RENAL DIAGNOSTICS —
DIAGNOSING REDUCED RENAL FUNCTION
(NOT RENAL FAILURE!)

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RENAL DISEASE DIAGNOSIS
Currently, diagnosis of renal disease in reptiles is based on history, physical examination, hematology, biochemistry, urinalysis, diagnostic imaging, and ultimately renal histopathology and microbiology.1-3 Elevations of nitrogenous metabolites in plasma are poor indicators of renal function because the changes occur late in the course of disease. In human and domestic animal medicine, measurement of renal function has been established as an important tool in the diagnosis and surveillance of kidney disease. The most advanced techniques utilize imaging modalities including scintigraphy, computed tomography, and magnetic resonance imaging to measure renal blood flow and/or renal clearance of radioactive nuclides or contrast agents. Other techniques rely on determining the plasma clearance of an exogenous compound (eg, phenolsulfonphthalein, inulin, and creatinine) which requires intravenous drug administration, serial blood sampling, and catheterization for urine collection. Due to the post-renal modification of urine in the reptilian cloaca, colon, or bladder, it is essential to catheterize the ureters (not the bladder) in order to differentiate the roles of glomerular filtration and tubular transport from those of the cloaca, colon, and bladder. Recently, iohexol clearance studies have proven useful for determining glomerular filtration rate (GFR) in mammals without the need for catheterization.

Iohexol is a non-ionic radiographic iodine contrast medium of low osmolarity, extensively used in clinical radiology and considered free from side effects. Iohexol is excreted solely by glomerular filtration with negligible extra-renal elimination in mammals. The plasma clearance of iohexol (PCI) can be determined by analysis of plasma iohexol concentration over time after a single intravenous injection. The rate of clearance of iohexol from plasma can be used to estimate GFR by dividing the iohexol dose by the area under the curve (AUC), since elimination is solely by glomerular filtration. Calculation of GFR by this method has been used and validated in dogs, cats, pigs, rats, humans, and green iguanas.

MEASURING RENAL FUNCTION IN PRACTICE
Iohexol clearance in iguanas appears to be a safe and effective method for estimation of glomerular filtration rate and renal function.4 The procedure is as follows:

1. Contact the Diagnostic Center for Population and Animal Health (Michigan State University) in case submission requirements have changed.
2. Once stabilized and hydrated, fast the reptile for 24 hrs, but provide water to maintain hydration. Maintain within preferred optimum temperature zone for the species in question.
3. Record an accurate weight, and inject 75 mg/kg iohexol IV (time = 0, eg, 9:00 am). Intravenous catheterization should be considered to ensure all the drug enters the circulation as this is critical for correct analysis.
4. Collect a minimum of 0.5 ml blood at 4 hr (1:00 pm), 8 hr (5:00 pm), and 24 hr (9:00 am the next day). Centrifuge and separate the plasma (at least 0.2 ml of plasma is required for each sample point).
5. Send samples on ice with details of the animal’s weight and the exact times of sample collection to the following laboratory for iohexol analysis and GFR determination:

Diagnostic Center for Population and Animal Health
Michigan State University
4125 Beaumont Road, Room 122
Lansing, MI 48910-8104
Tel 517-353-1683
http://www.ahdl.msu.edu/

The mean GFR for healthy green iguanas has been determined to be 14.8–18.3 ml/kg/hr.4 Iguanas with renal disease display significant reductions in GFR, while those without any biochemical derangements may still exhibit reduced GFR because of the sensitivity of functional assessment over standard biochemical tests that typically only deteriorate once the majority of renal tissue has been affected. See Figure 1.

References
Figure 1. Plasma clearance of iodine vs. time curves for two iguanas, one healthy and one with renal disease. Note the clearly reduced rate of iohexol excretion and lower GFR associated with an iguana with renal disease, but no significant changes in plasma biochemistry.