Hypercalciuria in Rabbits
Excessive Calcium in the Urinary Tract

Basics

OVERVIEW

- The urinary tract consists of the kidneys, the ureters (the tubes running from the kidneys to the bladder), the urinary bladder (that collects urine and stores it until the animal urinates), and the urethra (the tube from the bladder to the outside, through which urine flows out of the body).
- Crystal or stones composed of calcium salts can form anywhere within the urinary tract. Most often, excessive calcium crystals are retained in the bladder, resulting in thick, sand-like or paste-like urine (“sludge”) and inflammation of the bladder wall. Crystals can condense to form stones in the bladder, urethra, ureters, or kidneys.
- In rabbits, nearly all calcium in the diet is absorbed. In all normal rabbits, calcium is eliminated through the kidneys (vs. the gall bladder in other mammals). Rabbits normally eat a diet high in calcium; however, not all rabbits develop hypercalciuria. The factors leading to hypercalciuria and sludge or stone formation in rabbits are unclear; however, the disease is seen more commonly in obese, sedentary rabbits fed a diet composed primarily of commercial alfalfa-based pellets.
- Inadequate water intake leading to a more concentrated urine, and factors that prevent the rabbit from completely evacuating the bladder, such as lack of exercise, obesity, or neurologic or muscular disease are the primary cause of hypercalciuria. Without frequent urination and dilute urine, calcium crystals may precipitate out of solution within the bladder. Precipitated crystals form a thick sand or sludge within the bladder that does not mix normally with urine and is not eliminated during urinating.
- Most commercial diets contain excessive amounts of calcium. It is unlikely that high dietary calcium content alone is the cause of hypercalciuria, but it may promote urinary sludge formation when combined with other factors leading to urine retention.

SIGNALMENT

- All breeds and genders are equally affected.
- Seen most commonly in middle-aged rabbits 3–5 years old

SIGNS

- Some animals have no signs of disease (known as asymptomatic)
• Depend on location, size, and amount of sludge or urinary tract stones (uroliths)
• Typical signs of stones or sludge in the bladder include urine scald (hair loss, redness, and inflammation of the skin around the rabbit’s hindquarters), abnormal frequent passage of urine (known as pollakiuria), urinating outside of the litterbox or in unusual places, difficulty urinating (known as dysuria), and occasionally, blood in the urine (hematuria).
• Stones in the kidneys and ureters (the tubes running from the kidneys to the bladder; stones known as nephroureteroliths) may be asymptomatic. When the stones are passing or moving down the ureters, the rabbit will show signs of pain such as a hunched posture, grinding teeth, not moving around, and not eating.
• Stones in the bladder (urocystoliths) are sometimes detected during physical examination; failure to feel stones does not exclude them from consideration.
• Enlarged urinary bladder, if patient has complete blockage or obstruction of the urethra (the tube from the bladder to the outside, through which urine flows out of the body), or with large amounts of sludge causing gradual enlargement of the bladder
• Abnormal-appearing urine is not always reported. Some rabbits pass clear urine while sludge remains in the bladder; sometimes cloudy urine is seen. In these cases, the veterinarian may express urine out of the bladder that is thick and sandy.
• X-rays are used to detect stones and sludge.

CAUSES
• Presence of high levels of calcium in the urine, leading to the formation of sludge or stones. The cause is not completely understood but occurs most often in rabbits that are fed all-pellet diets, do not exercise, and are often are obese. All rabbits eliminate calcium in the urine. If drinking and urinating frequently, this calcium stays mixed in the fluid portion of the urine and is passed when the rabbit urinates. If the urine becomes concentrated because the rabbit is not drinking enough, or if urine is held in the bladder, the calcium falls out of solution and forms sludge or stones.

RISK FACTORS
• Inadequate water intake (dirty water bowls, unpalatable water, changing water sources, inadequate water provision)
• Urine retention (cage confinement, neurologic disease, bone or muscular disease)
• Inadequate cleaning of litter box or cage may cause some rabbits to avoid urinating for abnormally long periods.
• Obesity
• Pain and a reluctance to move
• Lack of exercise
• Feeding of exclusively commercial pelleted diets, especially alfalfa-based pellets

TREATMENT

APPROPRIATE HEALTH CARE
• Rabbits with mild clinical signs and no obstruction of the urinary tract usually respond to increased fluid consumption (either oral or injected under the skin), dietary changes, weight loss, and increase in exercise alone.
• Severely affected rabbits with large amounts of calcium sludge in the urinary bladder benefit from removal of the sludge by flushing the bladder, which usually requires sedation or anesthesia.
• If the bladder is completely obstructed by a stone, hospitalization is usually necessary until the stone can be removed.

ACTIVITY
• Encourage exercise; provide large exercise areas. Rabbits that exercise drink and urinate more, which keeps the calcium dissolved in the liquid urine so that it can be passed during urination.

DIET
• Increasing water consumption is essential to prevention and treatment of hypercalciuria. Provide multiple sources of fresh water. Automatic, continuously pouring water fountains available for cats entice some rabbits to drink. Flavoring the water with fruit or vegetable juices (with no added sugars) may be helpful. Provide a variety of clean, fresh, leafy vegetables sprayed or soaked with water.
• Following treatment, reduction in the amount of calcium in the diet may help to prevent or delay recurrence. Eliminate feeding of alfalfa pellets, and switch to a high-fiber timothy-based pellet. Feed timothy and grass hay instead of alfalfa hay, and offer large volumes of fresh, green, leafy vegetables that have been soaked in water.

**SURGICAL CONSIDERATIONS**

• Surgical removal may be needed for solid stones in the bladder, urethra, or ureters, and occasionally to remove large amounts of immovable sludge in the bladder.

**MEDICATIONS**

• No available drugs effectively dissolve calcium stones (uroliths).
• Pain medication is used to treat rabbits that are not urinating as frequently due to painful conditions.
• In severe cases, the bladder becomes stretched out due to sludge accumulation. Treatment with bethanechol chloride may help the bladder to empty more completely.
• Diuretics such as furosemide or hydrochlorothizide have been used in rabbits with recurrent stones or sludge to increase water intake and urination when husbandry changes alone were not successful in preventing recurrence.

**FOLLOW-UP**

**PATIENT MONITORING**

• Postsurgical X-rays are essential to verify complete stone (urolith) removal.
• To attempt to prevent the need for repeat surgery, and to monitor formation of sludge in the bladder, evaluate abdominal X-rays every 3 to 5 months. Treatment is more successful with early detection of sludge or stones.

**PREVENTION/AVOIDANCE**

• Increase water consumption for the remainder of the rabbit’s life.
• Avoid alfalfa-based diets. Diets containing a high percentage of timothy, oat, or grass hays, a lower overall percentage pellets, and a wider variety of vegetables and fruits decrease the risk of sludge or stone development.
• Increase exercise—Rabbits that exercise drink and urinate more frequently.

**POSSIBLE COMPLICATIONS**

• Renal failure, urinary tract obstruction, loss of bladder tone
• Urine scald

**EXPECTED COURSE AND PROGNOSIS**

• The prognosis for rabbits with early disease and small amounts of sludge is generally good with changes in husbandry alone.
• The prognosis following surgical removal of stones or bladder flushing for the removal of calcium “sand” is fair to good.
• In severe cases, the bladder may become severely stretched out from sludge accumulation, and may fill most of the abdomen. The prognosis for this is poor.
• Although husbandry changes and dietary management may decrease the likelihood of recurrence, many rabbits will develop clinical disease again within 1–2 years.

**KEY POINTS**

• Stone (urolith) removal does not alter the factors responsible for their formation; eliminating risk factors is necessary to minimize recurrence.
• Encouraging water intake and frequent urination is essential to prevent sludge or stone formation.