

PACKGOATS AND URINARY CALCULI



Wether Goats

Packgoats are used to carry items on long hikes or treks through backcountry. They are like a backpacking companion. There are several considerations when choosing a packgoat and keeping them healthy. First, since these animals are meant to carry gear through mountainous terrain, they must have a good conformation and be strong. These packgoats are animal athletes. Due to the need for strength, most packgoats are males. Female goats are smaller and can not bear the same load as males. Intact bucks often have a strong unpleasant odor in addition to undesirable behavioral issues. Therefore, packgoats are typically neutered goats or wethers.

Urinary Calculi

This condition occurs when mineral deposits are formed in the urinary tract. These mineral deposits, or calculi, can block the urethra. Early warning signs of these formations include straining when urinating, slow urination, hoof stomping during attempts to urinate, and kicking at their penis. In extreme cases, the mineral deposit may completely block the urethra resulting in a condition known as “water belly”. This is when the bladder bursts and typically death is the result.

Utilizing Forage Analysis

When you receive a forage analysis, compare the nutrients on a dry basis to the goat’s requirement in the table below. Consider which nutrients meet requirements. Which nutrients require supplementation? Are any nutrients present at toxic levels? Understanding your forage can help you determine which feed and mineral supplements will be best for your goat’s overall health and support a healthy urinary tract. If you require further understanding call and speak with one of Ward Laboratories’ animal nutrition consultants.

Risk Factors

- Wethers as castrated males have smaller urethra diameter
- Consumption of a high concentrate diet with excessive phosphorous and magnesium
- Lack of water
- Hard water sources with high calcium carbonate
- Any diet with imbalances in calcium, magnesium, or phosphorous

Prevention

- Provide fresh, clean water
- Use water analysis to avoid mineral issues from water sources
- Feed a balanced ration
- Use forage report and feed tags to accurately balance diets and determine mineral supplementation
- Keep the Calcium:Phosphorous Ratio between 2:1 and 1:1
- Include salt in the diet to ensure adequate water intake
- Use ammonium chloride at a level of 0.5% of total diet to acidify the urine and prevent the formation of mineral deposits

Nutrient Requirements of Mature Nondairy Bucks Maintenance^a

Body Weight (lb)	Daily DMI (lb)	TDN (%)	Crude Protein (%)	Ca (%)	P (%)	Na (%)	Cl (%)	K (%)	Mg (%)	S (%)	Co (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	Se (ppm)	Zn (ppm)
110	2.51	53.51%	6.49%	0.18%	0.15%	0.11%	0.21%	0.79%	0.13%	0.36%	0.15	21.05	22.81	18.42	0.29	42.98
165	3.42	52.90%	6.45%	0.17%	0.14%	0.10%	0.18%	0.66%	0.11%	0.30%	0.13	17.42	18.71	16.13	0.23	35.48
220	4.23	53.13%	6.46%	0.17%	0.14%	0.09%	0.16%	0.60%	0.10%	0.27%	0.11	15.63	17.19	14.58	0.19	31.77
276	5.00	52.86%	6.43%	0.16%	0.14%	0.09%	0.16%	0.57%	0.10%	0.25%	0.11	14.54	15.86	13.66	0.17	29.52
331	5.73	53.08%	6.42%	0.16%	0.14%	0.08%	0.15%	0.54%	0.09%	0.23%	0.10	13.46	15.00	13.46	0.16	28.08
Maximum Tolerable Level				1.50%	0.60%		4.00%	2.00%	0.60%	0.50%	25.00	40.00	500.00	1000.00	5.00	

^a Adapted from NRC Nutrient Requirements of Small Ruminants, 2007 Table 15-4 & Table 15-7

Utilizing Water Analysis

Water analysis can help ensure your animals have a clean supply of water. Hard water and mineral imbalances in the water are contributing factors when urinary calculi is an issue. Here is some information straight from our WardGuide to help interpret your water report.

Total Dissolved Solids (TDS) is the measure of all inorganic constituents or minerals which are dissolved in the water. The most common soluble salts found in water are combinations of sodium, calcium, and magnesium ions with sulfate, chloride, and bicarbonate ions. High salinity waters can affect animal health resulting in diarrhea, excessive water intake, mineral intake imbalances, and decreased production performance.

pH has not been well defined in livestock species; however, the current NRC recommendation for beef cattle and swine is to keep pH between 6.5 - 8.5.

Hardness is expressed as the total calcium and magnesium ions in water reported as the calcium carbonate (CaCO₃). While hardness itself is not a contributing factor in animal performance and health issues; hard water can result in excessive intake of calcium and/or magnesium which results in issues with mineral imbalances when combined with a balanced diet or ration. We have seen case studies where hard water was a major contributing factor to urinary calculi.

Category	Hardness ppm
Soft	0 - 60
Moderately Hard	61 - 120
Hard	121 - 180
Very Hard	> 180

Sulfates include sodium sulfate, magnesium sulfate and calcium sulfate. These compounds have a laxative effect on animals. Water high in sulfates pose animal health issues including diarrhea, poor average daily gains, and potential to develop a neurological disorder known as Polioencephalomalacia (PEM).

SO ₄ -S (ppm)	Comments
< 50	Safe for all livestock classes.
< 500	Safe for most livestock species.
500 - 1000	Safe for most livestock species Not recommended for young ruminants such as baby calves.
1000 - 6999	Unsafe for ruminants.
> 7000	Toxic to all livestock species.

Total Dissolved Solids (ppm)	Comments
<1000	Safe for all livestock classes.
1000 - 2999	Satisfactory for most livestock.
3000 - 4999	Satisfactory for some livestock. Ruminants may refuse water and exhibit diarrhea temporarily.
5000 - 6000	Reasonable for some livestock. Do not expect optimum performance
>6000	Reasonable for some livestock Do not expect optimum performance
>7000 ppm	Unacceptable for all livestock use.

Nitrates are found in most all forages and occasionally in water. Nitrate itself is not toxic, but during digestion gut bacteria reduce nitrate to nitrite, which then enters the blood stream. There, the nitrite converts the red pigment hemoglobin, which carries oxygen from lungs to tissue, to methemoglobin, a dark brown pigment which cannot carry oxygen. Nitrate poisoning is usually more of a problem in pregnant and young, especially newborn, animals. Older animals seem able to tolerate higher nitrate levels. For more on animal health and nitrates refer to the Feed Testing section of the Ward Guide. High nitrate water levels are often caused by shallow water tables, leaching of nitrate from sandy soils, or under heavy N fertilization.

NO ₃ -N (ppm)	Comments
0 - 10	Safe for consumption by all livestock species.
11 - 20	Safe in all livestock species. Ensure diet low in nitrates for ruminant animals.
21 - 40	Safe for most livestock species. Can be harmful to ruminant species over long periods of time.
41 - 100	Safe for most livestock species. Ruminants at risk; feed with very low nitrate diet. Death possible.
> 100	Safe for non-ruminant livestock species. Unsafe for ruminant livestock (cattle, goats, sheep). Death possible. Do not use as water source for affected species.
> 300	Unsafe for all livestock species. Do not use as water source.



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This information is based on the experiences, observations, and opinions of Ward Laboratories, Inc. The contents may or may not be based on scientifically proven information.