

Normal Kidney Function?

Therapeutic choices for marginal proteinuria and azotemia

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A 9-year-old, spayed female domestic short-haired cat was presented for routine annual evaluation. As part of the senior care program, a hemogram, biochemistry panel, and urinalysis were evaluated.

History. The owners reported that the cat had been healthy with no complaints during the past year. The animal's dietary history, urination patterns, and other health-related observations were reported to be normal.

Examination. The animal's body condition score was a 3/5, consistent with normal body weight and composition. Mild sinus tachycardia (195 beats per minute) was noted, serum creatinine concentration was mildly elevated at 1.9 mg/dl (normal range, 0.7–1.8 mg/dl); serum phosphorus concentration was mildly elevated at 5.8 mg/dl (normal range, 3.5–5.5 mg/dl); and urine protein dipstick reaction was +1. The urine specific gravity was 1.023 and the urine sediment examination was unremarkable. The rest of the physical examination showed no abnormalities and the cat's hemogram and all other biochemical parameters were within normal limits.

ASK YOURSELF ...

What is the most appropriate therapeutic intervention in this patient?

- A. Fluid therapy. A urine specific gravity of 1.023 indicates the ability to produce concentrated urine and the mild increase in serum creatinine is prerenal in origin.
- B. Begin low-protein diet to preserve kidney function.
- C. Restrict dietary phosphorus ± intestinal phosphorus binder.
- D. If proteinuria is confirmed with a more specific test, therapeutic intervention with an angiotensin-converting enzyme inhibitor should be instituted.
- E. Both C and D

continues

INSIGHTS FROM CLINICAL CASES . DISCUSSION

Correct Answer: E

Dietary phosphorus restriction (\pm intestinal phosphorus binder) and, if proteinuria is confirmed, an angiotensin-converting enzyme (ACE) inhibitor.

Case management. The cat was fed a low-phosphorus diet. After 1 month, serum phosphorus concentration remained elevated, so an intestinal phosphorus binder (1.0 gm ipakatine, twice daily with food) was added to the low-phosphorus diet. The cat's systolic blood pressure as determined by an indirect oscillometric device (**Figure 1**) was 142 mm Hg (normal, < 150 mm Hg); thus, systemic hypertension was not complicating the cat's condition at this time.

Proteinuria was confirmed with a strong positive reaction for albuminuria (30 mg/dl) and a urine protein-to-creatinine ratio of 0.55 (normal, < 0.40); thus, an ACE inhibitor (0.5 mg benazepril hydrochloride, orally once daily) was provided. The cat remains in good health with stable renal function 8 months later and she is being carefully evaluated every 3 months. Evaluations include measurement of the urine protein-to-creatinine ratio, serum creatinine and phosphorus concentrations, and systemic blood pressure. Annual urine culture, complete biochemical panel, and hemogram are also planned.

Interpretation of findings. The presence of mildly elevated serum creatinine concentration in a cat with no evidence of dehydration or other prerenal factors is sufficient to conclude that kidney disease is present. Furthermore, a urine specific gravity of 1.023 is not concentrated (< 1.035). To determine duration of the kidney disease, and as a useful confirmatory test in this patient, renal imaging studies were conducted. Abdominal radiography revealed the presence of irregular margins of both kidneys and renal ultrasonography demonstrated a hyperechoic corticomedullary junction. While normal



Systemic blood pressure should be serially evaluated in every patient with chronic kidney disease.

renal imaging studies do not rule out kidney disease, abnormal radiography and ultrasonography can be used to confirm the diagnosis of chronic kidney disease (CKD) in this patient.

Staging. Appropriate therapy for feline CKD depends upon the severity and accompanying factors. We can stage CKD according to guidelines of the International Renal Interest Society (IRIS) (**Table**). These guidelines are provided to stage CKD after a diagnosis is established. In this case, we established a diagnosis by observing a mildly elevated serum creatinine concentration, low urine specific gravity, and abnormal renal imaging study results.

Clinical and laboratory studies indicate that therapeutic intervention is appropriate in cats with CKD. In particular, dietary phosphorus restriction in hyperphosphatemic cats with CKD and ACE inhibitors in cats with proteinuric CKD (urine protein-to-creatinine ratio > 0.40 or strong positive for microalbuminuria) have shown promise, regardless of level of systemic blood pressure. Dietary protein restriction has not been shown to be beneficial in stage I or II

feline CKD and is usually not recommended until stage III or IV.

Accordingly, this particular case would be classified as stage II CKD with proteinuria and without hypertension. In this cat, dietary therapy was indicated as hyperphosphatemia was present. The cat was fed a low-phosphorus diet with subsequent addition of an intestinal phosphorus binder to control the hyperphosphatemia.

Proteinuria. The finding of proteinuria with the urine dipstick evaluation mandates special consideration. Proteinuric kidney diseases tend to progress more rapidly in cats. However, the presence of a positive test with a urine dipstick should neither be ignored nor considered reliable, especially in cats, as such tests often produce false-positive results.

Fortunately, there are now more sensitive and specific tests for confirming the presence of proteinuria such as the urine albumin assays. This cat had a strong positive reaction for albuminuria (30 mg/dl). A urine albumin concentration of 1–30 mg/dl is abnormal and is referred

Announcement

DEA Fees Rise

The Drug Enforcement Administration has raised the annual fees for practitioners and researchers who handle controlled substances from \$130 to \$184—or \$551 for a three-year registration period. The higher rate takes effect on November 1st. For additional information, contact Mark W. Caverly at 202-307-7297. —*Press release 9/14/06*

Clean, Fresh Water

FILTERED PET WATERER (Ergo Systems Inc; Addison, IL) makes it easier for a dog to get the water it needs. The device processes water through eight stages of filtration to provide clean, oxygenated water. It is available in 2, 3, or 5 gallon versions. For more information, visit www.autopetfeeder.com. —*Press release 10/11/06*

New Product

Equine Radiographic Guide

A comprehensive positioning guide for capturing diagnostic equine digital radiographs is now available from Eklun Medical Systems Inc, Santa Clara, CA, for a nominal cost. The 65-page guide illustrates proper positioning of the panel and camera while providing suggestions for acquiring superb images. For more information, contact Laurie Hallwyler at lhallwyler@eklin.com. —*Press release 10/12/06*

New Tool

Table: IRIS Classification of Feline Chronic Kidney Disease*

Stage	I	II	III	IV
	No azotemia	Mild renal azotemia	Moderate renal azotemia	Severe renal azotemia
Creatinine:				
micromol/L	< 140	140–250	251–440	> 440
mg/dl	< 1.6	1.6–2.8	2.9–5.0	> 5.0

*Urine protein content and systemic blood pressure should be assessed in all stages.

to as microalbuminuria in cats (micro for relatively small amounts). The urine protein-to-creatinine ratio was determined to be 0.55 and a ratio > 0.4 indicates feline proteinuria. The normal urine sediment and negative urine culture indicate that the protein is likely of renal origin.

Discussion. Recent clinical and laboratory studies indicate that therapeutic intervention with an ACE inhibitor is appropriate in cats with proteinuric chronic kidney disease, an approach followed in this cat. We might have also considered dietary protein restriction, as it reduces proteinuria in people and dogs with kidney disease. However, sound evidence that low protein diets reduce proteinuria in cats is lacking. The low phosphorus diet we chose was somewhat reduced in protein content as well and we did consider further dietary protein restriction. It is also important to determine if systemic hypertension is present, particularly in proteinuric CKD. Measurement of this cat's blood pressure confirmed normal blood pressure at initial presentation.

It is critical to routinely perform a complete urinalysis, which includes a dipstick, specific gravity determination, and sediment examination (**Figure 2**). More specific and sensitive assessment of proteinuria, such as a species-specific albuminuria assay or a urine protein-to-creatinine determination, should also be



A complete urinalysis evaluates a urine sample obtained by cystocentesis (> 5 ml) with dipstick, biochemistry analysis, specific gravity determination, and sediment examination. A urine culture and a more sensitive/specific urine protein assay are often appropriate. Proteinuria should be quantified in every patient with chronic kidney disease.

considered, particularly if the dipstick is not negative. In older cats, bacterial urinary tract infections without clinical signs are more common than previously thought and a urine culture is appropriate, particularly if there is evidence of urinary tract disease in the patient's examination or history. ■

See Aids & Resources, back page, for references, contacts, and appendices.