

FUZZERFOOD™©

The Fresh Approach to Resolving and Preventing Calcium Oxalate Uroliths in Canines

A diet that really works

Calcium Oxalate kidney and bladder stones are appearing more frequently in our animal companions. Commercial food products, even prescription diets are ineffective in dissolving them and in preventing their return. Veterinarians and human companions alike have been frustrated in their ability to effect change for these pets.

Breeds which have a high incidence of calcium oxalate stones are Lhasa Apsos, ShihTzus, Yorkies, Poodles, Bichons, and Miniature Schnauzers. Additionally, dogs diagnosed with Hyperadrenocorticism (Cushing's disease) are at higher risk for these stones. There may be many reasons for this problem. It may be linked to a substance in urine called Nephrocalcin. This substance helps to prevent oxalates from forming, and if it is defective, stones are more likely. Through dietary restriction of oxalic acid, certain supplements, and combining foods which are highly bioavailable and which are complementary to canine nutrition, these stones can be successfully resolved and maintained.

I formulated this diet in 1996 when my own dogs, all Lhasa Apsos, were diagnosed with severe, inoperable calcium oxalate stones which affected their kidneys, bilaterally. We were told that because the stones were so severe, their kidneys were nearly calcified and they were given only months to live. My intention in changing to a homemade diet was to make their last months as happy and satisfying as possible. The result was both thrilling and astounding. Within only a few weeks they each appeared younger and more vital. This continued such that it was quite noticeable to everyone, especially their long-time veterinarians. In less than a year, the stones were gone, without surgery. They all remained on the diet for the rest of their lives, which were very long, indeed. They all lived to be 18-19 years of age, and without recurrent stones, even though the stones had left them with kidney damage.

We still feed the basic diet today to our dogs who have never had to experience these stones.

Before you Begin

This is not a one-size-fits-all diet. Each dog is an individual. You will learn how to make adjustments to this diet which will customize it for your own dog. Before you begin, ask your veterinarian to run a complete blood panel for your dog, and get a urinalysis. I refer to this as a Well-Dog Check-Up, and it is combined with an examination by your vet. It is a good idea to do this yearly, or bi-annually. A little planning in the beginning will allow you to adjust this diet to the individual needs of your dog.

Calcium oxalate stones can cause damage to the kidneys and bladder. The blood panel and urinalysis will tell you if any of that has occurred. In case it has, you will make a few minor adjustments¹ to this diet which will support any damage already there, and can help your dog live a longer and more quality life. My own dogs were all seniors when they were diagnosed, ages 15, 14, 13 and 11. The severity of their inoperable stones left them with kidney damage. The diet not only eliminated their kidney stones, it also rejuvenated them and it gave us many more quality years with them. My 15 year old went on to live to the age of 19, and all the others lived to 18, so do not be discouraged. Be proactive. Feeding a fresh diet is the very best thing you can do for the life of your dog. Partner with your veterinarian in keeping track of the levels in his/her blood, especially BUN, creatinine, phosphorus, and calcium.

If your vet indicates that your dog should be fed a low fat diet, you are in luck, because the diet as formulated is also low in fat. Some of my dogs had also suffered with pancreatitis, and the diet was designed for dogs who cannot handle a lot of dietary fat. If you or your veterinarian would like your dog to have more fat in the diet, it is very easy to accomplish simply by using fattier cuts of meat.

The Guidelines

- Avoid high oxalate / high acidic foods. Use the food charts included.
- PUSH FLUIDS –an additional ½ -1 oz per pound of body weight per day in addition to the water contained in the food. Fluid consumption can be encouraged by making chicken broth, (fat and sodium free) at home. It is very easy and well worth it. You can simply pour this into the food bowl at the time of feeding.
- Use steam distilled water only
- Do not starve calcium, and use calcium citrate as the only form of calcium. This is fed with meals, used to balance the dog's dietary phosphorus.
- Allow no supplements which contain Vitamins C or D.
- Add no salt

¹ www.K9KidneyDiet@Yahoogroups.com contains information & assistance. I am a Co- Moderator on this list, which has helped countless dogs with renal disease.

What is Oxalate?

Oxalate has no known function in animals. In humans it is a waste product of metabolism which is excreted in the urine. When excess oxalates are consumed, calcium and oxalate accumulate in urine, calcium oxalate crystals can be the result. In turn, they may become calcium oxalate stones. Primary sources of oxalate in urine are: excess vitamin C, general metabolic waste, and foods with high oxalate content, such as spinach, sweet potatoes, nuts, etc.

“Oxalic acid (chemical formula HOOC-COOH) is a strong organic acid which is widely distributed in nature in both plants and animals. However, plants contain more than animals. The name comes from the plant *Oxalis* (wood sorrel) from which it was first isolated. Oxalic acid has the ability to form a strong bond with various minerals, such as sodium, potassium, magnesium, and calcium. When this occurs, the compounds formed are usually referred to as oxalate salts. Thus, "oxalate" usually refers to a salt of oxalic acid, one of which is calcium oxalate. Although both sodium and potassium oxalate salts are water soluble, calcium oxalate is practically insoluble, which is why calcium oxalate, when present in high enough levels, has the propensity to precipitate (or solidify) in the kidneys or in the urinary tract to form calcium oxalate crystals. Calcium oxalate crystals, in turn, contribute to the formation of kidney stones”.²

Oxalate Content of Foods

(see charts)

You will soon become acquainted with the foods which are high in oxalic acid, and also those which are safe to feed your oxalate dog. There are certain foods you will want to avoid completely. They just are not worth the risk. In addition to high oxalate foods, you will omit foods which are highly acidic. The urine pH in these dogs is already quite acidic (low), so we do not want to add to that problem.

Protein

Meat, fish, and eggs do not contain oxalates. The exceptions to that are bacon, sardines, cured hams, and organ meats, especially liver.

In the past, dietary guidelines for those with oxalate stones, whether human or animal, have usually recommended lowered animal protein. Dogs are carnivores, and as such, cannot thrive on a low protein diet. Further, contrary to popular belief, older dogs actually require more protein than do adult dogs.³

² Michael Liebman, Ph.D. From The Vulvar Pain Newsletter, Number 22, Summer/Fall 2002

³ “There is a myth that older dogs do not need high levels of protein. Research indicates that the exact opposite is true: older dogs may actually need more protein than younger dogs. If an elderly dog is healthy, higher levels of protein will help maintain lean body mass and support immune functions,” Dottie Laflamme, DVM, PhD, <http://www.superk9.com/articles/feed13.asp>

I initially made the mistake of reducing the protein levels for my own dogs too much. They began to lose muscle mass. After much research and analysis and discussions with my veterinarians, I increased their protein levels to 33-40%, (proportionally) of their total daily diet. They quickly regained the muscle and weight, and there were no further problems.

A one pound portion of meat, fish, and/or eggs does not contain one pound of (100%) protein. It also contains fat, fiber, water, and ash. Protein at 33-40% of the total diet will actually net protein levels of closer to 25% after fat, fiber, and water are considered. Be careful about reducing protein below the recommended amounts.

Vegetables

According to USDA studies on oxalates, vegetables should be boiled for the lowest possible oxalate content. If you prefer to steam them, realize that more oxalate may survive.

Dogs' saliva does not contain the enzyme human's saliva contains which breaks down cellulose. If you wish to feed your dog raw vegetables, they must be pureed in a food processor or a juicer for them to assimilate the nutrients. Be sure to note which vegetables may be used and which ones may not for an oxalate dog.

Grains

Grains in the canine diet are controversial. It is true that many dogs have difficulty digesting grains. They can cause allergies, digestive problems, and sometimes, weight gain. For dogs who cannot tolerate diets with much fat, grains are relied upon for extra calories in the diet. You may choose to feed grains or not, as they are not an essential part of the canine's nutritional requirements. If your dog has been plagued by skin allergies or has experienced frequent digestive upsets, try this diet with meat and vegetables only, or with a minimum of grains (no more than 20%). If you do feed grains, cook them well. Be sure to note which grains are appropriate to feed your calcium oxalate dog, and which ones are not.

Salt and Sodium Restriction

Salt (sodium) itself will not cause these stones. Sodium exchanges for calcium in the kidneys. Increases in dietary salt cause urinary calcium elevations, regardless of the calcium intake. Because salt (sodium) encourages the kidneys to excrete more calcium, added salt is something to omit from the diet.

If you use canned vegetables, be sure to choose those with labels which expressly indicate, "No Salt Added". Many foods naturally contain sodium and some contain more than others. If you feed processed foods, canned or frozen, be sure to read labels and choose wisely.

Hydration & Urination

A chief problem for those who form stones is dehydration. To prevent any extra mineral intake, use only steam distilled water. Other water sources contain minerals which can easily combine with excess oxalic acid to form stones.

Push fluids. Feeding a fresh, whole food diet is a good first step, since its water content is high. In addition, be sure that your dog consumes at least ½ to 1 oz of water (and/or dilute broth) per pound of body weight per day over and above what is naturally contained in the food. Fluid consumption can be encouraged by making fat and sodium free chicken broth at home. This can be diluted 1 to 4, or an even greater dilution and poured over the food at feeding time to increase fluid consumption. Store-bought broths usually contain high amounts of sodium, and are not appropriate.

Calcium oxalate stones form quickly and easily in highly concentrated urine. Holding urine for a prolonged time is conducive to the creation of these stones. If your dog is confined for several hours with no way to relieve herself/himself, find a way to create an indoor area with plastic and newspapers and/or towels where he may relieve himself in a reasonable time. And always have a supply of fresh water to drink.

Acid/Alkaline - Urine pH

Calcium oxalate stones and crystals form in low pH, or acidic urine. Some dogs are inclined to this low pH, and even the addition of potassium citrate medications and alkalizing foods are ineffective to alkalize their urine. Ideally, the right foods should cause the urine to become less acidic, but many find that to not be the case. Although I kept accurate measure of my dogs' urinary pH, it was often a source of discouragement. I thought that unless we could bring the pH higher, their stones would return. To the contrary, not only did they not return, their stones dissolved. The key is to monitor and know where you are, but to not panic if the urine stubbornly remains more acidic than you would like. Just stick to the guidelines overall, and you will get where you want to go for your friend.

Supplements

(see chart)

Certain supplements are important in the resolution of these stones. These need to be added at meal time. I recommend human grade supplements. Although it may be convenient to use combination multi-vitamin and mineral supplements, it is not something we can do for calcium oxalate dogs. They contain vitamins C and D and often contain calcium. Use no supplements containing vitamin C or vitamin D. Excess amounts of vitamin C have been found in urine, and it is inclined to acidify the urine. Vitamin D helps to bind minerals in the body.

Supplement daily with the following vitamins. A dosing guide is provided based on weight.

Essential:

Multi- B vitamins are essential for correct urinary pH. Best to give twice daily with meals

Vitamin E is a very effective anti-aging substance. Give once daily. Dry forms of Vitamin E are said to be more easily assimilated by canines.

Omega 3 Fish Oil or Salmon Oil is an important anti-inflammatory which supports and is said to regenerate renal function. Choose one with the highest EPA/DHA content you can find. Use Gel caps only, as the liquid oxidizes with exposure to air, and loses its effectiveness.

Optional:

CoQ10 is a wonderful anti-oxidant and anti-inflammatory; studies have shown it to be effective in reducing and maintaining levels of serum creatinine, in supporting the renal system as well as being helpful for periodontal, heart, and cancer issues.

Lysmachia-3 is a Chinese herb which will assist in softening stones. It is made by Seven Forests, and can be ordered by your veterinarian.

Magnesium may act as a calcium oxalate stone inhibitor. It binds oxalate in the large intestine to reduce oxalate absorption. It also binds with oxalate in the urine to form a more easily dissolved compound.⁴ Magnesium supplementation is contraindicated for dogs in renal failure, so use this only as long as there are stones, then discontinue. It can have a laxative effect, so begin at the low end of the range. 3-5 mg per pound of body weight divided A.M. & P.M., with meals.

Glucosamine may help with calcium oxalate kidney stones according to recent studies. This is a supplement which has been traditionally used to relieve osteoarthritis pain, rehabilitating cartilage, renewing synovial fluid, and repairing joints that have been damaged from osteoarthritis. My own dogs had been on this supplement for many years when their stones were diagnosed, so it did not have this beneficial effect on them in regard to stones. However, they clearly had stones which had a familial/genetic association. So, perhaps for dogs whose stones are connected more to diet, Glucosamine may be effective. In either case, it cannot hurt the dog, and in case it might be effective for your dog, so my advice is to add this supplement.

⁴ The Kidney Stone Handbook, Savitz/Leslie,M.D.

All of the supplements can be mixed with the food AT FEEDING TIME. Do not add supplements to pre-mixed foods which are to be stored, frozen, or fed later in the day. The only exception to that is calcium, which can be added at anytime – before or after cooking, freezing, or storing.

Lysmachia-3 is in tablet form and can be crushed and mixed with food, or you can put the tablet in a dollop of low fat cream cheese, or ‘pill’ them by putting it down their throat. If you do not know how to do this, your veterinarian can demonstrate. My own dogs had no objection to having these crushed and mixed with their food, and I have Lhasas, who are notoriously picky.

Digestive enzymes are very helpful to dogs (and people) who are going through a dietary change, for older dogs and for dogs who have been ill. They make digestion easier, and help the body assimilate nutrients.

Probiotics are important to give if your dog has been on antibiotics. They will help to reestablish a normal balance of healthy bacteria in the digestive tract. Whereas all the other supplements will be mixed into the food at the time of serving, probiotics are sprinkled on top of the food just before it is served. This is called ‘top dressing’.

Supplements in capsules are easiest because the capsule can be opened and poured into the food and mixed. It can be also be more economical to buy some vitamins in capsules which contain higher strengths than you will need for single doses. It is easy to open them, pour out ¼ or ½ to use for one meal, and then close the capsule and save the remainder for next time.

B vitamins can sometimes have a strong odor and if you find your dog objects to their food with the B vitamins mixed in, simply hide the capsule in some low fat cream cheese or ‘pill’ him. B vitamins are very important for dogs with calcium oxalate stones.

Fish or Salmon Oil gel caps are often something they will love handed to them as a treat. If not, simply open the gelcap and mix into the food at serving time, or as above.

If you wish to use Flax Seed Oil for the Essential Fatty Acids in the diet, I would recommend that you alternate between Flax Seed Oil and Omega-3 Fish or Salmon Oil. There are two reasons for this; (1) Many dogs have allergies to Flax Seed Oil, and (2) Calcium Oxalate stones can cause renal irritation or even renal damage, as it did in my dogs. Omega-3 Fish or Salmon Oil is renal protective and studies have indicated it may even regenerate renal cells. Additionally, the Omega-3 fatty acids which come from plants, as Flax Seed Oil are not easily converted to the active form of Omega-3 by dogs, and when dogs are older or ill, this may be even more difficult. Flax Seed Oil is a pro-inflammatory oil. Omega 3 is anti-inflammatory.

Supplement Chart

SUPPLEMENT	<u>Small Dogs</u> 5-25 pounds	<u>Medium Dogs</u> 25-50 pounds	<u>Large Dogs</u> 50-75 pounds	<u>Giant Breeds</u> 75 pounds, up
Multi- B Vitamins	25 mg twice/day	50 mg twice/day	75 mg twice/day	75-100 mg twice/day
Vitamin E	50-100 IU	100-200 IU	200-400 IU	400-800 IU
Omega 3 Fish Oil	1000 mg/20#	1000 mg/ 20 #	1000 mg/ 20 #	1000 mg/ 20 #
CoQ10	1 mg per pound	1 mg per pound	1 mg per pound	1 mg per pound
Magnesium ⁵	3-5 mg/pound	3-5 mg/pound	3-5 mg/pound	3-5 mg/pound
Lysmachia-3 ⁶	½ - 1 Tablet twice daily	1-2 Tablets twice daily	2-3 Tablets twice daily	3 tablets twice day
Digestive Enzymes	¼ Human Dose	½ Human Dose	¾ Human Dose	Human Dose
Probiotic	¼ Human Dose	½ Human Dose	¾ Human Dose	Human Dose
Glucosamine	200-500 mg	500-750 mg	1000-1500mg	1000-1500mg

Note that most animal supplements are combination supplements and usually contain vitamins C and D, and some also contain Calcium. These products are not for dogs with oxalate problems. This diet's success involves using individual, human grade supplements in the amounts listed in the chart. There are supplement suppliers which are quite reasonable and which are also very reliable. I will list some options for you, although there are many other sources. I do not have a vested interest in any of them, & provide these only as a convenience.

***Puritan Pride**

www.Puritan.com

1-800-645-1030

***Vitamin Shoppe**

www.VitaminShoppe.com

1-800-223-1216

⁵ Use Magnesium with care. It can have a laxative effect. Use Mg only until there are no more stones. If your vet says your dog is in CRF, use this with care for short periods only to dissolve stones

⁶ Lysmachia-3, a Chinese Herb by Seven Forests is an important addition for help dissolving these stones

How Much To Feed?

One size does not fit all dogs in terms of diet, any more than it does in humans. Factors such as activity, age, metabolism, existing disease, and breed type may impact the amount of food, the amount of protein and fat you include, and whether you feed grains. This diet for dogs with Calcium Oxalate Uroliths is intended to provide guidelines which will allow you to customize it for your dog. Larger dogs require less food and fewer calories pound for pound than smaller dogs. That is why we do not feed a 60 pound dog 6 times more than we feed a 10 pound dog. My own small dogs, who are not highly active, maintain their 12 pound body weight nicely with 10-12 ounces of food per day.

This is intended as a guideline only. Take stock of your dog's weight. If he is overweight, feed more vegetables than grains. If he is underweight, and has no issues with fat (pancreatitis, liver issues), you may use fattier meats, such as medium ground beef and lamb as choices during the week. Varying the meat sources (red meat, poultry, eggs, and fish) will prevent allergies, and boredom, and provide him with a wider range of essential amino acids. If he is underweight and should not consume fattier meats, feed lean meat, drain any excess fat, and use higher calorie grains, such as Sushi rice (also called Sticky rice) which has more calories than other grains.

How much to Feed Daily Based on Weight of Dog

<u>Dog's Weight</u>	<u>Daily Volume Guideline</u>
2 lb.	2- 4 oz ($\frac{1}{4}$ to $\frac{1}{2}$ cup)
5 lb.	4 - 6 oz ($\frac{1}{2}$ to $\frac{3}{4}$ cup)
10 lb.	6 - 10 oz ($\frac{3}{4}$ to $1 \frac{1}{4}$ cups)
15 lb.	10 - 12 oz ($1 \frac{1}{4}$ to $1 \frac{1}{2}$ cups)
25 lb.	12 - 16 oz ($1 \frac{1}{2}$ to 2 cups)
35 lb.	16 - 20 oz (2 to $2 \frac{1}{2}$ cups)
45 lb.	20 - 24 oz ($2 \frac{1}{2}$ to 3 cups)
55 lb.	24 - 28 oz (3 to $3 \frac{1}{2}$ cups)
65 lb.	28-32oz ($3 \frac{1}{2}$ to 4 cups)
75 lb.	32 - 36 oz (4 to $4 \frac{1}{2}$ cups)
85 lb.	36 - 40 oz ($4 \frac{1}{2}$ to 5 cups)

FOODS TO USE⁷

*Medium oxalate content, feed less often

<u>VEGETABLES</u>	<u>GRAINS</u>	<u>PROTEIN</u>
Avocado Broccoli, boiled Brussels Spouts, boiled Cabbage, boiled Cucumber, raw Cauliflower, boiled Peas, green boiled Potato white boiled Zucchini Squash Turnips boiled Asparagus, boiled* Carrots, boiled* Lima Beans* Yellow crookneck Squash* Green Beans, frozen, boiled* Mustard Greens, boiled* Savoy Cabbage, boiled* Spaghetti Squash	Oatmeal Quinoa Rice white, boiled Wild rice, cooked Barley, cooked* Macaroni, cooked* Egg Noodles, boiled* Spaghetti, cooked* Millet	Beef Buffalo Chicken Lamb Pork Rabbit Turkey Venison Fish- Cod, Salmon, Haddock,Plaice Eggs Bacon* Liver* Sardines*

<u>FRUIT</u>	<u>MISCELLANEOUS</u>	<u>DAIRY</u>
Avocado Banana Cherries, Bing or sour Cranberries, canned Mangoes Melons Nectarines Papaya Apples, raw* Apricots* Peaches* Pears*	Apple Cider Vinegar Corn Syrup Jelly, Preserves, allowed fruits Sugar Vanilla Extract	Butter Cheddar Cheese Yogurt

⁷ From Oxalate Content of Selected Foods, The General Clinical Research Center University of California San Diego Medical Center

FOODS TO AVOID⁸

VEGETABLES

Beets
Beetroot
Celery
Chard, swiss
Chicory
Collards
Dandelion greens
Eggplant
Escarole
Leek
Kale
Okra
Parsnips
Pepper, green, sweet
 chilies
Pokeweed
Potato, sweet
Rutabagas
Spinach
Watercress

FRUTS

Berries
 Black, Blue,
 Green, Goose,
 Dew
Currants
Grapes
Lemon peel
Lime/orange peel
Plums
Raspberries
Rhubarb
Strawberries
Tangerine

GRAINS

Grits, corn
Wheat
Wheat germ
Whole wheat
Rice, brown
Popcorn
Corn
Soybean crackers

MISCELLANEOUS

Fig Newtons®
Fruit cake
Graham Crackers
Nuts in general
Peanuts
Peanut Butter
Pepper

⁸ From Oxalate Content of Selected Foods, The General Clinical Research Center University of California San Diego Medical Center

Calcium

Note that Calcium was not included in the section on supplements. This is because in canine nutrition it is used as a balance to the phosphorus in the diet. When you purchase calcium citrate for your dog be certain you choose one that contains no other ingredients (such as magnesium).

Calcium Citrate is ***the*** form of calcium to use for calcium oxalate dogs. Citrate is an important natural inhibitor of calcium oxalate stones. When calcium citrate is combined with food at mealtime it helps to absorb and to bind excess oxalic acid in the gut. This bound oxalate cannot be absorbed and is excreted through the feces. This means that it does not get into the bloodstream or the kidneys to cause stones. Current research shows that calcium restriction in the diet actually encourages stone formation.

Both humans and dogs have a requirement for a certain amount of nutrients, and both species need more calcium in their diets than phosphorus. In dogs, the balance between phosphorus and calcium, and most especially in dogs with calcium oxalate and renal issues, is very important. All foods contain phosphorus in varying amounts. The canine's original diet contained a combination of meat and bones, which comprised the phosphorus and calcium balance.

There are two ways to determine the amount of calcium to add to your dog's diet.

Option A:

If you wish to balance your dog's food with a general amount of calcium, based on the quantity of food served, you may add 350-400 mg of **Calcium Citrate** per each cup of food. This will be an approximate number, but overall, will come close to the precise balance. Calcium Citrate is the only form of calcium which can safely be used for a dog with oxalates, and it is actually a part of the treatment regimen.

Option B:

You can apply a ratio based on the amount of phosphorus mg. contained in the food. The latter tends to necessitate one on one instruction in class, or you may join the K9Kidney Diet Group located in Yahooogroups.com where you will have access to files and online assistance. The NRC guidelines for the calcium to phosphorus ratio for dogs is 1.3 Calcium: 1.0 Phosphorus, but you may safely use a 1.0:1.0 ratio.

Should you wish to calculate this independently, the USDA Data Base, at www.nal.usda.gov/fnic/foodcomp/Data/SR14/sr14.html has the data.

Helpful hint: The easiest calcium I have found to work with is powdered, with no capsules to open, and it contains only 100% calcium citrate. One teaspoon equals 700 mg of calcium citrate. It comes in a small container with a bright orange label, and it is NOW brand calcium citrate. It is very inexpensive and can be ordered online or purchased at HEB stores or at Whole Foods. (I have no connection to the company whatsoever. I simply use and rely upon this product myself).

Day by Day

Each day that passes with your dog eating fresh, whole foods that limit his intake of oxalates and that support hydration is a day that will help to extend the quality and quantity of his life. There simply is no food on the market that will resolve calcium oxalate stones in dogs. This diet does that.

I recommend that you obtain a good baseline Ultrasound so that you will have it to track your results by comparing later Ultrasounds. Begin now to maintain records of all your dogs' blood work and urinalysis reports, as well as your own notes as you go. We are inclined to believe we will remember things we simply cannot in our busy lives.

If you have questions beyond what you have read here, go to www.YahooGroups.com and join K9KidneyDiets@Yahoogroups.com.

Glossary

- acidosis** when the pH of the blood is low and urine is chronically acidic
- bioavailability** when food is found in a form readily absorbable by the intestines
- bladder** the portion of the urinary system composed of muscles where urine is stored until excreted
- BUN** also referred to as Urea. BUN is produced in the liver and excreted by the kidneys. Increased levels can indicate dehydration and a reduction in the kidney's ability to filter.
- calculi** plural of calculus. Latin for stone or pebble
- citrate** an important natural inhibitor of calcium oxalate stones. It can bind calcium in the urine to make it more soluble. Low citrate is common in stone formers
- creatinine** a product of muscle metabolism. This is an indicator of overall kidney function
- cystinuria** a genetic disorder which causes the kidneys to excrete too much cystine (an amino acid) in the urine. Cystine can form stones
- cystocentesis** a procedure in which your veterinarian can obtain an uncontaminated (sterile) urine sample directly from the bladder of your dog
- hyperparathyroidism** when the amount of parathyroid hormone (PTH), which regulates calcium metabolism in the body is secreted at an inappropriately high rate. The calcium in the bloodstream (serum calcium) stays too high and spills into the urine, causing stone formation
- hypercalciuria** too much calcium in the urine
- hyperuricosuria** increased urinary excretion of uric acid
- jackstones** another name for calcium oxalate stones. Word is derived from the resemblance of their sharp spikes to those on a child's toy jacks

parathyroid hormone (PTH) this regulates the metabolism of calcium in the body. This is excreted by the parathyroid gland, responding to the amount of calcium in the bloodstream

phosphate a mineral found in some kidney stones and also in bones

potassium citrate a medication used to alkalize the urine, in an attempt to reduce stones

pyelonephritis recurrent and frequent episodes of kidney infections

radiolucent a stone such as a uric acid stone is radiolucent, meaning it does not cast a shadow on plain x-rays

radiopaque something that is visible on plain x-rays, such as calcium stones

reflux a condition in which urine in the bladder goes back into the kidney pelvis. Creates an environment for frequent infections and also kidney stones

renal (kidney) pelvis the final collection point for urine in the kidney. From here it enters the ureter for elimination through the bladder

struvite stones triple phosphate stones. Associated with urinary tract infections and alkaline urine. When the infection is resolved, these stones usually resolve as well

trigone a muscle structure, triangular in shape, at the head of the bladder that seals the ureters during urination so that urine will not reenter the kidneys. Problems of this area can cause reflux of urine from the bladder back into the kidneys and can cause urinary infection

triple phosphate stones Struvite stones. Called triple phosphate due to the elements of magnesium, ammonium, and calcium which are found in these stones. These stones are associated with UTI (urinary tract infection)

ureter the tube and funnel that connect each of the kidneys to the bladder

ureterolithotomy a procedure in which an incision is made in the lower abdomen into the ureter and a stone is removed

urethra structure through which urine is eliminated from the bladder. In the male, the urethra passes through the prostate gland and the penis

urinalysis an evaluation of the urine for color, transparency, pH level (measure of acid or alkaline level of the urine), sediment, protein, bacteria, & concentration. The Specific Gravity of urine (concentration) is the earliest indication of renal dysfunction in the canine

UTI the abbreviation for urinary tract infection

CALCIUM / PHOSPHORUS BALANCE

Using NOW Brand Calcium Citrate Powder

All foods contain *phosphorus* in varying amounts. It is very important to balance the food's *phosphorus* content with an appropriate amount of calcium. If the required amount of calcium is not available from the diet, the body will obtain it from the bones. For a dog's diet, the most recommended ratio is between 1.2 to 2.0 parts of calcium to one part phosphorus.(1.2:1.0 or 2.0:1:0)

If you wish to balance your dog's food with a general amount of calcium, based on the quantity of food served, you may add 350-400 mg of **Calcium Citrate** per each cup of food. This will be an approximate number, but overall, will come close to the precise balance. Remember, Calcium Citrate is the only form of calcium which is to be used for a dog with oxalates.

Any of the (free) nutritional data bases will automatically calculate the *phosphorus* content of your recipe. If you wish to balance the phosphorus mg to mg, you will then multiply the phosphorus content in mg by 1.2 to 2.0 to calculate the amount of calcium you will add to the food in order to balance the phosphorus content with calcium on a mg to mg basis.

Commercial and prescription foods use varying ratios, from 1.2:1.0 (1.2 parts Calcium to 1 part Phosphorus) to 3:1 (3 parts calcium to 1 part Phosphorus). For the purpose of home feeding at least 1.0:1.0 (1 part Calcium to 1 part Phosphorus) to 2.0:1.0 (2.0 parts Calcium to 1 part Phosphorus) is what most veterinary nutritionists recommend.

To calculate the precise amount of Phosphorus in the food you prepare, you can sign on to <http://www.nutritiondata.com/>. It is a very user friendly tool.

If your dog has been diagnosed with Renal Insufficiency, or Chronic Renal Failure, it is a good idea to subscribe to K9KidneyDiet@YahooGroups.com for more specific assistance and recommendations. If your dog's serum creatinine, BUN, and/or phosphorus is elevated, you may need to restrict the amount of phosphorus in his diet.

NOW Calcium Citrate Powder = 700 mg per teaspoon

For ½ cup of food, add 175-200 mg of NOW Calcium Citrate

For 1 cup of food, add 350-400 mg of NOW Calcium Citrate

For 2 cups of food, add 700-800 mg of NOW Calcium Citrate

For 3 cups of food, add 1050 – 1200 mg of NOW Calcium Citrate

For 4 cups of food, add 1400 – 1600 mg of NOW Calcium Citrate

Here are some measures which may be helpful:

1/32	tsp	=	22 mg NOW Calcium Citrate
1/16	tsp	=	44 mg NOW Calcium Citrate
1/8	tsp	=	88 mg NOW Calcium Citrate
¼	tsp	=	175 mg NOW Calcium Citrate
½	tsp	=	350 mg NOW Calcium Citrate
¾	tsp	=	525 mg NOW Calcium Citrate
1	tsp	=	700 mg NOW Calcium Citrate

FYI (tiny measuring spoons in these measures are now available):

Dash: 1/8 tsp
Pinch: 1/16 tsp
Smidge: 1/32 tsp