Calcitriol Therapy for Dogs with Kidney Disease

Calcitriol therapy is a beneficial treatment for dogs with chronic kidney disease and has been for many years, but some vets are not fully aware of its potential, because they more often rely on standard treatment regimes.

It is a very complex subject – and to use it to treat any particular dog requires veterinary intervention, careful blood and urine testing and intensive diet and supplement management. Calcitriol is not a singular treatment for kidney failure. It is a complementary therapy given alongside other more traditional treatment regimes. But, as one part of a series of treatment methods, various studies show it is remarkably successful in slowing the progression of kidney failure in many dogs.

When I first came across Calcitriol therapy and then started reading more about it, I wondered why it wasn't seemingly more widely used to treat canine kidney failure. I started looking for references about it that were detrimental – signs that it was a bad idea or that it didn't work. I haven't found any to date other than the fact it is not simple, straightforward or easy to regulate from an

owner or vet's point of view. I have concluded that either some vets simply aren't aware of it or they have become over-reliant on cheaper and more established treatments. This blinkered vision could be costing some dogs the benefit of a biologically intricate but potentially advantageous complementary treatment. Another discouragement for employing Calcitriol therapy is the cost, which is prohibitive, mainly because of the parathyroid hormone test required.

While Calcitriol treatment is a contentious issue even among those vets that are familiar with it, there remains a lack of adequate research material to either prove or disprove the potential benefits. Small veterinary and university studies confirm this form of treatment is helpful to dogs with kidney failure. In some cases the results seem nothing less than remarkable. But there is also a need and real scope for much more exploration and testing to assert its value.

What is Calcitriol?

In the simplest of terms, Calcitriol is Vitamin D – but it is not the same as the supplement you might buy at your local health store or at a pet shop. Calcitriol is "active Vitamin D3", which is the hormone ordinarily processed by the kidneys to aid calcium regulation in the rest of the canine body. There are a lot of organs, systems and metabolic processes it interacts with. These include the heart, the liver, kidneys and the parathyroid glands, which in turn help support healthy calcium regulation and phosphorus balance. Damaged kidneys cannot produce or regulate the release of Calcitriol and this has harmful effects on the systems above. To appreciate what Calcitriol does, it is probably useful to first explain why adequate levels of Vitamin D are essential to a healthy canine anatomy.

Vitamin D

Dogs get Vitamin D from eating two different substances from plant and animal tissue, which are then absorbed in the intestines and carried to the liver. They are then reprocessed into their respected forms of "calcidiol". These are known as two forms of a hydroxyl group. The kidneys create the third and last hydroxyl group in this process, which turns "calcidiol" into Calcitriol, the essential hormone needed for calcium regulation.

In humans, sunshine provides us with an amount of Vitamin D, because the sun's rays help convert stored cholesterol under the skin into a substance called "cholecalciferol". This is in fact the same precursor of Vitamin D we get from eating animal tissue. It is one reason some people believe dogs can also benefit in this way from lying in the sun. In reality, a dog's anatomy is very

different to human anatomy, which means exposure to the sun is not a viable source of Vitamin D for dogs.

The parathyroid glands, situated around the thyroid in the throat, produce a biochemical called “parathyroid hormone”. This is commonly more easily abbreviated to PTH. Both PTH and Calcitriol regulate calcium levels in the blood. If there is too little calcium circulating, PTH permits the release of calcium from bone into the blood – while at the same time instructing the kidneys to hold on to calcium and not excrete it in urine. Calcitriol increases the absorption rate of calcium from ingested food and enhances the release of calcium from a dog’s bone structure.

Importantly, Calcitriol shuts down PTH production when calcium levels become normal again. Without Calcitriol in the system, the only regulator remaining is PTH – and that can run riot, causing excessive calcium in the bloodstream resulting in dire health consequences. This is known as hypercalcemia, which creates a range of symptoms including increased thirst and excessive urination, constipation, the potential for bladder stones, vomiting and reduced appetite, hypertension, confusion, lethargy and depression. In very severe or untreated cases, it can also lead to coma. Therefore, the value of Calcitriol obtained from Vitamin D and produced naturally by the kidneys in the healthy canine body cannot be understated.

How Does Kidney Failure Affect Calcitriol Levels?

Dog owners may have read articles by me and others about why phosphorus levels are important in the ongoing management and treatment of kidney failure. Phosphorus is not a dangerous substance in itself and, in fact, it is the second most abundant in the body. It has a role to play in maintaining a healthy canine’s anatomy – but when the level of phosphorus becomes excessive, it can lead to bone disease, heart disease, muscle spasms and toxemia.

When a dog Is suffering from kidney failure, phosphorus is not properly regulated because excessive amounts of it cannot be excreted or removed from the bloodstream. Excessive amounts of phosphorus not only exacerbate the situation by encouraging PTH secretion (see above), but it also restricts the enzyme needed to convert calcidiol into Calcitriol. The combined effect detrimentally produces phosphate crystals throughout the body. These are inflammatory and interfere with almost all bodily functions. Without Calcitriol in circulation, the PTH spirals out of control and once properly regulated systems start to shut down or interfere adversely with other metabolic processes.

Isn’t a Low-Protein Diet Enough to Control Phosphorus Levels?

In the early stages of kidney failure, most vets and many academics involved in this field of science will recommend a low-protein diet. This makes good sense, because dogs get phosphorus from ingested protein. However, dogs do need a certain amount of high quality protein, otherwise they are unable to process carbohydrates into valuable energy. The amino acids acquired from protein also build hair, skin, nails, muscles, tendons, ligaments and cartilage and play a major role in hormone production. As dog owners, we need to consider the balance for providing good high quality protein (which create less toxic waste material), while limiting the amount of phosphorus produced as a bi-product of the protein. Phosphate binders can certainly help improve this balance – but introducing Calcitriol will also benefit things in the right circumstances.

What Evidence Exists to Promote Calcitriol Therapy?

In 2005, Dr. David J. Polzin, DVM, PhD, DACVIM, Professor of Veterinary Internal Medicine, conducted a study into the “Clinical Benefit of Calcitriol in Canine Chronic Renal Failure”, through the University of Minnesota. This clinical trial concluded that Calcitriol is effective in stabilizing the renal function in dogs with kidney failure in stage 3 and stage 4, leading to prolonged survival. Dr Polzin's study proved Calcitriol therapy is safe and effective in stabilizing renal function and the investigators recommend using it to treat dogs with kidney disease. Previously untested studies had suggested there were added benefits such as increasing appetite, but Dr Polzin’s study could not substantiate these. Over the course of one year, there was a significant reduction in mortality rate in the group of dogs receiving Calcitriol (28%) as compared to the placebo group (63% mortality). In dogs receiving Calcitriol, the median survival time was 365 days, as compared to a median survival time of 250 days in those receiving a placebo.

In an earlier 1996 study, “Benefits of calcitriol therapy and serum phosphorus control in dogs and cats with chronic renal failure”, Professor Larry A Nagode, DVM, PHD, of the Department of Veterinary Biosciences, Ohio State University, concluded that low doses of Calcitriol are most effective when started early in uremia and before the advanced stages of renal secondary hyperparathyroidism. This study also found that phosphorus restriction achieved through a combination of diet and intestinal phosphate binders is important to allow Calcitriol therapy to successfully lower PTH levels. The author states that Calcitriol supplement for dogs and cats with chronic renal failure makes good endocrinologic sense.

How Is Calcitriol Administered?

Reducing parathyroid hormone is the goal of this form of treatment. The earlier this is started the better, because PTH is an influential and disastrous toxin involved in kidney failure. It is also worth noting that averting excessive PTH production is easier and more successful than trying to reverse an established process. Calcitriol is given in miniscule amounts in comparison to Vitamin D supplementation, by tablet or liquid. These small doses can succeed in shutting down PTH secretion, but are not high enough to cause rising phosphorus levels.

Calcitriol cannot be given to dogs with high serum calcium levels. Primary assessment and then a continuous and diligent monitoring of these levels are essential. Without monitoring, Calcitriol can raise serum calcium levels, which is likely to make the kidney damage worse. It is interesting that some of the adverse comments received about Calcitriol therapy are due to higher administered doses of the hormone, resulting in adverse reactions and high serum calcium levels. After using small amounts of Calcitriol, there are multiple anecdotal comments from vets reporting that there is vastly improved quality of life and extended life span.

Phosphate Binders

Calcitriol therapy should only be started when the phosphorus level is below 6.0 mg/dl, because otherwise the hormone simply can’t do what it should do. The advice from Sherri Wilson, DVM, Diplomate ACVIM (Internal Medicine), Internal Medicine Consultant for the Veterinary Information Network (VIN), is to introduce a low protein (also low in phosphorus) diet, together with aluminum hydroxide (trade names Amphogel, Alternagel, Basaljel), to bind phosphorus in the diet. Once phosphorus levels drop, the phosphate binder isn't usually required for continuous treatment.

It is useful to point out that some phosphate binders contain calcium. When combined with Calcitriol, this type of binder could adversely elevate blood calcium levels. If your dog is receiving a phosphate binder and you are considering Calcitriol therapy, make sure you ask your vet about the type of binder being used.

Can I Not Achieve The Same Result Just By Giving Extra Vitamin D?

No. In fact, giving extra Vitamin D could be dangerous, because even healthy dogs can overdose on it. Dogs in kidney failure cannot process Vitamin D into Calcitriol, so the purpose of Calcitriol therapy is to give their body the end product they need, but cannot create themselves. It's a bit like giving a diabetic insulin, because their own body cannot create this life-maintaining substance on its own anymore.

There are some natural Vitamin D variation supplements that can truly help CKF dogs achieve a better balance, such as pure salmon oil. Salmon oil has some essential fatty acids that can offer the so-called Vitamin D3, which helps to keep the release of PTH in check. Conversely, plant-based Vitamin D2 goes straight to the kidneys for processing and is best avoided, because it simply stresses the already compromised kidneys even more. Mushrooms (fungi) are one of the primary sources of D2, so it is best to omit these from any homemade diet and avoid manufactured dog food products that list mushrooms or D2 in the ingredients.

The Cost Issue

Quite apart from the various tests required before and during Calcitriol therapy (some of which are only undertaken by specialist laboratories), there is also the cost of the hormone itself. Unfortunately, it takes a compound-producing pharmacy to make-up the correct strength of Calcitriol for a specific dog. There are not many veterinary pharmacies able to undertake this kind of work, which makes the cost higher than standard off-the-shelf medicines. Once a vet has assessed the right strength of Calcitriol, it may then be possible to get an appropriate stock item of the hormone, which should bring the price down.

Ask your vet to devise an estimate of the total cost of Calcitriol therapy in advance and before embarking on this journey (including the various tests), just to find out whether it is an affordable treatment.