

*Reprinted from The Humming Herald*

# Nutrition in Llamas

## What Veterinarians and Owners Should Know

By C. Norman Evans, DVM

Poor nutrition is causing the majority of llama health problems: ulcers due to low fiber and high acid supplements; angular limb deformities due to imbalances of calcium, phosphorous and Vitamin D; skin problems due to zinc deficiency; weak pre-mature crias due to selenium and Vitamin E deficiency; and anemic crias due to iron and copper deficiency. All are common findings. Reproductive problems such as semen quality, infertility, and uterine infections, can be caused and/or potentiated by Vitamin A, Vitamin E and selenium deficiency or toxicity.

What and how the client feeds governs obesity, birth weight, milk production, and mothering ability, as well as cria sickness and/or death. The immune system status (IgG quantity and quality) as well as heat stress (the ability to control body temperature during extremes of heat and cold) are strongly affected by how the client feeds. Poor nutrition not only causes herd problems, but is also actually the silent killer in many llama herds.

The malnourished llama fits two extremes: over feeding and under feeding. Over feeding creates animals that are not easily reduced as well as making them more susceptible to heat stress. Under feeding predisposes to infertility and light milking as well as birthing problems, such as dystocia and malpresentation. Under feeding (which is on the increase now) creates another set of problems. I now see more problems where the mother's energy intake is too low for her to maintain herself, much less milk properly, breed back, and conceive. This condition often results in multiple breedings and resulting infections. Armed with how the above problems can affect the client's billfold and the patient's health just may be how to vet can get the owner's attention.

How can veterinarians help their llama clients? We must realize that most llama clients have very little knowledge of feeding livestock. They feed by the cup, the coffee can, the bucket, the fleck of hay, the bale of hay, and many by free choice. They use sheep feed, goat feed, rabbit pellets, cow feed, horse feed, alfalfa hay, pangola hay, raw vegetables and whatever an apparently successful llama breeder 500 miles away uses. Feed companies even suggest one llama feed be used for growing crias, another for maintenance of geldings and males, one for gestation and lactation, one for packers, and one for the geriatric llama. Name one species of animal where one bag of feed is meant to balance the forage for animals with so many different needs.

Veterinarians should suggest that llama owners test their pasture and hay as this makes up to 85% to 100% of the llama's total intake. I also suggest that the present food source and vitamin mineral sources be tested. These results can be used to adjust for any excess and supplement any deficiency.

Test for the following: moisture, crude protein, crude fiber, TDN, calcium, phosphorous, manganese, sulfur, potassium, sodium, copper, zinc, iron and selenium. These tests usually run about \$50 per sample.

I feel that crude protein should run about 8% to 10% for maintenance and about 12% to 14% the last three weeks of gestation and the first two to three months of lactation.

The crude fiber should run at least 30% on the whole diet and preferably 20% to 25% in the supplement mix.

The TDN for maintenance should be at least 55%, and 58% to 62% is preferable in late gestation and during lactation.

### Components of Life Minerals and What They Do -

The major minerals in livestock

Good quality grass hay cut at the proper time usually tests 55% to 60% TDN. If it has 20% to 30% alfalfa present, it will test 62% to 65% TDN. It is important that veterinarians remind their clients that a two to three week tardiness in harvesting hay can change both the protein and the TDN by 4% to 6%. We should also remind them that pasture tests which test 20% to 27% in April through June may only test 6% to 7% in August and September.

Llamas normally gain weight in the spring and early summer and lose weight in late summer, fall and sometimes winter, depending on the region.

Calcium and phosphorous are the two most important minerals. Phosphorus is a commonly seen deficiency. I recommend a Cal-Phos ratio of 1.5 to 2.0 parts Ca to 1 part Phos. In herds where there is a history of Phos. deficiency, I suggest that the supplement contain 2.0% to 2.5% phosphorous in order to balance the forage. Magnesium should be about 0.35% to 0.40% of the total diet while potassium should be 1% to 2% of the total diet. I feel the following should be maintained in the diet: salt at about 1%, copper at 15 to 25ppm (should be 6:1 ration to Molybdenum in diet), iron at 300 to 800 ppm, manganese at 200 to 300 ppm, sulfur at .25%, cobalt at 1 to 2 ppm, and iodine at 0.25 to 0.5 ppm.

Selenium and Vitamin E merit special attention as some parts of the United States are selenium deficient in forage while others are actually toxic. I like for llamas to have an intake of 1mg. of selenium per one hundred pounds of body weight per day from their total diet. I suggest the following: 0.5 to 0.75 mg. per llama per day for mild deficient soil areas; 1.0 to 1.5 mg. per day for moderate deficient areas; 2.0 to 3.0 mg. per day in severe deficient soil areas. These levels apply for females, males and geldings. Do not be confused if selenium levels are expressed in parts per million (ppm). To convert mg/kg to ppm, multiply mg x 2.2 = ppm. **Example: 1.5mg x 2.2 = 3ppm.**

Toxic levels for selenium are thought to be 5 to 6 times my previously suggested levels, Vitamin E, without selenium and visa versa, greatly reduces the efficiency of the body's protective enzyme system at the cellular level.

While 40 to 60 IU of natural Vitamin E from spring and early forage is very sufficient, it seems to take about seven times that level (1IU of dl-a-tocopherol per pound of body weight) of synthetic Vitamin E to provide similar functions.

A set of scales is necessary for every successful nutritional program. All llamas should be weighed and recorded every 60 days. These records should be retained and reevaluated yearly. A twenty pound gain per parity relates to sixty pounds after three years which leads to infertility and fatty deposits in the mammary tissues. This soon creates a troublesome breeder that starves her cria once she does get pregnant.

are calcium, phosphorous, sodium, chlorine and potassium. An essential mineral performs specific functions in the body and must be supplied in the diet. Too much or too little of any one may be harmful or even dangerous. Check with your vet to best determine which supplements to use at your farm.

**Calcium (Ca) and Phosphorous (P)** are the most abundant minerals found in the animal. Both are found in teeth and bones. Calcium is necessary for blood clotting and muscle contraction, as well as for the function of numerous biochemical reactions in the body. All biochemical reactions, which allow the energy in food to be utilized by animals, require phosphorous.

**Vitamin D** levels are essential to the absorption and deposition of Calcium. Excessive magnesium (mg) decreases absorption, replaces calcium in the bones and increases calcium excretion. Excess calcium and magnesium causes a decrease in the absorption of calcium. Research has shown that females over the age of eight usually need a calcium increase of 30% to 35% to maintain a balanced diet.

**Sodium and Chlorine** are found together as Sodium Chloride (NaCl or common salt) and serve to maintain proper acidity levels in the body fluid and pressure in the cells. A sodium deficiency can result in reduced growth, eye disturbances, and reproductive impairments (delayed sexual maturity in females and infertility in males).

**Potassium (K)**, like sodium, serves to maintain proper acidity

Veterinarians should help llama clients establish a subjective scoring system based on frame size plus body weight and/or body conditions. Frame size or basic skeletal size is simply broken down into small, medium and large. A small framed llama might ideally weigh 175 to 200 pounds; a medium framed llama, 250 to 275 pounds and a large framed llama might weigh 325 to 350 pounds. We should help clients body score these llamas by palpating for firmness and slope of muscle over the area of the loin.

A score of 5 would be ideal while 1 might be very thin and 10 might be very fat. Palpitation of the lower ribs in the fiberless area for firmness or softness can aid in assessing the scoring. Bulging perianal regions are seen with fatter, higher body scoring llamas. Never palpate over the pelvic area as all llamas present as very skinny there.

With these criteria established, how much do we feed? I might suggest that all growing llamas with a body score of 1 to 4 be allowed free choice of pasture and hay supplemented with one pound of mixture that contains 100% Vitamin A, D and E plus minerals, protein, and energy to balance the forage per the previously mentioned requirements. Animals scoring 5 to 6 can often do nicely on free choice pasture or hay with vitamin and mineral supplement which supplies 90% to 100% of the animal's needs not supplied by forage.

In extremely cold weather, I suggest supplementing ¼ pound cracked corn per one hundred pounds of body weight for every 10 degrees Fahrenheit drop below 30 degrees F up to a maximum of two pounds per head per day plus forage. This applies to the groups mentioned above.

What about "fatties?" Let these ladies, which are usually at the top of the pecking order, have at it together. Trouble and death occurs when they are reduced too quickly. A baseline blood panel should be taken prior to any reduction program and should be reevaluated every 6 to 8 weeks until the desired condition is reached. I have had the best results by supplying them with ¼ pound of 7.0% protein supplement mix which contains 100% of their vitamin requirements plus about 80% of their mineral requirements. They may be allowed one hour to forage in the A.M. and P.M. and dry lotted with 4% to 5% protein forage for the remainder. The key is exercise. A proud gelding will often instigate exercise. A hill field with little forage may work.

Even equine treadmills have been utilized to reduce weight as long as the owner uses plenty of common sense. The key is to realize the problem, implement a plan, and see the results. Fat llamas usually do not have happy owners.

Many llama owners seem to feel that they must feed low quality forage to their llamas in the summer to prevent heat stress. I feel this is a huge mistake. Common sense as well as research from the dairy industry dictates that easily digestible feed (high TDN) creates less body heat produced by the digesting process than does foraging on pasture or hay (low TDN). Would a person be cooler wearing a wool overcoat in 80 to 90 degree temperatures searching for tender green morsels in dried up pastures or staying in the shade under a fan eating the appropriate amount of high quality, easily digestible feed or forage which contains 90% to 100% of the daily needs? Nutritionists have proven that our thinking of four to five years ago was incorrect. I think it is time for the llama industry to take heed and make the summers

levels in body fluids and pressure in cells. It is also required in a number of enzyme reactions in carbohydrate metabolism and protein synthesis.

**Trace Minerals** are listed below and supplementation is not an easy matter. They are required in only very small amounts. Some of these fed in excess may cause a deficiency in others.

**Magnesium (mg)** is necessary for utilization of energy in the body and for bone growth. An excess of magnesium upsets calcium and phosphorous metabolism.

**Sulfur (S)** is a component of body protein, some vitamins and several hormones. It is involved in protein, fat and carbohydrate metabolism as well as blood clotting and the maintenance of proper fluid acidity.

**Zinc (Zn)** affects growth rate, skin condition, reproduction, skeletal development and the utilization of protein, carbohydrates and fat in the body. Deficiency can result in poor hair development and slipping of wool along with rough, scaly or thickened skin. An excess of zinc interferes with copper metabolism and may cause anemia.

**Copper (Cu)** deficiency can result in anemia, de-pigmentation in the hair, infertility, cardiac failure, lameness, joint swelling and bone fragility. Excess molybdenum and zinc inhibit copper utilization and storage. Toxicity has much the same symptoms as deficiency.

**Molybdenum (Mo)** forms an essential part of some enzymes. It may also have a stimulating effect

more pleasant for our critters. I advise my clients to feed 75% to 80% of the llama's needs in hot summer from their highest quality forage. (high TND 60% to 62%). This forage is then supplemented with calcium, phosphorous, selenium, and Vitamins A, D, and E to balance.

Supplement is not necessary in all cases. In some cases a prescription vitamin mineral blend will balance the forage. We also add digestive aids and by-pass protein source feeds as well as thiamin for stress to aid in counteracting the effects of "fescue endophyte" in some areas. Fescue endophyte can increase body temperatures by 0.8 to 1.0 degrees F as well as inhibit milk production. I prefer to feed in the morning as the llama's body temperature will be the lowest at this time, and it will set the pattern for the day.

on fiber digesting micro-organisms in the rumen Excessive quantities may cause a copper deficiency.

**Selenium (Se)** is often a major deficiency in llamas. However, in some regions there is a surplus of selenium in the soil. Selenium deficiency results in lower fertility, an increase in retained placenta, weak crias and white muscle disease.

**Magnesium (Mg)** is needed for bone formation, growth and reproduction. Magnesium is also essential for utilization of carbohydrates.

**Iodine and Cobalt** are needed in trace amounts. Iodine is needed for the thyroid glands, which influence metabolism of the body. Cobalt is necessary for microorganisms in the rumen to synthesize Vitamin B12

Apply common sense to the needs of your llamas rather than just accepting as gospel truth what an apparently successful veterinarian or friend says. Knowing the individual animals and their needs will become apparent. Just like humans, they have individual needs.

---

*Return to the [Llama Information Exchange Index](#)*

*Web design and space contributed by [Cathy Norwood](#), [Norwoods' Melodie Hill](#).*