

# discuss

Edited by Farmina editorial Scientific Research

*"NUTRITIONAL TREATMENT OF CHRONIC RENAL FAILURE."*

*"DIET FOR STRUVITE UROLITHIASIS PREVENTION IN CATS."*

## Farmina Vet Research

*Farmina Vet Research Group (FVR) aims to support the veterinary in the management of some diseases commonly encountered in pets, through their effective, scientifically proven, Farmina Vet Life diets.*

*It also proposes to offer viable solutions to food issues, and provide scientific advice, through the collaboration with the Department of Veterinary Medicine and Animal Production - University of Naples Federico II.*

*Farmina Vet Research is now able to have a scientific dialogue with the veterinary world, discussing clinical issues and new products.*

*Farmina Vet Research, is the company's scientific area where different profiles and skills cooperate, but all working together to offer professional advice.*

*Farmina Vet Research, integrates with the production center studying the technological innovations to improve working processes to pursue the challenges of the future, in order to bring health and wellbeing to our faithful companions through the value of its products.*

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## Nutritional treatment of chronic renal failure.

Patients with kidney failure are usually subjected to nutritional treatment, regardless of the type of drug therapy chosen.

The main objectives of nutritional treatment in chronic renal failure are:

- to control the levels of urea, phosphorus, and parathyroid hormone
- to counteract metabolic acidosis, controlling acid-base equilibrium
- to maintain a normal nutritional status
- to slow down the progression of the disease

The diets specifically formulated for the treatment of renal failure are characterized by lower protein contents than those of the maintenance diets, however, they meet the daily protein requirements (18-20% of metabolizable energy, in dogs and cats, respectively), using sources that ensure quality and digestibility.

In order to do this animal sources (eggs, fish and meat), rich in essential amino-acids are particularly indicated.

The effectiveness of low-protein diets in renal patients has been debated for a long time and it is still the subject of several studies in the canine and feline species. Less controversial, however, is the effect of diets containing low levels of phosphorus on the course of renal disease. In fact, animals with CKD show increased blood concentrations of phosphorus and calcium.

Due to the inefficiency of the kidney system, the levels of parathyroid hormone in the body are high, while those of vitamin D are limited. This can favor the appearance of bone fragility. The reduction of levels of phosphorus in the diet usually leads to a gradual lowering of the blood values, without having to resort to the use of phosphate

binding agents (aluminum carbonate, hydroxide aluminum oxide, ammonium, calcium citrate, acetate calcium and calcium carbonate) and allows its excretion in the faeces. The binding agents with calcium may promote the precipitation of calcium salts in the soft tissues, including the kidneys.

Since animals with chronic renal failure are not able to recycle water through urine concentration, they have higher needs than normal, and is therefore necessary to remind the owners to make sure there is the constant availability of fresh water to prevent dehydration. If the subject does not eat or vomits, you will need to rehydrate artificially subcutaneously.

Acidosis may occur in some animals with CKD, specific diets are formulated to counteract this condition, however in hospitalized subjects and those who have no appetite the use of substances that can counteract this condition may be necessary.

Damaged kidneys are less efficient in regulating sodium, which is indispensable to balance the volume and blood pressure. An excess of sodium causes water retention while insufficient levels may promote dehydration. When switching from a normal sodium diet to one that is characterized by low sodium levels, it takes a few weeks before we can observe significant changes in the blood sodium levels.

However, it is always advisable that the transition to the new diet takes place in a gradual way to avoid a sudden imbalance. The kidneys contribute to the production of erythropoietin, a hormone that stimulates the production of new red blood cells. Usually red blood cells survive approximately 100 days, and a healthy organism regenerates them continuously.

In subjects with kidney failure a reduction in blood levels of erythropoietin is observed, which explains the relatively common anemia, which, among other things, helps to further depress the patient's sensorium.

The integration of polyunsaturated fatty acids can be useful to slow down the course of the pathology.

## THE EXPERIMENT

### THE DOG

A total of 48 dogs were recruited with renal failure for a period of 90 days (adaptation 15 and 75 of treatment) and received feed Vet Life Canine Renal formula on the basis of EM 130 kcal/kg PM/d in support of medication. During the recruitment period and on a monthly basis the subjects underwent a blood test and urine test to assess the blood count and values of the main biochemical renal function indicators.

### RESULTS

Less than 40% (19/48) of the recruited subjects completed the test. This is primarily due to subjects who abandoned the experimental program. A dog died during the observation period.

In table 1 the average values of the main blood and urine parameters recorded during the test period. The blood values of potassium, sodium and chlorine went significantly down as nutritional treatment progressed, reaching average values considered optimal or close

Sampling		1	2	3	4	MSE	Ideal Range
Urea	mg/dl	95,85	86,85	97,14	97,79	68,64	20-45
Creatinine	mg/dl	2,13	2,103	2,092	2,027	1,316	0-2
Calcium	mg/dl	10,64	10,49	10,34	10,19	1,99	9,8-12
Phosphorus	mg/dl	6,674	6,544	5,775	5,096	3,586	2,5-5
Potassium	mEq/l	10,58a	10,45a	8,58ab	5,44b	6,69	3,6-5,6
Sodium	mEq/l	235,8A	222,2AB	191,6AB	150,7B	84,69	141-145
Chlorine	mEq/l	234,2A	212,2AB	170,9AB	114,5B	117,5	96-122
Protein tot	g/dl	8,06	7,89	7,52	7,03	1,83	6-7,5
Unit weight		1030	1023	1020	1019	21,72	1020-1050
Creatine	UI/l	90,9	128	130,7	173,4	118,5	20-200
pH		6,6	6,9	6,5	6,6	1	5,5-7,5
PU/CU		1,995	1,6607	1,2368	0,8242	3,2808	<0,5

Table 1 - Average Value

to it. For the other parameters statistically significant differences did not emerge between the samples, probably due to the high variability (high MSE). However the mean value of urea, creatinine and PU/CU progressively reduced, although only a few subjects reached optimum levels.

In our opinion, the high variability is due to the different degrees of renal degeneration as well as to specific subjective response. Therefore in order to evaluate if the treatment effect was dependent on the degree of pre-existing renal degeneration, steps were taken to carry out a statistical analysis of many factors. In particular the sample result was correlated with the creatinine level. Although such analysis increases the likelihood that the differences recorded between the samples are due to the treatment, only with regards to urine specific gravity there were significant differences.

Therefore it is clear that the use of Farmina Vet Life Renal Canine formula diet is a safe therapeutic benefit that allows you to re-balance electrolytes in the organism, thus having the advantage of limiting the overload of intact nephrons. These variations do not normalize blood and urine parameters in subjects affected by serious renal failure.

### THE CAT

A total of 55 cats with renal failure were recruited for a period of 60 days (15 of adaptation and 45 of treatment) They were given Vet Life Renal Feline formula at a rate of 100 kcal EM / AM kg / d in support of a drug therapy.

During the trial period and on a monthly basis the subjects underwent blood and urine tests to assess the blood count and main biochemical markers of renal function.

### RESULTS

About 40% (22/55) of the recruited subjects completed the test. This is primarily due to them abandoning the experimental program, although in the case of the feline species, the number of deaths was higher (4 subjects).

In Table 2 the average values of the main blood and urine parameters recorded during the test are reported.

Table 2 - Average value

Sampling		1	2	3	MSE	Ideal Range
Urea	mg/dl	102,8	96,92	96,45	78,33	20-50
Creatinine	mg/dl	3,25	2,45	2,41	6,36	0,5-2
Sodium	mEq/l	150,6	151,8	152,1	6,06	143-158
Potassium	mEq/l	9,85	3,72	6,01	17,38	3,60-5,30
Phosphorus	mg/dl	6,12	6,1	5,14	13,49	3,8-5,0
Na/K		39,67	39,7667	36,975	7,21	>30
Proteine tot	g/dl	8,42A	8,03ABa	7,12Bb	1,5	2,2-3,5
Unit weight		1033	1031	1033	22,87	1020-1040
pH		6,3	6,57	6,26	1,22	6,5-7
PU/CU		0,51	0,82	0,67	1,11	<0,4

All main blood and urine parameters taken into account showed a progressive decline, although there was a significant statistical difference only in serum total proteins. When the sample factor was correlated with the content of creatinine also the levels of urea, pH/UC and their connection were significantly different from each other. This observation confirms and strengthens what was already mentioned in dogs: nutritional treatment efficacy is closely related to the degree of impairment of the renal parenchyma. In subjects in which renal function is still effective, the therapy slows down the degenerative process and can help to bring blood levels within the optimal range. Instead, in patients whose renal function is now impaired, the therapy can only limit the course of the pathology.

## Conclusion

The adoption of Farmina Vet Life Renal Formula diet at an early stage of renal failure, in both species, slows down the course of the IRC, helps the drug therapy and improves the quality and life-expectancy of patients with renal problems. ■

## Diet for struvite urolithiasis prevention in cats.

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### FELINE UROLITHIASIS

Urolithiasis is a common disease in the feline species with a similar incidence in both sexes. Until not long ago, it was thought that the majority of uroliths in cats were small, sandy or even gelatinous with an bigger organic matrix than uroliths of other species. However recently stones of bigger dimensions primarily composed of calcium oxalate, magnesium ammonium phosphate and uric acid are more frequent (Brown, 2013).

Usually the suspicion of urolithiasis is postulated on the basis of clinical signs (hematuria, dysuria or urethral obstruction), but the definitive diagnosis is carried out following more specific tests, such as the analysis of urine, urinate culture, radiography, ultrasound. It may be necessary to do a differential diagnosis to urinary tract infection and / or tumors. The x-ray, cystoscopy or ultrasound are of fundamental importance to detect uroliths, because only about 10% of bladder uroliths are detected by abdominal palpation. Uroliths with a diameter larger than three millimeters are usually radiodense, however, given that smaller uroliths are the most common, you may need a double contrast X-ray. In about 20% of cats with hematuria and dysuria uroliths were identified with an X-ray.

Usually larger uroliths must be removed surgically or through lithotripsy, followed by a diet therapy as a preventive measure, more common in struvite uroliths.

There are three distinct types of struvite uroliths recognized in cats: urethral plugs amorphous with a large amount of matrix, sterile struvite uroliths (which are probably formed due to some ingredients of the diet) and struvite uroliths with bacterial matrix, which are formed following a sequence of urinary tract infections of urease producing bacteria, the latter is much less frequent in the feline species than in canine species.

The treatment of ureteral stones of sterile struvite crystals is based on the reduction of urinary pH and the limitation of the concentration of magnesium in urine. The nutritional treatment is considered beneficial in this type of calculi, however, patients must be monitored every 4 weeks, with ultrasound and urine tests. Since the small uroliths can not be detected radiographically, the diet should be continued for at least four weeks after the dissolution. If the treatment does not induce the complete dissolution of urolithiasis, it is likely that the identification of the mineral component was wrong.

The recurrence of struvite crystals in the feline species is frequent, Albasan et al. (2006) found an incidence of 2.7% in 20 months. Therefore, after removal and / or dissolution of the calculi, it is essential to follow specific diet capable of ensuring the maintenance of urinary pH values around 6.5, as well as to facilitate the diuresis either through a diet or through simple things, such as providing fresh water and a frequent cleaning of the litter box. It is preferable that diets used to restrict relapses are not characterized by magnesium levels which are too low because the low urinary levels of magnesium may favor the formation of oxalate and calcium urate, as demonstrated in studies conducted on the murine and human species.

### MATERIALS AND METHODS

We recruited 45 adult cats that had recently (maximum 30 days) complete diet treatment for the dissolution of struvite crystals. Cats were fed with Vet Life Struvite Management feline formula diet at a rate of 100 kcal EM/kg AM. The trial period lasted a total of six months; during this period and every two months subjects did blood and urine tests to assess the possible reappearance of uroliths.

## RESULTS AND DISCUSSION

In table 1 the average values of the main blood parameters taken into account are reported. No statistically significant difference emerged between the tests, but it is evident that the reduced protein content during the diet brought about a progressive reduction of urea blood levels bringing them back to normal.

With regard to the urine test, no cat showed the presence of ketones, leukocytes, glucose and bilirubin, while 11 subjects, 15% presented hemoglobin in the urine. This symptom progressively reduced and at the end of the test it was evident in 4 subjects (8%).

Even the presence of crystals progressively decreased (Table 2) regardless of their nature (53-6% of subjects).

Table 1 - Principal Average Value

Prelievo	Urea mg/dl	Creatinine
1	74,45	1,94
2	63,59	1,60
3	56,43	1,56
4	50,26	1,29
5	44,50	1,77
MSE fisiological	35,4	0,93
Range fisiological	20-50	0,5-2

It is interesting to notice how the nutritional treatment limited the presence of crystals in the urine also of a different nature from struvite, probably due to the magnesium content of the diet.

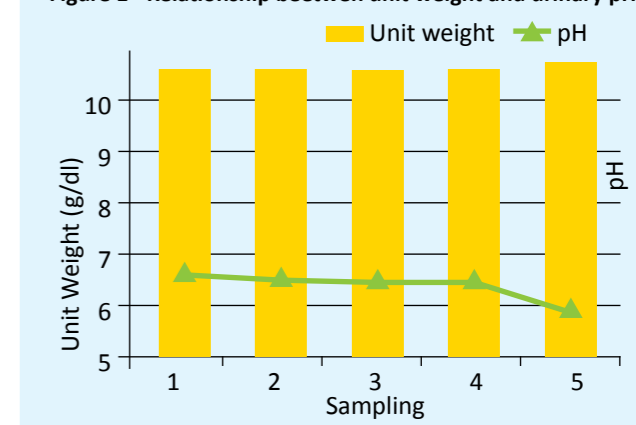
However, the specific urine gravity of all cats was always higher than 10.40 g/dl (physiological maximum limit), regardless of the pH. Only two cats produced urine during the test which specific gravity was within physiological limits.

Figure 1 shows how the specific gravity and the pH recorded opposite trends meaning that the recruited subjects showed a strong tendency to the formation of urates. However the nutritional treatment seems to be able to limit any process of crystallization.

Table 2 - Subjects positive to the crystals

Sampling	Struvite	Others crystals
1	18	6
2	16	3
3	11	2
4	7	2
5	2	1

Figure 1 - Relationship between unit weight and urinary pH



## CONCLUSION

From the above results it is evident that Farmina Vet Life Feline Struvite Management formula diet can be a valuable prophylactic aid to prevent the formation of struvite urate and of urates of any other nature even if the clear predisposition of the examined cats suggests implementing all control systems (urine tests every two months) and management techniques (frequent renewal of drinking water, constant litter cleaning etc.) so as to detect the appearance of crystals at an early stage. ■

### Bibliography

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