its partner Mitsui Chemicals, Inc. from Japan, IQI Trusted Petfood Ingredients is a supplier of taurine as a high quality supplement, approved for various applications including pet food, infant nutrition, pharmaceuticals, cosmetics, energy drinks, aquafeed in global market. Mitsui Chemicals, Inc. has been manufacturing taurine in a dedicated facility in Fukuoka, Japan, since 1995. It is a common ingredient in infant nutrition, pharmaceuticals, cosmetics, energy drinks, aquafeed, and, as mentioned above, to supplement cat diets. When administered according to the inclusion levels deemed safe by the EFSA, taurine supplements may reduce the risk of taurine deficiency for dogs of different breeds, with changing diets, health issues, or in old age. Oral administration routes of taurine via feed or water for drinking are considered bioequivalent. IQI is able to provide pure taurine of reliable high quality from a stable supply against a stable price, available in 20kg cartons, from its partner Mitsui Chemicals, Inc. The product comply with global quality standard (USP and JP) and does not contain any additives such as anti-caking agent.

**For more information about taurine supplements and the finest pet food claim-ingredients please visit our [website](#) or contact us directly.**

### **Want to know more?**

[Mitsui Chemicals, partner of IQI, as a supplier of taurine](#)

[FDA Investigation into Potential Link between Certain Diets and Canine Dilated Cardiomyopathy](#)

[News article 'DCM: add taurine to grain-free dog foods, says scientists' on petfoodindustry.com](#)

[Landmark study 'Myocardial failure in cats associated with low plasma taurine: a reversible cardiomyopathy' by Pion et al from 1987](#)

## ABOUT IQI TRUSTED PETFOOD INGREDIENTS

IQI Trusted Petfood Ingredients is a global provider of premium-claim ingredients to the top brands in the pet food industry. Founded in 1994 as a trading company in raw pet food materials, today IQI offers an extensive variety of services to aid and assist our customers and suppliers worldwide. IQI Trusted Petfood Ingredients employs highly skilled personnel, owns and operates a global network of logistical hubs, and relies on a global supply network to obtain the purest natural resources available.

For IQI, quality is key. IQI Trusted Petfood Ingredients goes to great lengths to ensure the quality of its products and develop innovative new products. IQI also invests a great deal in maximizing the quality of its partnerships. Since this business is all about trust, IQI needs to bond with its partners to succeed. By working closely with both its customers and suppliers, IQI creates full transparency in the supply chain. IQI oversees and controls every step in the process from source to shelf and supplies products that are pure and traceable to their source.



## ABOUT GEERT VAN DER VELDEN

Geert van der Velden is IQI Trusted Petfood Ingredients' Innovation Manager responsible for Business Development, generating new products and concepts that meet the needs of existing and new customers. Geert has more than 25 years' experience in the international pet food industry and has gained knowledge and experience in many sections of IQI's business.

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