

Urinary Disease in Small Ruminants

Dr. Misty Edmondson reviews the most common causes of urinary tract disease in small ruminants.

Speaker Bio:

Dr. Edmondson is a native of Alabama where she grew up on a commercial cattle farm. She received a BS in microbiology from Auburn University in 1997 and DVM from Auburn University in 2001. She worked in a mixed animal practice in rural Alabama for 2 years before returning to Auburn University to complete a residency in food animal theriogenology. Dr. Edmondson completed her residency and MS in biomedical sciences from Auburn University in 2006 and became a Diplomate of the American College of Theriogenologists in 2005. She joined the faculty at Auburn University's College of Veterinary Medicine in 2006 and was promoted to professor in 2018. Dr. Edmondson taught in numerous courses (including theriogenology, reproductive anatomy, urogenital surgery, production medicine, and others) for veterinary students, as well as clinical rotations in food animal medicine and surgery and advanced rotations in advanced beef production and advanced small ruminant medicine and surgery. She was also involved in theriogenology resident training through clinical instruction, graduate lectures, and laboratories. In September 2018, Dr. Edmondson left Auburn University to join the Alabama Department of Agriculture and Industries as an Associate State Veterinarian. Dr. Edmondson has been married to her husband, Jason, a beef nutrition specialist, for fifteen years. They have two children, Wyatt and Laken, and have a farm where they raise Angus and SimAngus cattle, horses, and a few chickens.

Learning Objectives:

1. Attendees will be able to diagnose common urinary tract diseases in small ruminants based on key physical examination findings and diagnostic tests.
2. Upon diagnosis, attendees will be able to offer treatment strategies to their clients for each of the common urinary tract diseases.
3. Attendees will also have a basic knowledge on the best methods to prevent the urinary diseases covered in this discussion.



Urinary Disease in Small Ruminants

Misty A. Edmondson, DVM, MS, DACT

Agenda



1. Physical examination
2. Diagnostic tools
3. Obstructive urolithiasis
4. Ulcerative proctitis
5. Other diseases
 - Hypospadias
 - Renal Amyloidosis
 - Neoplasia



Physical Examination



Physical Examination: External Genitalia



- Urinary tract disease very common in small ruminants
- Abdominal palpation
- Urethra
 - Male
 - Observe indirectly as exits pelvis and stays along body wall to external urethral orifice
 - Pulsations & generalized or focal swellings along length (obstruction, urethral rupture, hematoma, abscess)
- Vulvar or Sheath Hairs
 - Examine for grit, blood, purulent exudate, urine

Physical Examination: External Genitalia



- Exteriorize penis

- Examine free portion of penis and prepuce
- +/- Sedation: set up on rump or lateral recumbency

Physical Examination: Micturition Behavior



- Males

- Urethral pulsation with urination

- Females

- Standing but often squat to urinate


Diagnostic Tools



Diagnostic Tools 

- Vaginoscopy
- Cystoscopy
- Radiographs
- Ultrasound
- Urine Collection/Urinalysis
- Chemistry/CBC

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Vaginoscopy 

- Vaginal examination
 - Use a speculum & light source to examine urethral orifice
 - Also visualize cervix, vagina for trauma, adhesions, etc

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Cystoscopy



- **Fiber optic endoscope**

- Visualize inside of bladder
 - Epidural, sedation
 - Void bladder of urine
 - Inject 500cc of air to visualize bladder musoca
 - Rarely used for routine cases
- Rarely used due to requirements for diameter and length of the endoscope

Ultrasonography



- **Transabdominal ultrasound used to visualize bladder & kidneys**
 - 3.5-5 mHz curvilinear or linear probe
 - Left kidney: dorsal, paralumbar space
 - Right kidney: 11-12th intercostal spaces
 - Locate both kidneys on right side
 - Kidney smooth & lack lobulations
- **Very difficult to visualize urethra & ureters in SRs**
- **Visualize abnormalities such as...**
 - Hydronephrosis – dilated ureter with anechoic fluid
 - Pyelonephritis – enlarged kidney with dilated renal sinus, echogenic debris present

● Bladder

- Right inguinal area transabdominally, may be viewed transrectally.
- Evaluate wall thickness (varies with fullness), contents, distension
- Bladder may contain hyperechoic debris with hematuria, pyuria, or stones/crystals
- Excessive free fluid in abdomen
 - Anechoic fluid - transudate or modified transudate → urine leakage
 - Echoic fluid - cells or protein indicate inflammation or exudate

- Biochemical Tests for Urinalysis (dipstick)

- Urine Glucose
 - Normally negative
 - Renal threshold 100-140 mg/dL (may be as low as 81 mg/dL)
 - Causes: *Clostridium perfringens* type D enterotoxemia, corticosteroid, xylazine, or dextrose administration; less common causes include stress and renal tubular disease

- Biochemical Tests for Urinalysis (dipstick)

- Urine Ketones

- Detect excessive fat metabolism (pregnancy toxemia, starvation)
- BEST test for diagnosing pregnancy toxemia in SRs
- Urine ketone strips do not detect β hydroxybutyrate (primary ketone produced)
 - only detects acetoacetate & acetone
 - false negatives may occur due to volatility of ketone bodies

- Biochemical Tests for Urinalysis (dipstick)

- Bilirubinuria
 - May be result of hemolytic disease, hepatic insufficiency, biliary obstruction
- Urobilinogen, nitrates, and Urine SG (via dipstick) → not considered diagnostic
- Urine Sediment Examination
 - Presence of cells, bacteria, casts, crystals, other debris

- Biochemical Tests for Urinalysis (dipstick)

- Occult Blood
 - Indicates presence of hemoglobin, myoglobin, or whole blood
 - Color alone cannot differentiate
 - Centrifuge & examine sediment
 - supernatant loses pigmentation: hematuria (hemorrhage, inflammatory)
 - supernatant remains red/brown & no sediment: hemoglobinuria, myoglobinuria
 - Hypophosphatemic hemoglobinuria (*Brassica* sp.), postparturient hemoglobinuria, cold water isoerythrolysis

Discolored Urine



- Hematuria

- Urolithiasis, cystitis, pyelonephritis, enzootic hematuria, etc

- Hemoglobinuria

- Leptospirosis, bacillary hemoglobinuria, copper toxicity, post-parturient hemoglobinuria

- Myoglobinuria

- Toxic plants (*Cassia* plants)

● Renal Function

- BUN - 10-30 mg/dL
- Creatinine - < 2 mg/dL

- Creatinine may increase more quickly than BUN
 - Ruminants recycle urea through rumen

Obstructive Urolithiasis



Obstructive Urolithiasis



- **Debilitating/life-threatening**
 - Recognize & treat early

● Pathophysiology

- Disease of males, especially castrated males
 - Decreased diameter of urethra
 - Preputial attachment still intact
- One large stone to many small, sand-like stones
 - Depends on composition of calculi
- Most calculi form readily in alkaline urine
 - Herbivores
 - High protein diets
 - Urinary tract infection
- **Single most important factor = decreased water intake → dehydration**

Obstructive Urolithiasis



● Pathophysiology

- Most common sites of lodging
 - Urethral process
 - Sigmoid flexure

- Three potential outcomes
 1. Urethral obstruction – partial or complete
 2. Urethral rupture
 3. Bladder rupture

- Prolonged partial obstruction → hydroureter, hydronephrosis, bladder wall damage, urethral strictures

● Clinical Signs of Ruptured Bladder

- Pain may subside
- Gradual abdominal distension
- Depression, anorexia
- Signs of uremia
- Large amount of fluid in abdomen

● Treatment

- Fluid support
 - Administer during surgery
 - Must have outlet for urine if surgery delayed
 - Isotonic sodium chloride
 - Especially important if hyperkalemic

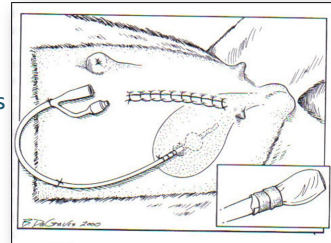
● Treatment

- Salvage (Feedlot Animal)
 - Urethrostomy at site of obstruction
 - Penile amputation
 - Temporary → ***Stricture formation will occur in weeks to months following surgery***

- Breeding or Pet Animal
 - Tube cystotomy
 - Bladder marsupialization

● Treatment

- Tube Cystotomy
 - Foley (16-24 Fr.) into bladder & exit catheter through ventral abdomen
 - Clamp catheter ~day 4
 - Normal urination for 1-2 days before remove
 - Must be in at least 7 days
 - Antibiotics, anti-inflammatories, urinary acidifiers
 - \$\$\$\$

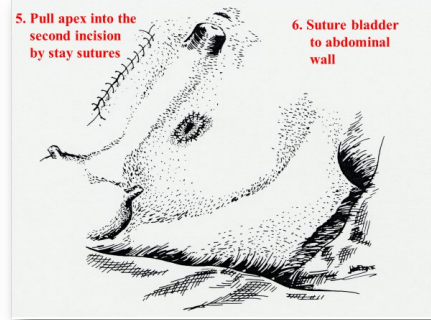
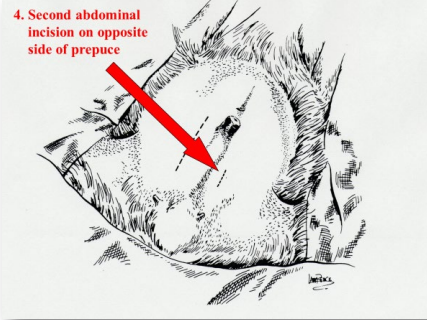


Sheep and Goat Medicine, DG Pugh, 2nd ed

- **Bladder Marsupialization**

- Marsupialize bladder to external body wall
- Primary procedure or secondary to failed tube cystotomy
- Significant concerns regarding urine scald of skin surrounding the marsupialization site

● **Bladder Marsupialization**



Techniques in Large Animal Surgery, Turner and McIlwraith, 2nd edition

Urolithiasis



● Prevention

- Females as pets
- Delay castration as long as possible (at least until puberty)
- Increase water intake
- Avoid excess protein (grain supplements, legume hay) in pets
- Ca:P ration of 1.5-2:1
- Urinary acidifiers – monitor pH

Ulcerative Proctitis/Vulvitis



Ulcerative Posthitis/Vulvitis



- Other names

- Pizzle rot, sheath rot, enzootic posthitis

- Causative Agent

- *Corynebacterium renale*
 - Contagious

Ulcerative Posthitis/Vulvitis



● Pathophysiology

- Hydrolyzes urea to form ammonia in urine of animals on high protein diet which excrete high levels of urea → ulcerations of skin of preputial orifice or vulva
- Angoras and Merinos
 - Due to hair at preputial orifice

Ulcerative Posthitis/Vulvitis



• Clinical Signs

- Ammonia irritates skin causing maceration & ulceration
- May spread into preputial cavity
- Swelling ± preputial prolapse
- May lead to stenosis & phimosis
- Ulcerative vulvitis in females
 - Ulcers that potentially distort vulvar commissure

Ulcerative Posthitis/Vulvitis



- **Treatment**

- Debride and emollient antibacterial ointment
- Dry environment
- Procaine penicillin G (PPG)
- Dietary changes

- **Prognosis**

- Good if early
- Stricture if later

Other Diseases



Hypospadias

- Common congenital defect in newborn male lambs/kids

- Pathophysiology

- Failure of closure of urethra
- Genetically female intersexes (polled)

- Clinical Signs

- Visible opening on ventral aspect of penis & prepuce
- Concurrent defects
 - Diaphragmatic hernia, brachygnathia, atresia ani



Armstrong, et al. JAVMA, vol 248(10); 2016.

Hypospadias



- **Treatment**

- Corrective surgery, if not severe
- Castration

- **Prevention**

- Do not breed polled goats

Renal Amyloidosis



● Pathophysiology

- Chronic wasting disease caused by tissue deposition of fibrils formed by polymerization of protein subunits
- Protein subunits arranged in beta-pleated sheet biochemical conformation
- Reactive systemic amyloidosis
 - Sequela to chronic inflammatory or neoplastic disease – caseous lymphadenitis

Renal Amyloidosis



● Clinical Signs

- Renal failure, death
- Nephrotic-like syndrome
 - Chronic weight loss, ventral edema, ascites, pleural & pericardial edema, hypoproteinemia, & proteinuria
 - Anorexia

● Diagnosis

- Renal biopsy or necropsy - histologic evaluation of Congo red-stained renal tissue
- Amyloid deposition in glomeruli & medulla

● Treatment

- Limited
- DMSO may prevent formation of some affecting proteins & promote solubility of fibrils (legal use)
- If disease associated with chronic infection, appropriate antibiotics
- Prognosis poor

Neoplasia



- **Enzootic Hematuria**

- Diagnosis
 - Clinical signs
 - Ultrasound - excessive bladder wall thickness, asymmetry
- Prevention
 - Reducing or limiting bracken fern in diet



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Misty A. Edmondson, DVM, MS, DACT

References:

1. Belknap and Pugh, Diseases of the Urinary System, Sheep and Goat Medicine, 2nd edition, Pugh and Baird editors.
2. Jones, Miesner, Baird, Pugh. Diseases of the Urinary System, Sheep, Goat and Camelid Medicine, 3rd edition, Pugh, Baird, Edmondson, and Passler editors.

Image Credits:

Figure 1. Personal photograph, Dr. Dwight Wolfe, Auburn University College of Veterinary Medicine

Figure 2. <https://www.progressivecattle.com/topics/herd-health/watch-for-unusual-health-issues-in-the-feedlot>

Figure 3. Personal photograph, Dr. Dwight Wolfe, Auburn University College of Veterinary Medicine

Figure 4. Sheep and Goat Medicine, Dg Pugh, 2nd edition.

Figure 5. Techniques in Large Animal Surgery, Turner and McIlwraith, 2nd edition.

Figure 6. Armstrong, et al. JAVMA, vol 248(10); 2016.