URINARY CALCULI in Small Ruminants

by Dr. Beth Johnson, DVM

Doc, my sheep/goat is straining to defecate, what is wrong? When I was in practice, my heart sunk when asked this question. Sheep and goats have an excellent gastrointestinal tract and should never be constipated. So what causes this clinical sign? The small ruminant is straining to urinate, NOT defecate! Unfortunately the condition urinary calculi (also known as urinary urolithiasis, water belly, etc.) can be fairly common on some farms with improper nutrition or management. There are not many treatments for this condition that are 100% curable or inexpensive therefore prevention is the key!

Urinary calculi rarely causes a problem in female sheep/goats due to the larger urethral diameter of the urinary tract and the shorter length and straightness of the urethra in females vs. males. The male urinary tract is depicted in **Figure 1**.

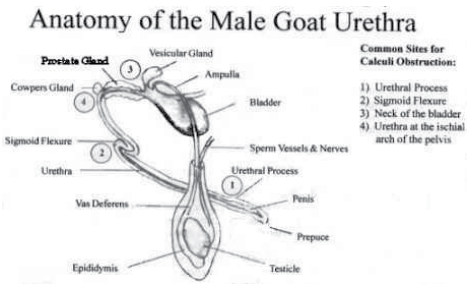

Figure 1. Normal urinary tract of a male small ruminant.

As you can see, not only is the urethra rather long, it makes a "S" curve called the sigmoid flexure and has an extremely small urethral process at the end of the urethra which is where a large number or urinary calculi lodge and results in the inability to urinate.

CLINICAL SIGNS OF URINARY CALCULI

As mentioned, the most obvious clinical sign is straining to urinate. The animal will stretch out, raise their tail, and may even vocalize while it is straining. An acute observer may notice a pulsing under the skin just below the rectum. This is the urethra trying to expel urine. Depression with initial elevated rectal temperature followed by a decrease in body temperature near death. A decreased appetite, "bloated" appearance, sternal recumbency, edema in ventral abdominal skin and sudden death are all signs that occur in the later stages of urinary obstruction due to urinary calculi.

Figure 2. Struvite/Phosphate Uroliths in a bladder.

Figure 3. Calcium carbonate stones

TREATMENT

Obviously, the goal of treatment is to remove the obstruction in the urinary tract and establish a patent urethra. This requires removal/dissolution of urinary calculi within the bladder/urethra and changes in the diet to accomplish treatment. It is important to identify what type of calculi you are dealing with. Most calculi are derived from elevated levels of phosphate (struvite, which appear like sand) but some calculi are calcium ammonium magnesium carbonate stones (look like BB's, very hard) as seen in **Figure 2 & 3**. Consult with your veterinarian to identify the calculi so that appropriate diet modifications can be performed to prevent urinary calculi development. **DO NOT PROVIDE BAKING SODA TO MALE SHEEP AND GOATS.**

Immediate medical attention is necessary to save the affected male sheep or goat. It may be as simple as snipping the urethral process at the end of the penis or as complex as abdominal surgery. I utilize a mild sedative which allows me to set the male sheep or goat on his rump, extend the penis and examine the urethral process. If I identify a calculi in or near the urethral process, then I snip the end of the process and hope that the animal can pass urine after performing this procedure. If I do not get urine at this point, then I proceed to other alternatives which may include bringing the urethra out below the rectum or in more advanced cases, bladder surgery. In all cases, the animal is placed on antibiotics and ammonium chloride drench daily for 7-10 days, if the calculi are phosphate or struvite in composition. An anti-inflammatory is also administered to prevent scarring of the urethra and give pain relief.

PREVENTION

As you can see, it is much easier to prevent urinary calculi then it is to treat. Most of the urinary calculi cases occur in market wethers being raised for 4-H/FFA livestock projects because they are consuming high grain diets. Grains generally contain elevated levels of phosphorus and low levels of calcium. Your goal should be to maintain an overall calcium:phosphorus (Ca:P) ratio of 2:1 or greater in the animal's diet. Forages usually contain higher Ca:P ratios and should be incorporated into small ruminant diets. If you are unsure of your feedstuff's Ca:P

ratio, then have an analysis performed. Forages from a heavily fertilized field may contain low Ca:P ratios. Also be sure all animals have access to a trace mineral mix which obviously includes salt in order to increase water consumption. Restriction of water intake is one of the leading causes of urinary calculi. Provide fresh, clean water at all times.

USE OF AMMONIUM CHLORIDE

Ammonium Chloride is incorporated into the ration of many small ruminant grain diets to aid in dissolving the phosphate/struvite stones. If you are experiencing a problem with Calcium stones, then the ammonium chloride will not help with prevention. Consult with your feed dealer to be sure that ammonium chloride is at the appropriate amount in your feed which is 2% of the grain ration.

Animals that have experienced a blockage from phosphate calculi, should receive 10 grams of ammonium chloride daily for 7-10 days after treatment for the obstruction. Due to the bitter taste of ammonium chloride, it is usually recommended to drench the animals with the ammonium chloride dissolved in water with sugar or syrup added to increase palatability.

Research has shown that pulsing ammonium chloride, i.e. feed for 3 days, then off for 4 days, then back on, may decrease the ability of small ruminants to compensate. The goal is to maintain the urine pH below 6.5, but above 5.5. You can test the animals urine pH by using urine test strips which can be purchased from your veterinarian. The easiest way to catch urine is attaching a cup to a stick and collecting after an animal has been in a rest period.

TIMING OF CASTRATION

Research has shown that delaying castration to 2-4 months of age allows the male hormones to develop the width of the urethra. Because sexual maturity usually begins around 4 months of age and the adhesions that are normally present between the prepuce and penis in young animals are broken down by this time, waiting until 4 months to castrate will allow the urethra diameter to be as large as possible. The adhesions of animals castrated younger than 4 months, generally do not break down as thoroughly which makes the extension of the penis for examination in the case of urinary calculi extremely difficult.

Finally, I strongly feel that genetics may play a role in the development of urinary calculi. When you have a group of male lambs/kids and one develops urinary calculi and all the others are fine, this animal's metabolism makes him more prone to develop urinary calculi than others. If you notice an increase in urinary calculi cases out of a common sire, and the diet is unchanged, you should consider a genetic predilection to urinary calculi and cull those animals.

CONCLUSION

Hopefully, you will never have to experience a valued pet or livestock project sheep/goat with this problem but if you do please contact your veterinarian as soon as possible for assistance.

Dr. Beth Johnson *is a Staff Veterinarian in the Kentucky Department of Agriculture and has 40 years of experience raising and treating small ruminants. Her family farms in Parksville, KY where she raises Gelbvieh cattle and Boer goats.*