



Dr. Joerg Mayer
Dipl. ABVP (Exotic
Companion Mammal) Dipl.
ECZM (Small Mammal),
Dipl. ACZM

Associate Professor of
Zoological and Exotic
Animal Medicine
USA

mayerj@uga.edu

URINARY TRACT MEDICINE IN RODENTS

Why are uroliths in herbivorous mammals so common???

Lower Urinary tract infection

- DEFINITION
- Result of microbial colonization of the urinary bladder and/or the proximal portion of the urethra
- INCIDENCE/PREVALENCE
- Urinary tract infection secondary to urolith rare in mouse and rat, described in hamster
- More common in true herbivores and in older animals

Clinical signs

- Historical Findings:
 - None, Pollakiuria, Hematuria, Urine scald
- Physical Examination Findings:
 - The bladder may be enlarged and painful
 - Automutilation of the penis (mouse)
 - No abnormalities in some animals

Causes

- Bacteria – *Esherichia coli* and *Pseudomonas sp.* are common causes of bacterial cystitis. Urethral obstruction as a result of *S. aureus* preputial gland and *P. pneumotropica* bulbourethral infection are described in rats
- Parasite – Bladder threadworm *Trichomoide crassicauda* in rat
- Urolith and crystals – bladder stone of struvite, crystals of ammonium magnesium phosphate, mixed carbonate and oxalate, and mixed carbonate, phosphate, magnesium and calcium in rat
- Mucoïd calculi – part of copulatory plugs found in the urethra and bladder of rats

Risk Factors

- Inadequate water intake – dirty water bowl, unpalatable water, changing water source, inadequate water provision)
- Inadequate cleaning of the cage – may cause some animals to avoid urinating for abnormally long period
- Injury on the penis – seen from aggressive breeding activity and abrasion on the cage in male mouse
- Obesity, lack of exercise
- Diet – high calcium diet magnesium deficiency, elevated dietary phosphorus or calcium, and diet preparations with a low calcium-to-phosphorus ratio

Diagnosis

DIFFERENTIAL DIAGNOSIS

- Female with pyometra, uterine neoplasia, or other uterine disorder may expel blood or a thick, often blood-tinged vaginal discharge when urinating. This discharge may mix with urine and mimic lower urinary tract infection. Obtain urine sample via cystocentesis to differentiate
- Lower urinary tract neoplasia
- Differentiate from other causes by urinalysis, urine culture, radiography, and ultrasonography

Lab Work

CBC/BIOCHEMISTRY/URINALYSIS

- Leukocytosis – may be seen, but this finding is rare
- Postrenal azotemia (e.g., high BUN, creatinine, and phosphorus) – if complete urinary outflow obstruction
- Crystals in urinary sediment – ammonium magnesium phosphate, mixed carbonate and oxalate, and mixed carbonate, phosphate, magnesium and calcium
- Pyuria, hematuria, and proteinuria – indicate a urinary tract inflammation, but these are nonspecific findings that may result from infectious and non infectious cause of lower urinary tract disease
- Bacteria – rarely observed on urinalysis even in animals with significant lower tract infection

Imaging

- Survey and contrast radiographic studies – could point out a radioopaque stone in the bladder or the urethra
- Ultrasound – detection of urolith, cristal in the bladder, inflammation of the bladder or the urethra (thickening of the wall), mass on the bladder or the urethra. Ultrasound can also assess the uterus to rule out genital disorder

Very small stones...

Endoscopy

- Cystoscopy – so far only possible in Guinea pigs and rats, allow to detect and treat urinary stones (lithotripsy), to visualize the bladder and urethra wall and to take samples

Treatment

- Fluid therapy – if patient dehydrated
- Treat associated urine scald with gentle cleaning; keep the area clean and dry; apply zinc oxide plus menthol powder to clean the skin q 24h

Management

- Increase water consumption. Provide multiple source of fresh water. Flavoring the water with fruit juice (with no added sugar) is usually helpful. Provide a variety of clean, fresh, leafy vegetables sprayed or soaked with water
- Provide a diet with a good calcium-to-phosphorus ratio and an adequate magnesium level

Prevention

- Urolith removal or does not alter the factor responsible for their formation; eliminating risk factors such as obesity, sedentary life, and poor diet combined with increasing water consumption is necessary to minimize recurrence. Even with these changes, however recurrence is likely.
- A frequent cleaning of the cage is essential to prevent any recurrence of the infection.

Surgery ?

- Except when a concomitant disorder requires surgical intervention, management usually does not involve surgery
- Uroliths within the bladder, urethra or mass obstructing the lower urinary tract must be removed surgically. The procedure is similar to those performed in dogs and cats
- HOWEVER, this can be a very complicated surgery in Guinea pigs

Urethroscopy

- Used to access bladder.
- Flexible pediatric urethroscope available for males.

Cystoscopy

- Many indications in small mammals.
- People are more and more requesting the least invasive procedure possible.
- Can be difficult to get into, great time to practice now.
- Urinary tract problems are very common
- Urinary sludge in rabbits

Colposcopy- Urethra opening

Urolith in the bladder

Medications

- Base choice of the antibiotic on result of a culture and sensitivity test
- Antibiotics that concentrate in the urine are most appropriate. Initial choice include enrofloxacin (10mg/kg PO, SC, IM q12h) and trimethoprim sulfa (30 mg/kg PO q12)
- Pain management may aid urination and promote appetite consumption. NSAIDs (meloxicam 1mg/kg q 24 PO) reduce pain and may decrease inflammation in the bladder.
- Antispasmodic
- Ivermectin (0.4mg/kg SC repeated 10 after the first treatment) for rat with bladder threadworm

COMPANION ANIMAL

EXOTICS

Polyuria / Polydipsia

- PATHOPHYSIOLOGY
- Urine production and water consumption (thirst) are controlled by interaction between the kidney, the pituitary gland, and the hypothalamus.
- Usually polydipsia occurs as a compensatory response to polyuria to maintain hydration. The patient's plasma become relatively hypertonic and activates thirst mechanism. Occasionally polydipsia may be the primary process and polyuria is the compensatory response. Then the patient's plasma becomes relatively hypotonic because of excessive water intake, and ADH secretion is reduced, resulting in polyuria.
- Very common in rat. Common in mouse and gerbil

Findings

- More likely to be seen in middle-aged to older animal
- Increase of water consumption. The owner often has difficulty to assess the urine production

Causes

- Primary polyuria due to impaired renal response to ADH – renal failure, pyelonephritis, pyometra, hepatic failure, hypokaliemia, drugs, hyperadrenocorticism (hamster)
- Primary polyuria caused by osmotic diuresis – diabetes mellitus (rat, mouse, degu, gerbil), post obstructive diuresis, some diuretic (e.g. mannitol and furosemide), ingestion or administration of large quantities of solute (e.g. sodium chloride or glucose)
- Primary polydipsia – behavioral problems (especially boredom), pyrexia, or pain.

Differentiating similar signs

- If associated with progressive weight loss – consider renal failure, hepatic failure, pyometra, neoplasia, pyelonephritis, and possibly diabetes mellitus.
- If associated with hypercalciuria – consider renal failure and nephrolithiasis
- If associated with polyphagia – consider diabetes mellitus
- If associated with recent estrus in an intact female – consider pyometra
- If associated with abdominal distension – consider hepatic failure and neoplasia

Lab Work

- Relative hypernatremia or high serum osmolarity suggest primary polyuria
- Hyponatremia or low serum osmolarity suggests primary polydipsia
- BUN elevation; creatinine elevation is consistent with renal cause for PUPD but may also indicated hydration resulting from inadequate compensatory polydipsia
- High hepatic enzyme activities are consistent with hepatic disease
- Hypercalcemia – can be a potential cause of renal failure, rather than the result of a renal failure
- Hypoalbuminemia supports renal or hepatic cause of PUPD
- Neutrophilia may suggest infectious or inflammatory disease
- White blood cell casts and/or bacteriuria should prompt consideration of pyelonephritis
- Urinary sediment evaluation often reveals struvite in rat, which could induce subsequent inflammatory cystitis or partial to complete blockage of the urethra.
- Pyuria hematuria and proteinuria indicate urinary tract inflammation, but these are nonspecific findings that may result from infectious and non infectious causes of lower urinary tract disease.