

# Chronic Kidney Disease in Cats with Hyperthyroidism

Tim Williams, MA, VetMB,  
PhD, FRCPath, MRCVS  
*University of Cambridge*



## YOU HAVE ASKED...

How do I approach and manage the hyperthyroid cat with chronic kidney disease?

## THE EXPERT SAYS...

Diagnosing chronic kidney disease (CKD) in a hyperthyroid cat can be challenging because hyperthyroidism can mask the presence of concurrent CKD:

- ▶ Serum creatinine concentrations are decreased secondary to the elevated glomerular filtration rate (GFR) and reduced body muscle mass associated with hyperthyroidism.
- ▶ Serum urea concentrations are not a good marker of renal function in

hyperthyroid cats because of the opposing effects of polyphagia, increased GFR, and increased muscle catabolism.

- ▶ Renal function in a hyperthyroid cat can only be fully assessed using serum creatinine concentrations after euthyroidism is established.

Nevertheless, the presence of elevated serum creatinine concentrations (for the purposes of this article, termed azotemia) in an untreated hyperthyroid cat signifies the presence of concurrent CKD, provided that prerenal azotemia is excluded via assessment of urine specific gravity.

In addition, hyperthyroid cats, with or without concurrent CKD, are frequently

**Renal function in a hyperthyroid cat can only be fully assessed using serum creatinine concentrations after euthyroidism is established.**

CKD = chronic kidney disease,  
GFR = glomerular filtration rate,  
TT<sub>4</sub> = total thyroxine

proteinuric; however, this often resolves following establishment of euthyroidism without additional antiproteinuric therapy. Regardless of when azotemic CKD is diagnosed in a hyperthyroid cat, a renal diet should be initiated and IRIS guidelines<sup>1</sup> for management of CKD followed in all cases.

### **Azotemia at Hyperthyroidism Diagnosis**

Hyperthyroid cats with an elevated serum creatinine concentration and evidence of reduced urine concentrating ability at the time of diagnosis are likely to have moderate-to-severe renal dysfunction. However, the degree of renal dysfunction will be underestimated because of the effect of hyperthyroidism on serum creatinine concentrations (as discussed previously).

In these patients, treatment of hyperthyroidism is associated with further increases in serum creatinine concentration, which may result in the cat developing severe azotemia (IRIS Stage 4). No studies have yet been performed to compare the survival times of hyperthyroid cats with azotemia that are left untreated with azotemic hyperthyroid cats that are treated (and thus develop more severe azotemia). The decision to treat, however, is best made based on the clinical presentation of the individual animal. If treatment is initiated, it is best to use reversible therapy (antithyroid medication or dietary therapy) rather than definitive treatments such as surgical thyroidectomy or radioiodine. Use of reversible therapy allows assessment of how the cat handles the normalization of the serum total thyroxine (TT<sub>4</sub>) concentration and offers the option of dose reduction if the patient deteriorates clinically because of treatment-associated worsening of renal function.<sup>2</sup>

When instituting antithyroid medication, the lowest possible dose should be used and TT<sub>4</sub>

concentration and renal parameters monitored closely. The first goal is to reverse the clinical signs of hyperthyroidism and then, if possible, attain a serum TT<sub>4</sub> concentration in the lower half of the reference range.<sup>2</sup> If achieving a lower serum TT<sub>4</sub> concentration leads to a marked increase in the serum creatinine concentration (>5 mg/dL or 440 μmol/L), the dose of antithyroid medication may need to be reduced or ceased. In these cases, a compromise between control of hyperthyroidism and improved renal function may be required in order to optimize the patient's quality of life. The prognosis for hyperthyroid cats with azotemic CKD before treatment is generally poor, with a median survival of 6 months; definitive treatment of hyperthyroidism (by radioiodine or surgery) is therefore not recommended.<sup>3,4</sup>

---

**Cats that develop azotemia after treatment have equivalent survival times to cats that remain nonazotemic.**

### **Azotemia after Hyperthyroidism Treatment**

Nonazotemic hyperthyroid cats should be treated for hyperthyroidism, with the goal of achieving a serum TT<sub>4</sub> concentration in the lower half of the laboratory reference interval. Serum TT<sub>4</sub> concentrations and renal parameters (serum creatinine concentration and urine specific gravity as a minimum) should be monitored at least every 3 to 4 weeks until euthyroidism has been restored for 3 months. Although GFR returns to normal within 1 month of successful treatment of hyperthyroidism, serum creatinine concentrations

continue to increase for up to 3 months after restoration of euthyroidism.<sup>5</sup> Azotemia develops after treatment in about 15% to 25% of cases<sup>3</sup>; however, cats that develop azotemia after treatment have equivalent survival times to cats that remain nonazotemic.<sup>6</sup>

Thus, in cats that develop azotemia *after* treatment of hyperthyroidism, a  $TT_4$  concentration in the lower half of the laboratory reference interval remains the therapeutic goal despite the development of azotemia. Treatment trials with reversible therapy (antithyroid medication or dietary therapy) in initially nonazotemic hyperthyroid cats (ie, before definitive treatment options, such as thyroidectomy or radioiodine treatment) are therefore no longer routinely recommended in hyperthyroid cats that are nonazotemic at the time of diagnosis.<sup>2</sup> However, normalization of the  $TT_4$  using antithyroid medication would be beneficial prior to general anesthesia for thyroidectomy. In cats that develop azotemia after treatment of hyperthyroidism, IRIS guidelines<sup>1</sup> for the management of feline CKD should be followed.

### Iatrogenic Hypothyroidism

If a cat treated with antithyroid medication has a serum  $TT_4$  concentration below the laboratory reference interval, the dose may need to be

reduced, particularly if the cat is azotemic or if the  $TT_4$  is below the limit of detection. If the  $TT_4$  is above the limit of detection but below the laboratory reference interval and the cat is nonazotemic, continued monitoring may be appropriate if the cat is clinically well. Measurement of thyroid-stimulating hormone concentrations is also helpful for distinguishing cats with low serum  $TT_4$  concentrations secondary to nonthyroidal illness (including CKD) and iatrogenic hypothyroidism. When dose adjustments are required, the change should be in the smallest increments possible and the serum  $TT_4$  concentration retested every 3 to 4 weeks until the  $TT_4$  is within the lower half of the reference interval. Once euthyroidism is restored, renal parameters should be rechecked.

In cats treated with radioiodine or by surgical thyroidectomy that subsequently develop a low serum  $TT_4$  concentration, monitoring for up to 6 months may be prudent. If serum  $TT_4$  concentrations remain below the laboratory reference interval for more than 6 months, thyroxine supplementation should be instituted. In many cases, nonablated thyroid tissue restores normal thyroid function following definitive treatment of hyperthyroidism by radioiodine or surgery. ■

### References

1. IRIS Treatment Recommendations for CKD. <http://www.iris-kidney.com/guidelines/recommendations.shtml>. Accessed August 2015.
2. Daminet S, Kooistra HS, Fracassi F, et al. Best practice for the pharmacological management of hyperthyroid cats with antithyroid drugs. *J Small Anim Pract*. 2014;55(1):4-13.
3. Williams TL, Peak KJ, Brodbelt D, Elliott J, Syme HM. Survival and the development of azotemia in hyperthyroid cats. *JVIM*. 2010;24(4):863-869.
4. Milner RJ, Channell CD, Levy JK, Schaer M. Survival times for cats with hyperthyroidism treated with iodine 131, methimazole, or both: 167 cases (1996-2003). *JAVMA*. 2006;228(4):559-563.
5. Boag AK, Neiger R, Slater L, Stevens KB, Haller M, Church DB. Changes in the glomerular filtration rate of 27 cats with hyperthyroidism after treatment with radioactive iodine. *Vet Rec*. 2007;161(21):711-715.
6. Williams TL, Elliott J, Syme HM. Association of iatrogenic hypothyroidism with azotemia and reduced survival time in cats treated for hyperthyroidism. *JVIM*. 2010;24(5):1086-1092.

CKD = chronic kidney disease,  $TT_4$  = total thyroxine