# DIETARY PROTEIN AND THE KIDNEY

**Technical Bulletin 8_28**

The relationship of dietary protein to kidney function has been the subject of much controversy and myth. To understand the effects of protein on the kidney, it is helpful to have a basic understanding of how the kidney works.

Blood flows through the kidney at a rapid rate. Nephrons in the kidney act as blood filters to remove waste products from the catabolism of protein. These waste products include ammonia, creatinine, urea, and uric acid. Other electrolytes and minerals are also filtered by nephrons. Specifically, the glomerulus portion of the nephron is responsible for filtering the blood. The tubular portion of nephrons actively reabsorb certain electrolytes, minerals, and water. After these substances have been reabsorbed, urine is excreted from the nephrons.

Each kidney contains thousands of nephrons. This allows a large percentage of nephrons to be damaged and still maintain normal filtering, reabsorption, and urine production. Only after approximately 70% of kidney tissue has been destroyed do clinical signs of renal failure start to appear. A common early sign of reduced renal function is an increase in urination and thirst (polyuria and polydipsia). This is due to the kidney's reduced ability to reabsorb water within the nephron. Signs of more advanced renal disease are related to the accumulation of waste products in the blood that the kidney is no longer able to remove completely. These signs include loss of appetite, depression, vomiting, anemia, a bad odor to the breath, ulcers in the mouth, weight loss, and disturbances in behavior.

High protein diets cause an increase in blood flow through the kidney (glomerular filtration rate). The myth has been that if the dietary protein is restricted, this will make the kidney work less, and will ‘spare' the kidney from damage. Thus in the past, many have recommended low protein diets to ‘protect' a dog from developing kidney disease. This has been the focus of considerable research over the last 10 years. There has been no scientific evidence to support this theory. The feeding of **low levels of dietary protein are NOT protective against the development of kidney disease.**

Reducing dietary protein in the older pet will not protect them from the development of renal disease. In fact, reducing the protein in the older dog's diet may have adverse effects. As pets age, their ability to utilize nutrients decreases. The older pet actually requires a higher level of protein to maintain its body stores of protein than does the younger adult dog. An important aspect of the management of the older pet is to maintain its body weight and condition. High quality proteins must be fed to provide a proper level of amino acids and to maintain a positive nitrogen balance. With a positive nitrogen balance, the dog eats and absorbs enough nitrogen (from protein sources) to meet its metabolic requirements. If the dog does not absorb enough protein, its body goes into negative nitrogen balance. With a negative nitrogen balance, enough protein for metabolism is not provided from the diet, and protein is pulled from muscle to provide the body the protein it needs. This leads to muscle wasting, loss of body weight, and protein deficiency. Other signs of protein deficiency include anemia, a reduced ability to fight off infections, and decreased plasma protein levels. Therefore, the older pet should receive the amount of protein, fat, and calories necessary to maintain its body weight and condition. It may be necessary to feed a 26%, high quality protein diet to keep the older dog in a positive nitrogen balance.

Even in early renal failure, dietary protein restriction may not be beneficial. It has been previously thought that decreased dietary protein was necessary to decrease the glomerular filtration rate (GFR) and protect the kidney from further damage. However, it is now known that dietary protein is important for maintaining GFR, even in renal failure. Severe restriction of protein decreases the GFR, decreasing the filtering of all metabolic waste by the kidney. Long term studies feeding 19%, 27% or 56% protein diets for four years to dogs with reduced renal function have been completed. These studies showed that even though the high protein diets resulted in an increase GFR, there was no difference in progression in signs of renal failure among the three groups. Another study fed 16% or 31% protein diets for 14 months to dogs with a 7/8 loss of kidney mass. Again there was no difference in renal failure progression between the dietary protein groups. Both studies show no correlation between dietary protein and progression of renal disease.

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, and the serum creatinine is greater than 2.5 mg/dL. 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. Dietary protein may need to be gradually decreased over time as renal failure progresses. Dietary phosphorus will also need to be restricted in dogs with advanced renal disease. Dogs with clinical renal disease need to be closely

monitored by a veterinarian to determine when protein and phosphorus restriction should be initiated, and when dietary changes are necessary. Other medications may be indicated as renal failure progresses to control clinical signs of the disease.

- Dietary protein restriction does NOT prevent the development of kidney disease.
- Older dogs have a higher protein requirement than do younger adult dogs.
- Older dogs require more dietary protien to maintain body condition and muscle mass than do young dogs.
- Older dogs should receive the level of dietary protein necessary to maintain their body weight and condition.
- There is no correlation between progression of kidney disease and dietary protein level.
- Dietary protein and phosphorus restriction is beneficial in advanced renal failure.

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