

The Protein Predicament of Dogs with CKD



Protein plays a crucial role in the dietary management of chronic kidney disease (CKD) in dogs, but there is an alarming amount of conflicting information about it stemming from the internet, canine nutritionists, and so-called experts in the field. Even veterinarians don't all talk with a single voice on this subject. Some offer advice using outdated information – while others just don't accept the findings of recent study papers describing how dietary protein interacts with CKD.

This situation leaves dog owners in limbo, not knowing what to do for the best. In this article, I hope to clarify things by providing the most reliable information about the quality and amount of protein required in a CKD dog's diet (according to the current stage of disease). Although small amounts of protein can come from vegetables, grains, and pulses, there are more substantial amounts supplied by meat, poultry, and fish.

Why Is Protein A Problem?

From a historical perspective, it wasn't very many years ago that veterinarians and research studies all determined that protein was a significant problem in all cases of canine CKD. As a direct result, the advice given out at that time was to restrict protein in the diet – and pet food manufacturers produced specialized kidney diets with reduced protein in them, and many still do. The volume of research in this area now makes this generic approach invalid.

Although the focus of advice restricting protein in many cases remains a persuasive argument, we now know it is far from a simple and straightforward rule that all CKD dog owners should follow.

Protein is one of the major components required for sustaining a healthy and active life. Protein also importantly contributes to the repair and regeneration of damaged or destroyed bodily cells, and it also helps support the auto-immune system, facilitates organ development, and is a key factor involved in converting ingested fat into energy.

A general rule is that healthy adult dogs need 2 grams of animal protein per kilogram of body weight per day. Taking other essential ingredients into account, this commonly equates to between 20%-30% of daily food intake by volume. Manufactured wet and dry dog foods usually fall somewhere between these levels, while specific renal dog food products typically consist of 15%-20% or less protein. The smallest amount of protein suggested necessary for healthy adult canine maintenance is 18% in the diet recommended by the Association of American Feed Control Officials (AAFCO). A low protein diet consists of less than 16% according to PetMD and others.

For CKD dogs, protein is a double-edged sword that leaves both veterinarians and dog owners with a dilemma. It is necessary for sustaining life – but it also inflicts further deterioration in kidney function owing to the high volume of waste products that protein digestion creates. The more the disease has progressed, the more difficult it is for these dogs to break down and use protein, so there is a need for constant adaptation of both the amount and type (see below) of meat and poultry used in a CKD dog's diet. Research confirms that reduced protein diets decrease the production of nitrogenous waste products which the kidneys need to excrete, thus offering real health and management benefits. In short, compromised kidneys cannot remove the waste products created when metabolizing protein, and this difficulty worsens as kidney function deteriorates. It is, therefore, a tricky balancing act to give enough protein without giving too much (according to the stage of kidney disease).

Protein Quality

Research studies have also discovered that it is not only the amount of protein in food that matters but the quality of it too.

Most dog food supplied by pet food companies has low-quality protein. These are often animal sources of protein deemed unfit for the human food market, but which remain mostly unrestricted in dog food products. Low-quality protein is harder to digest, which means the kidneys need to work harder to accomplish the same results, but it also causes more waste-products and more toxins circulating in the blood.

A typical listing of some pet food protein in the product ingredient list might include, for example, animal meat or poultry 'by-product', which usually means slaughterhouse waste. It may still be considered to have some nutritional benefit, but it will also almost certainly be harder for a CKD dog to digest. The industry's official description of poultry by-products according to DogFoodAdvisor is: *"the non-rendered clean parts of carcasses of slaughtered poultry such as heads, feet, viscera, free from fecal content and foreign matter except in such trace amounts as might occur unavoidably in good factory practice."*

The more significant concern is when dog food does not explicitly name the type of animal in the product and instead refers to 'meat meal' or something equally vague. The accepted dog manufacturing practice is that meat can legally come from almost any mammal. In turn, this means 'meat meal' can originate from euthanized cats and dogs, roadkill, dying, diseased or disabled farm animals, and dead zoo animals. The 'meat meal' carcasses may also have been pumped full of antibiotics and other drugs, along with the toxins these might have produced or be accompanying. This fact might rightly give most dog owners cause for concern – and prompt them to investigate more comprehensively the country of origin and the source of the protein in any manufactured dry or wet dog food bought.

In the UK, 'animal derivatives' is another common but vague term often seen among dog food ingredients. According to the Pet Food Manufacturer's Association (PFMA): *"Meat and animal derivatives are legally defined in the Animal Feed Regulations 2010. PFMA members use by-products of the human food industry that come from animals slaughtered under veterinary supervision eg. heart, lung, or muscle meat, which may not be traditionally eaten by people in this country."* While that explanation might seem reassuring, it does not necessarily follow that protein content is high-quality and manufacturers that are not in the PFMA may not necessarily follow the same rules.

A simple definition of high-quality protein is any meat, poultry, or fish that is fit for human consumption. The more stringent food safety standards affecting human-grade foods means it is rare for any low-quality, unsafe or unsavory proteins to enter this market. The quality of protein used in dog food products is not nearly as easy to verify, but manufacturers and suppliers should answer the question openly and honestly if asked. The sad truth is that they are just not asked the question often enough, and the market price usually takes precedence over quality.

How Much Protein Is Appropriate For My CKD Dog?

In addition to the increased creation of by-product waste materials, meat and poultry proteins also introduce far more phosphorous into a CKD dog's digestive tract than most other food sources. As both these aspects of dietary protein are harmful, it makes good sense to restrict this ingredient without compromising the benefits by giving too little. Too little protein contributes to a reduction of lean body mass. There

is a known association between increased rates of morbidity and mortality in humans and the loss of lean body mass, and a study in dogs provided a similar result (Kealy RD. Factors influencing lean body mass in aging dogs. Purina Nutrition Forum Proc 1998).

Recent studies show that dietary protein levels can be increased in dogs with CKD without adversely affecting life expectancy. However, the diet must be phosphorus restricted, using protein sources naturally lower in phosphorus concentration, such as soy isolate (Sanderson SL, Tetrick M, Brown SA, et al. Effect of dietary approach on clinical outcome measures in dogs with naturally occurring chronic kidney disease. AAVN Symp Proc 2013).

SA Center from Cornell University suggests in '*Nutritional Support for Dogs and Cats with Hepatobiliary Disease*' (published in The Journal of Nutrition) that the recommendations for dogs with mild to moderate CKD (creatinine 1.6-4.5 mg/dL, or 141-398 $\mu\text{mol/L}$) are 2.0 - 2.2 g/kg body weight of high biologic value protein, or around 1 gram of protein per pound of bodyweight daily. Note the grams of protein refer to nutritional analysis, not the actual grams of meat or poultry. Experts mostly agree it is not necessary to feed a low protein diet unless a dog is uremic (when urea and other waste products build up in the body because the kidneys are unable to eliminate them). Protein does need to be moderately reduced for dogs with glomerulonephritis, to minimize protein loss in the urine which contributes to inflammation.

It is now widely accepted that most owners of CKD dogs in stages 1 and 2 (with no evidence of uremia) do not need to worry too much about the amount of protein in the diet. Research now suggests it is more helpful to give enough high-quality protein in food and not too little.

Patricia Schenck, DVM, Ph.D., Veterinary Nutritionist, suggests in technical bulletin 8_28 Dietary Protein and the Kidney: '*Dietary protein restriction is appropriate in renal failure when the disease has become severe. Restriction of protein is based on the appearance of clinical signs. It has been recommended to start protein restriction when the dog's BUN (blood urea nitrogen) is greater than 80 mg/dL [28.6 mmol/L], and the serum creatinine is greater than 2.5 mg/dL [221 $\mu\text{mol/L}$]. Both BUN and serum creatinine are good indicators of kidney function. Protein is restricted in an attempt to keep the BUN below 60 mg/dL [21.4 mmol/L]. Dietary protein may need to be gradually decreased over time as renal failure progresses.*'

The main risk of restriction is protein deficiency, which is a big concern with older dogs that usually need higher levels of protein to support good health and body mass despite having CKD. There is now also significant evidence that the daily protein requirements increase slightly for dogs in chronic renal failure (Dr. Lucy L. Pinkston, D.V.M. Introduction to the Urinary System: Anatomy and Function.). The

excessive restriction of protein is likely to produce malnutrition with dire consequences.

While this subject remains contentious, it strikes me there is adequate evidence for being cautious and guarded against veterinary suggestions of protein restriction, even in later stages of the disease. It is undoubtedly the case that high-quality protein is a priority over low-quality protein – and moderate limitation to 10% by dry-matter volume may be appropriate in late-stage 3 and 4, assuming that either or both phosphorous and BUN are abnormally high. When protein is restricted, owners must increase the ratio of fat and carbohydrates to offset the likelihood of adverse nutritional consequences.

Commercial pet food companies express their recommendations slightly differently. They suggest a moderate reduction between 60g to 90g of protein per 1000kcal of food intake. Low protein diets have less than 60g per 1000kcal. (ACVN Nutrition Notes, 'Nutritional Management of Chronic Kidney Disease in Cats & Dogs'. Today's Veterinary Practice, March/April 2016).

Why Calculate Dry Matter Protein?

Dry-matter calculations of protein are more accurate than the whole food analysis you are likely to see on the labels of some dog food products. For example, Hills Prescription Diet K/D Canine (canned) which the manufacturer recommends for chronic kidney disease (IRIS stages 1 - 3) has 16% protein listed in the ingredients on a dry-matter basis. On the other hand, Purina Pro Plan Veterinary Diets Canine NF (Renal Function) canned shows the amount of protein is 5.4%, which you might think is far too low for CKD. But if we apply the dry-matter conversion, it comes to a higher and more accurate value of 19.2% protein.

The dry-matter formula removes the water content from the product and analyses the particular ingredient as a percentage. The calculation is very straightforward. Divide the percentage of protein (or any other element you want to find the dry-matter equivalent of) by 100 less the water content. Then multiply by 100. In the above 'Purina' example, the calculation would be 5.4 divided by 28 (percentage remaining from 100 after 72% water content is deducted) multiplied by 100 = 19.2.

The advantage of dry matter analysis is that different products with different amounts of water can be directly and correspondingly compared with each other, as the influence of the water element is removed from each product.

In Conclusion

The prevention of cachexia (the loss of lean body mass) and protein malnutrition are the primary reasons clinicians continue to debate and disagree about the role of protein restriction in canine kidney disease. Each dog needs to be assessed individually for signs of cachexia, and protein intake requires evaluating with due

regard to the degree of proteinuria, uremia, and the stage of CKD (according to IRIS guidelines).

Above all, owners should use a low phosphorus diet, and make sure all protein content is high-quality and ideally human-grade. While in very late stages moderate protein restriction may be appropriate, the amount of limitation needs carefully assessing by a veterinarian and canine nutritionist (both being very familiar with kidney disease).

The role of protein in canine CKD is continually being scrutinized and researched. The advice given to owners a decade ago was very different – and the advice given a decade from now will likely be different again. We can only do the best we can do according to the information and guidance we have at any specific point in time. The good news is we are continually learning new things, which all help promote prolonged life and improved quality of life for dogs suffering from this dreadful disease. I hope this article goes somewhere towards helping you help your best friend.

Note: While this article is presented as a free information resource for dog owners and associated interested parties to read, it remains the copyright of Tony Booth. No copying, publishing or printing in full or part is permitted without express written permission and agreement of the author.