

Urinary Calculi [Water Belly] in Cattle and Sheep



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• INTRODUCTION

The term "urinary calculi" describes mineral deposits in the urinary tract. These deposits may block the flow of urine in male cattle and sheep. Prolonged blockage generally results in rupture of the urinary bladder or urethra, releasing urine into the surrounding tissues. This produces the condition referred to as "water belly." Urinary calculi are formed equally in both sexes, but urinary blockage is an important problem only in males and especially in castrated males because of the constricted nature of their urinary tract. Two types of urinary calculi predominate in cattle and sheep: (1) the phosphatic type formed principally under feedlot conditions and (2) the siliceous type occurring mainly in range animals. Other types, including those composed mainly of carbonates or oxalates, occur infrequently.

• CLINICAL SIGNS

Animals afflicted with urinary calculi may at first appear restless with frequent straining in an unsuccessful attempt to urinate. They may repeatedly stamp their feet and kick at the abdomen. In some cases when urinary blockage is not complete, urine may dribble slowly from the sheath. Upon failure to pass the stone and after complete blockage of urine flow, the bladder or urethra finally ruptures releasing urine into the body cavity and surrounding tissues. At this stage the animal may show a complete loss of appetite and stand quietly or lie down, being very reluctant to rise. Death follows. Post-mortem examination generally reveals blood-tinged fluid in the body cavity, reddening and swelling of the urinary tract, and hemorrhages at the point of rupture. The carcass often smells like urine.

• PHOSPHATIC URINARY CALCULI

CAUSES: Calculi formed under feedlot conditions are commonly composed of phosphates of calcium, magnesium and ammonium. **Phosphatic calculi are caused by nutritional conditions that promote the formation of urine that is alkaline and has a high phosphorus content.** Concentrate feedstuffs such as grains, oil meals, etc., normally fed at high levels to feedlot cattle and sheep, often provide levels of phosphorus in excess of the level required for op-

timum weight gains, and they are low in calcium content. Both of these factors, the high phosphorus level and the calcium-phosphorus imbalance, tend to promote high urinary phosphorus excretion.

The urine of cattle or sheep is generally alkaline, and the extent to which a given feed contributes to urine alkalinity cannot be surmised from the initial acidity or alkalinity of the ration ingredients. The organic acids associated with plants or plant fermentation products (silage, natural vinegar, etc.) are metabolized in the body and do not reach the urine. **Urine becomes alkaline when the alkali-forming elements, potassium, sodium, calcium and magnesium, in the diet exceed the acid-forming elements sulfur, phosphorus and chlorine.** Most forages contribute toward an alkaline urine, cereal grains have little influence, and feeds having a high content of natural protein contribute some degree of acidity.

The extent to which calculi-forming materials are concentrated in the urine is dependent upon urine volume, which is influenced by variations in water consumption. **Lower water consumption by animals during the winter is believed to be an important reason for the higher urinary calculi incidence associated with that season.** Hard water is often blamed for the occurrence of urinary calculi. However, calcium and magnesium that constitute the "hardness" of water are among the factors that have been found to provide protection against phosphatic urinary calculi.

PREVENTION: Most materials and practices offering some degree of protection against phosphatic urinary calculi appear to result in at least one of the following: (1) a lowering of urinary phosphorus levels; (2) acidification of the urine; and (3) an increase in urine volume.

To maintain low urinary phosphorus levels, a large excess of dietary phosphorus should be avoided and a calcium to phosphorus ratio approximating 2:1 should be maintained. To obtain calcium to phosphorus ratios in this range, it is generally necessary to supplement high-concentrate finishing rations with 1.5 to 2 percent ground limestone (a

14.3
19
3
3.355
785

source of calcium), reducing this amount by one-half if the ration contains as much as 20 percent of a good quality legume forage.

Acidification of the urine may be achieved by feeding acid-forming salts. Ammonium chloride fed daily at a rate of 7.1 grams (0.25 of an ounce) to sheep or 28.4 to 42.5 grams (1.0 to 1.5 ounces) to fattening cattle has been approved by the Food and Drug Administration for this purpose. Although urine acidification may also be achieved through the feeding of ammonium sulfate, use of this material for calculi prevention without adverse physiological effects has not been adequately tested.

Urine volume can sometimes be increased by including salt (sodium chloride) at a level higher than normal in the diet. A level equivalent to 4 percent of the total diet has been used for this purpose. An increase in **urine volume is dependent upon increased water consumption**, and the importance of an adequate water supply is obvious.

Phosphorus levels and calcium to phosphorus ratios should be controlled as a regular feeding practice. Feeding ammonium chloride should be applied principally in problem areas where calculi prevention is not achieved through attempts to reduce urinary phosphorus output. An increase in urine volume through the feeding of a high level of salt has proved to be the least effective of the preventative methods for phosphatic urinary calculi; however, it is sometimes used as an adjunct to practices that reduce urine phosphorus. Preventative measures taken after outbreaks of calculi have occurred may appear to be only partially effective because stones already formed may cause blockage at a later date.

• SILICEOUS URINARY CALCULI

CAUSES: Urinary calculi composed mainly of silica are common in animals grazing western ranges. The source of silica appears to be the range grasses that contain approximately 3 percent silica (dry basis) in the spring months and amounts often exceeding 7 percent in the fall and winter. Urinary silica deposits may also occur in animals fed large amounts of high-silica feeds such as oats and oat straw in drylot. However, silica calculi causing urinary blockage in drylot animals have usually been formed previously while the animals were grazing range. Silica calculi are believed to form in animals without regard to the acidity or alkalinity of the urine.

PREVENTION: Methods for the prevention of siliceous urinary calculi involve changes in the nutrition of the animal to reduce silica intake or to increase water consumption, thereby diluting urinary silica concentrations.

Feeds having a low silica content may be used to reduce silica intake. These include alfalfa and other legume forages and low-fiber cereal grains such as

corn and milo. Substituting low-silica feeds for as much as one-half of the ration would be expected to greatly reduce, if not eliminate, the formation of siliceous urinary calculi.

High levels of salt (sodium chloride) in the diet have been used to increase water consumption and urine volume. Levels of salt in the range of 20 to 50 percent of a grain or protein supplement, or approximately 4 percent of the total ration, are sometimes used for this purpose. Successful reduction of siliceous urinary calculi incidence through the **forced feeding of salt is dependent upon an adequate supply of quality drinking water, and use of this method is not recommended in areas where drinking water is known to have a high salt content.**

Research with nonruminants shows increases in dietary phosphorus to provide some protection against experimentally produced siliceous urinary calculi. While this observation has not been extended to cattle and sheep, high silica range grasses often contain suboptimum levels of phosphorus. Therefore, the feeding of **phosphorus supplements free-choice to animals on the range appears to be a sensible management practice that may help prevent urinary calculi.**

Programs designed for prevention of urinary calculi have yielded disappointing results when initiated after the problem has already developed. While a calculi-prevention program may reduce the formation of additional deposits, some losses may continue to occur from stones previously formed.

• TREATMENT OF URINARY CALCULI

Treatments designed to facilitate passing or dissolving urinary deposits have generally been unsuccessful. However, when urine flow is only partially blocked, the use of muscle relaxants, or, in the case of phosphatic calculi, materials for urine acidification may occasionally meet with success. Administration of ammonium chloride in a drench or capsule should be approached with caution in that single dosages only slightly higher than the daily amount recommended for inclusion in the feed may result in ammonium toxicity under some conditions.

Surgery represents the most effective treatment with the stone(s) being removed at the point of blockage. In rams, the point of blockage is often the filamentous urethral process at the end of the penis. In this instance, the process and the accompanying stone may be surgically removed.

In steers, the urethra may be bisected and brought to the outside of the body to by-pass the constricted portion of the tract. Steers treated in this manner often make acceptable weight gains for the remainder of the feeding period. However, this operation requires the skill of an experienced veterinarian, and economics rarely allow its application to sheep.