Fact sheet 5. Mineral requirements for goats

MOHAIR AUSTRALIA
YOUTH PROGRAM

Vitamins and minerals are very important to animal health. Goats, like all mammals, require the right balance of vitamins and minerals, as too much or too little can make an animal sick. Goats do not need a large amount of vitamins and minerals, so they are present in very small amounts in feeds.

The vitamins that goats require include A, B, C, D, E and K. Goats also need the minerals calcium, phosphorous, sodium and chlorine, potassium, iron, copper, iodine, sulphur, magnesium and selenium, as well as trace amounts of zinc, manganese, fluoride and cobalt.

Vitamins

Goats produce **vitamin A** internally from beta-carotene that the goat ingests when it eats green plants. A good source of beta-carotene is green, leafy fresh hay (not old, weathered hay). That vitamin A is stored in the goat's liver and fat for use if green feed is unavailable. Unless a goat goes without beta-carotene for a long time, it is unlikely that it will suffer a vitamin A deficiency. Vitamin A helps maintain good eyesight and fertility, supports the goat's ability to fight infections, and helps keep the skin surface and internal organs healthy.

The **vitamin B** group of vitamins can be produced by microorganisms in the goat's rumen, so goats do not need to be fed vitamin B. If the goat gets a digestive problem like acidosis from eating too many concentrates, however, the healthy microorganisms that produce thiamine (vitamin B1) may be killed off. If this happens, the goat will require an urgent injection of thiamine or oral dose to replace Vitamin B1. Otherwise, the goat may start staggering, convulsing and will quickly die from a metabolic disease called *polioencephalomalacia.*

Vitamin C is produced in adequate quantities in the body tissue of goats. It is used for metabolism and a functioning immune system.

Vitamin D is produced in the skin of goats when they are out in sunlight. It is needed for proper bone growth and health. It should be added to the feed of goats that are kept indoors. Fresh, sun-cured hay is an excellent source of vitamin D.

Rickets in goat kids (weak, small bones resulting in a stunted, hunchback look) and brittle bones in adults are possible signs that vitamin D is lacking in the diet. The goat needs adequate vitamin D, as well as the proper balance of calcium and phosphorous, to have strong, healthy bones.

Vitamin E works with the mineral, selenium, to promote normal growth. A lack of vitamin E can cause degeneration of muscle tissue in young kids, known as white muscle disease. It can be prevented or improved by adding a combination of vitamin E and selenium to the feeding plan.

Like the B group of vitamins, **vitamin K** is produced by microorganisms in the goat's rumen. It is also plentiful in many feeds. Vitamin K is required to assist with blood clotting.

Minerals

Calcium (Ca) is critical to goats and must be supplied in feed, because it cannot be manufactured by rumen microorganisms. Calcium has many uses in the goat's body, but it is crucial for bone health and growth, as it is constantly being added to and removed from bones. It must always be present in the goat's diet. Legume hays like alfalfa/lucerne are higher in calcium than grass hays like oats and barley.

Phosphorous (P) is also an important mineral that is required by the goat on a daily basis. It must be added in the correct proportion to calcium in the feed. The ratio of calcium to phosphorous should never drop below 1.2:1, and vitamin D must also be available.

Calcium and phosphorous are both very important for lactating does and growing kids. They require a calcium-to-phosphorous ratio of 2:1 (two times as much calcium as phosphorous). Too much phosphorous compared to calcium may lead to calculi (stones) in the urinary tract of wethers.

Pregnant does should not be fed a calcium-to-phosphorous ratio that is high in calcium, as this can increase the likelihood of a metabolic disease called milk fever. However, once a doe is milking and excreting a lot of calcium every day in its milk, it needs a higher calcium-to-phosphorous ratio. Most grains are high in phosphorous and low in calcium.

Sodium (Na) and **chlorine** (Cl) together make up common table salt, which is an important supplement that is required for many functions in a goat's body, although some goats will eat more salt than they actually need if it is available to them.

Potassium (K) is important for fluid balance and metabolism in goats. It is present in good, fresh forages, so it is not usually necessary to add it to a grazing goat's feed.

Iron (Fe) and **copper** (Cu) are important minerals in a goat's blood. A lack of either one may lead to anaemia. The small amounts of these minerals that are present in a goat's regular diet are usually enough and deficiencies are rare, except occasionally in goat kids that are fed exclusively on milk for a prolonged amount of time, because milk lacks iron. If needed, iron can be given in an injectable form.

Some soils are very deficient in copper, and goats that graze on these soils may have dull, washed-out coats and become anaemic. These goats may benefit from copper in their trace mineral blocks. However, sheep and goat kids can be easily poisoned by too much copper, especially if they are not getting enough molybdenum (another mineral that is found in legumes and grains) in their diet.

Avoid salt blocks containing copper that have been made for horses or dairy cattle, as they may contain too much copper, and give the goat a sheep trace-mineral block instead. Adult lactating goats have a greater tolerance for copper and can generally tolerate a cattle block.

Iodine (I) is required by the thyroid gland, which produces hormones to help regulate the goat's body. It is deficient in some soils in Australia and goats grazing on these soils may need iodised salt supplementation with does a drench of iodine pre mating and kidding is recommended

Sulfur (S) is a component of many proteins. Rumen microorganisms need it to build proteins. Most feeds contain sulfur, but goats that are being fed urea or some other non-protein nitrogen source may not be getting enough sulfur.

There is usually sufficient **magnesium** (Mg) in goat feeds. However, fast growing, green pastures that have been heavily fertilised with nitrogen and potassium, or are high in nitrates because of cool, wet, overcast conditions, can become very deficient in magnesium. This can lead to a condition in goats called grass tetany or grass staggers, where the goat will become very excited, and may convulse and die. Grass tetany is treated with intravenous injections of calcium and magnesium, but too much magnesium can predispose a wether to urinary calculi.

Urea The balance of non- protein nitrogen is tied to sulphur and urea combination

Selenium (Se) and vitamin E together will help prevent white muscle disease and retained placentas, and can reduce susceptibility to worms and disease. In Australia, some soil types are lacking in seleniuma nd is supplemented by oral intake with lick or by additive in drenches

Zinc (Zn), **manganese** (Mn), **fluoride** (Fl) and **cobalt** (Co) are all needed in trace (very tiny) amounts by goats and are usually sufficiently available in a regular diet. However, cobalt is deficient in many soils of in Australia and may need to be added to the goat's diet in a mineral lick or concentrate. Without cobalt, the goat's rumen microorganisms cannot make the B vitamins, vitamin C or vitamin K.

Suggested activities

These activities are suitable for Year 7-9 students.

- Research which mineral deficiencies are common in soils in the local area. Work out how to supplement these minerals in a goat's diet in the correct amount.
- Create a display board of the vitamin and mineral content in the feeds that students give their goats.
- Read the labels from various trace mineral salt blocks and loose minerals mixes, and compare the differences in the amounts of important minerals.
- Design a feed ration with the proper calcium-to-potassium ratio to help prevent urinary calculi in wethers.