

## **Calcitriol**

### **-a treatment for chronic kidney failure in your cat or dog.**

Calcitriol as the active form of Vitamin D is actually a hormone over 1,000 times as potent as natural or synthetic vitamin D itself. It is normally created in your pet's body after plants and/or animal tissues are eaten. The ingredients to make the calcitriol must first make their way through the liver and then migrate to the kidneys which if healthy do the final step of making the calcitriol. Calcitriol helps your pet's body absorb calcium and phosphate from food and put it in growing bones, where extra calcium and phosphate is stored. It is vital to your pet's health that an appropriate amount of calcium and phosphates are available in the blood, and absorption from food or resorption from bone are controlled by calcitriol for this most critical control of blood calcium. A molecule called parathyroid hormone (PTH) works with calcitriol to release calcium to the blood. Its gland of origin is the main detector of low blood calcium, and the PTH secreted stimulates formation of more calcitriol in the kidney. The calcitriol once normalized inhibits further formation and secretion of PTH (called feedback inhibition). Parathyroid hormone also recaptures calcium otherwise lost to urine so it has many benefits when in normal levels. When too high, however, PTH becomes a serious health problem and we wish to lower it which we can do by giving calcitriol.

If your pet's kidneys are failing and no longer doing their job of making enough calcitriol the parathyroid glands (around the thyroid gland in the throat area) produce more PTH in an attempt to normalize calcium and phosphate in the blood. Although we would prefer to not let PTH increase at all in our patients with kidney disease, the PTH is not too damaging until it reaches about 3 times the upper limit of its normal level in the blood as this is when toxicity due to the PTH first appears. This is usually happening about when your pet first appears to be ill. The PTH increase is worsened by the failure of the sick kidneys to eliminate phosphorus from blood which then reaches too high of a level. This both slows calcitriol formation and also prevents calcitriol from working at the parathyroid gland to block the PTH excess. When at very high levels late in kidney failure the phosphorus combines with blood calcium to precipitate into soft tissues damaging them. Although very injurious, this only happens at late stages of disease and use of calcitriol should delay getting to such stages, as compared to pets not given calcitriol. The high levels of PTH directly damage kidney cells long before the mineral precipitation phase of renal injury.

#### **How prescribed calcitriol works:**

By taking a carefully measured dose of calcitriol in capsule or liquid form we intend to keep the parathyroid glands from producing a toxic level of PTH; the amount of calcitriol prescribed needs to be calculated specifically for your cat or dog by your veterinarian and can be prepared for you by a special compounding pharmacy. The prescription of calcitriol for your pet is designed to be enough quantity to shut off the PTH production but not so much as to create elevated levels of calcium and phosphate in the blood. Because PTH levels are difficult to control once kidney failure is well underway, it is desirable to administer calcitriol at low doses as early as possible in kidney failure to avoid PTH excess from occurring in the first place.

Nearly 2000 pet owners and 250 veterinarians who used calcitriol were surveyed recently. Over 80% of the owners reported that their pets were brighter and more social and had better appetites when taking calcitriol. It was also felt that these animals had a substantially longer life span than patients that were not receiving calcitriol. A study of cats showed that 29 cats which had PTH lowered lived over a year longer on average than did 21 cats that did not have their PTH lowered.

#### **Cautions:**

Doses of calcitriol that are too high can elevate blood calcium and, to a lesser extent, phosphorus. The calcium level needs to be monitored and if it elevates, the calcitriol prescription needs to be changed to every other day on an empty stomach at night (EOD dosing). A double dose (twice the original daily dose) is given every other day. Then, the calcium level should be rechecked in seven days. If the calcium increase was caused by the original calcitriol prescription, the EOD dosing will lower the calcium.

Due to the complex nature of hormone interactions, inadequate calcitriol can also cause calcium elevation. Your veterinarian can direct you further to determine the most appropriate calcitriol dosing strategy. Most moderate increases of total calcium seen in patients with damaged kidney

are caused by factors not related to calcitriol. They are not clinically important so only if ionized calcium is increased is there need for any concern.

If your pet has a plasma phosphorus level greater than 6 mg/dl, calcitriol might not succeed in lowering the toxic levels of PTH. In this case, the plasma phosphorus must be reduced by diet, fluid administration or by phosphate binders ~ calcitriol can then be prescribed. The above-described EOD dosing approach also works to reduce phosphorus to the small extent that phosphorus elevation might have been caused in part by previous calcitriol doses.

It is helpful to have your pet's PTH level monitored by serum assays when it is on calcitriol therapy in order to determine whether any adjustment to the calcitriol dosage should be made. This monitoring is not necessary when calcitriol is used early in a preventative mode, however.