

Amino Acids and Their Importance in a Healthy Diet

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Amino acids are commonly described as the “building blocks” of protein. There are twenty-two amino acids used by the body to build proteins involved in many important functions, including structural (muscle and hair) as well as physiological (enzymes and chemical messengers). In addition to the building of proteins, some amino acids have individual roles within the body, such as serving as messengers within the nervous system (neurotransmitters) or conjugating bile acids (makes the bile acids more water soluble) for cholesterol reabsorption within the digestive tract.

Among the amino acids used within the body, there are ten amino acids that are essential in the diet for dogs, and eleven that are essential in the diet for cats. By definition, these amino acids are essential in the diet because the body cannot synthesize them internally as they can for other nonessential amino acids. The ten essential amino acids for both dogs and cats include arginine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan, and valine. Cats have an additional requirement for the essential amino acid taurine. Amino acids consumed in the diet can be utilized for the building of proteins, as well as the building of other nonessential amino acids. Any additional amino acids in the diet that are not needed for the building of proteins can be converted in the liver to glucose for energy or converted to and stored as fat to meet later energy needs.

Amino acids are generally provided in the diet as intact dietary proteins (although some foods may be supplemented with key individual amino acids). Proteins from meat, poultry, fish and egg serve as excellent sources for all of the essential amino acids in the diet. Other dietary proteins, such as those found in vegetables and grains, can also serve as good sources of amino acids, but are often limiting in one or more of the essential amino acids. For example, grains are commonly limiting in the essential amino acid lysine, while legumes are commonly limiting in the essential amino acid methionine. Because of this, vegetarian diets commonly take advantage of complementing protein sources (such as the traditional combination of rice and beans) to provide all of the essential amino acids needed in the diet. Although most essential amino acids can be provided by vegetarian protein sources, taurine is the one exception, as it is only found in animal based proteins.

Taurine is a beta-amino-sulfonic acid that does not get incorporated into protein, but is found free or as part of small peptides. In dogs and humans, taurine can be synthesized within the body from the amino acid cysteine (which is derived from the essential amino acid methionine). In cats, where taurine is found in high amounts from a natural carnivorous diet, the metabolic enzymes have evolved such that cysteine and methionine are pulled away for other needs. Because of this, taurine must be provided in the diet to meet the physiological needs of the cat. Taurine is important in bile acid conjugation, and both retinal and myocardium (heart) function. Cats fed diets deficient in taurine have been reported to develop blindness due to retinal degeneration, as well as a serious heart condition known as dilated cardiomyopathy.¹⁻² Dilated cardiomyopathy with an associated low taurine status has also been reported in large breed dogs when fed diets limiting in sulfur amino acids (cysteine and methionine), demonstrating that large breeds have a higher requirement for these amino acids compared to smaller breeds.³⁻⁵

Taurine is one of the most commonly discussed amino acids, but research has shown that many other amino acids play important roles in pet nutrition. For example, tyrosine (a non-essential amino acid derived from phenylalanine) serves as a precursor for melanin, and black cats fed a diet limiting in phenylalanine and tyrosine will develop a reddish-brown coat color.⁶ Another important essential amino acid for dogs and cats is arginine. Arginine plays an important role in the urea cycle, which helps the body dispose of excessive nitrogen from protein in the form of urea. Because of cat’s high protein diets, arginine is a very important nutrient that allows them to properly dispose of excessive nitrogen from protein metabolism. Feeding a cat an arginine free diet has been shown to result in ammonia intoxication, immediate food refusal, and is the only known example of a single nutrient deficiency resulting in death within 24 hours.⁷

These are just a few of the many examples of the important roles that amino acids play in maintaining the health of dogs and cats. Feeding a well balanced diet with high quality animal-based protein ingredients will help to ensure that dogs and cats get the amino acids that they require to maintain a healthful life.

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Examples of Amino Acid Key Functions[†]

Essential	Essential		Non-Essential	Non-Essential		
	Amino Acid	Used to build body proteins		Other Key Functions	Amino Acid	Used to build body proteins
	Arginine	x		Alanine	x	
	Histidine	x		Asparagine	x	
	Isoleucine	x		Aspartic Acid	x	Neurotransmitter
	Leucine	x		Cysteine	x	Taurine Synthesis
	Lysine	x		Glutamine	x	
	Methionine	x		Glutamic Acid	x	Neurotransmitter
	Phenylalanine	x		Glycine	x	Neurotransmitter
	Threonine	x		Hydroxylysine	x	
	Tryptophan	x		Hydroxyproline	x	
	Valine	x		Proline	x	
	Taurine*			Serine	x	
		Heart & Retinal Health		Tyrosine	x	Melanin Synthesis

[†] Not all key functions discussed here
* Essential for Cats Only

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