



Which One, Loose or Block Salt Feeding?

Robert J. Van Saun, DVM, MS, PhD

*Department of Veterinary and Biomedical Sciences
Penn State University*

This column is in response to a reader's question asking whether loose or block salt products are equally appropriate for feeding llamas and alpacas. This is an important question as supplementing salt is an essential component to a balanced feeding program. Additionally, salt may serve as a carrier of other essential minerals given its effects on intake control. In this column, I will respond to the specific question of salt source form, but will take the opportunity to extend the discussion to other important aspects of mineral feeding for llamas and alpacas.

Essentiality of Salt – Sodium Chloride

Salt is the primary source of the essential nutrients sodium and chloride. As electrolytes in the body, sodium and chloride play many important biological roles in maintaining fluid and acid-base balance through kidney function, facilitating nutrient absorption and promoting cellular function through establishment of membrane electrochemical gradients. For example, nerve cell impulses that induce muscle contraction are due to a loss of the sodium ion gradient across the nerve cell membrane.

Animals have a daily requirement for sodium and chloride, which can be met by consuming salt. Recommended salt intake is between 0.25 and 0.5% of the total consumed diet

dry matter. Forages contain very little sodium (<0.01%), thus salt is often added to a concentrate or offered free choice. Salt content of concentrates often ranges from 0.5 to 2% or higher depending upon amount of concentrates being fed. If no concentrates are fed, then free choice mineral is used to meet salt needs.

Salt consumption increases water intake. Water intake increases dry feed consumption. Animals have an appetite for salt and will seek out sources of salt if not adequately supplied in their diet. Pica, a term for abnormal eating behavior, is a primary sign of salt deficiency. Salt deficient animals will consume dirt, drink urine and chew on rocks, pipes and wood in an effort to meet their craving for salt. Pica is not exclusive to salt deficiency. Iron, phosphorus and potassium deficiencies can all induce pica. Rough appearance, poor appetite and reduced performance are other non-specific signs of salt deficiency. Salt toxicity has been recognized in a number of species. However, if sufficient quality water is available, toxicity is not a concern. Whether or not concentrates containing salt are fed, llamas and alpacas should have ready access to salt. Now the question; is the form of salt important and what type of salt should be supplied?

■ Form of Salt Supplied

Salt supplements come in two forms, loose granular and compressed block products. Both forms are intended for free choice feeding, though the granular salt could be incorporated into a concentrate mix. Free choice salt feeding is the easiest method to provide salt, especially for llamas and alpacas out on pasture. To be consumed, salt blocks need to be licked. In contrast, loose granular salt can be licked or chewed (bites of salt). Two authors well versed in camelid nutrition stated that llamas and alpacas do not show licking feeding behaviors, unlike that of cows, and therefore do not adequately consume salt in a block form.^{1,2} Personal observations and those of many llama and alpaca owners are in agreement with this assessment. They may make attempts to take bits of the salt block, but are unable to consume sufficient amounts to meet needs. From a management standpoint, use of salt blocks is the most convenient feeding system. However, their use is not recommended as a primary source of salt for llamas and alpacas.

■ Salt Product Composition

Besides the physical form of salt supplements, they can fundamentally vary in composition, which is identified by different colors. Free choice salt products typically are either white or red in color. White salt contains pure sodium chloride and no other mineral sources. Red salt is typically a trace mineral salt product meaning that other minerals, primarily trace minerals like copper, cobalt, iodine, iron, selenium and zinc, are added and salt is acting as a carrier. Ferric oxide is added to impart the red color to trace mineral salt. Unlike that

for sodium, animals do not have specific appetites for trace minerals and sodium is used to facilitate intake.

From a nutrient composition basis, there really is no difference between loose and block salts, though composition of either varies tremendously across product brands. Table 1 compares mineral composition of 11 free choice mineral products marketed for llama and alpaca feeding. One can see there is tremendous variation in salt and mineral analysis across these products. This most likely reflects the lack of solid information on mineral feeding recommendations for llamas and alpacas. Of concern to you is how a salt mineral product provides needed essential minerals relative to your animal's requirements. Besides composition, daily intake of the mineral source is crucial to meeting nutritional needs.

■ Salt Intake

For a free choice mineral feeding system to be successful, the animals must consume sufficient product with appropriate mineral content to meet nutrient needs and not over consume. Factors influencing salt or mineral product intake are water availability and salt content and form. Be careful with your placement of water and salt sources within close proximity. In some instances, abnormal salt feeding behavior will occur where animals will become "addicted" to consuming salt provided there is a ready source of water conveniently available. If the water source is further away, this abnormal behavior can often be eliminated.

Besides containing required minerals, salt can be used as an intake limiter. Osmolarity sensors within the

body, which determine the concentration of dissolved substances in blood, control the desire to consume salt and limit the amount consumed. However, as one reviews the expected intake and salt content of mineral products in Table 1, there is no association between the two. Expected intake ranges from 0.5 to 2.0 oz/day, whereas salt content ranges from 0 to 28%. Some of the higher expected intakes are associated with highest salt content and visa versa. These observations again highlight the lack of available information and understanding of mineral needs for llamas and alpacas.

A good example can be demonstrated with selenium content of trace mineral salt products. Selenium is an essential trace mineral and one that is deficient in most areas of the United States. Selenium trace mineral salt products vary from less than 10 to 120 parts per million (ppm) selenium. Selenium intake is regulated by the Food and Drug administration as a food additive, but that's another column. Minimum daily selenium recommendation for llamas is 1 mg/day.³ This amount may be achieved by a number of combinations of salt intake with selenium content (Table 2). For example, if an animal consumes 0.5 oz/day of a salt containing 70 ppm selenium, they will consume 1.0 mg selenium. In reviewing the information in Table 1 and comparing it to the calculations of selenium intake in Table 2, it would seem many products more than adequately meet or exceed selenium intake recommendations based on an assumed intake of 1 oz/day or more.

Field observations do not support this assessment as selenium deficiency problems are still a concern in llamas and alpacas. Likewise, field determinations of actual salt intake by

llamas and alpacas would suggest a daily intake rate of only 0.25 to 0.33 oz/day. This is consistent with observations of free choice salt intake in sheep and goats. Typical free choice salt intake for cattle and horses is between 1 and 2 oz/day. Clearly we need more data to better direct our mineral feeding programs for llamas and alpacas. In the meantime, it behooves owners to determine average mineral intake for their animals so that better decisions can be made for your mineral feeding program. With a basic weighing scale and counting animal numbers, one can reasonably estimate average mineral intake over a period of time (see below).

Salt Feeding Recommendations

1. A salt source, preferably a loose granular salt, should always be available to all animals. Even if salt is incorporated into a concentrate mix, provide a source of free choice salt. Be sure the free choice salt is either in a covered barn or protected mineral feeder to minimize exposure to rain. Water can leech out iodine and other minerals over time.
2. A single source of salt should be available. Do not provide a white and trace mineral salt product. The animal only has an appetite for sodium and cannot differentiate between white and trace mineral salt products. If the trace mineral salt is to be the only source of trace minerals, then intake may be compromised if the animal consumes only the white salt.
3. Be sure to provide access to quality water, but do not have the water and salt source in close proximity to each other.

4. Determine average daily salt intake for your animals to use in selecting an appropriate product with an appropriate mineral profile. To determine average intake, weigh amount of salt placed into feeder and number of adult animals in group. Record an additional salt added over a period of 30 to 45 days. At the end of the defined feeding period, weigh any remaining salt and determine total amount consumed. This amount is divided by the number of animals and days in the observation period. Preweaned crias generally do not consume significant salt, so they can be ignored, or calculated average reduced slightly for the adult animals.
5. Use your calculated average daily salt intake to determine amounts of essential minerals provided (intake time product composition) are appropriately balanced to your feeding program (forages or forage and concentrates).

As you can see, a simple question generated an extensive overview of salt feeding practices.

Hopefully this has provided you with more insight and practical applications to improving your feeding program. Please keep your questions coming for future columns!

References:

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2. San Martin, F.A. and F.C. Bryant: Nutrition of domesticated South American llamas and alpacas. *Small Ruminant Research* 2:191-216, 1989.
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Table 1. Comparison of guaranteed (as fed basis) analysis of commercially available mineral supplements for llamas and alpacas.¹

Nutrient	Units	Commercial Mineral Products										
		A	B	C	D	E	F	G	H	I	J	K
Feeding Rate	oz/day	1.0	1.75	1.0	1.0	2.0	0.5	0.5	0.5	0.5	0.75	2.0
Calcium	%	8.5	13	12.5	12.5	8.7	9.9	8.5	8.5	8	7	4
Phosphorus	%	4.5	16	3.1	7	4.4	4.5	4.5	4.5	6.5	5	3
Magnesium	%		0.5			1.7		0.6	0.5	0.6	0.375	0.5
Potassium	%		0.4			1.5		2.8	3	2.8	0.25	1.5
Sodium	%		5			4	8.55	8.55	8	7.6		
Chloride	%						13.95	13.95	13	13.4		
Salt	%	28	12	2.75	19		22.5	22.5	21	20		20.9
Sulfur	%		0.6								0.325	
Cobalt	ppm	20	30			8.8	20	20	20	20	12	
Copper	ppm		200			110	27	27	600	200		
Iron	ppm	1,050	4,000			5,280	1,050	5,000	5,000	5,000	1,500	
Iodine	ppm	31	120			8.8	30	30	30	30	35	
Manganese	ppm	6,300	2,000			3,520	630	1,500	1,500	1,500	300	
Selenium	ppm	20	30	90	90	8.8	20	70	70	70	0.15	6.2
Zinc	ppm	7,000	3,000			4,510	7,000	8,000	8,000	9,000		

¹Adapted from Van Saun, R. Chapter 9. Nutrition, in The Complete Alpaca, 2nd ed., E. Hoffman, editor.

Table 2. Calculated selenium intake (mg/day) from free choice trace mineral salt with differing selenium content and varying intake rate.¹

Selenium (ppm)	Daily Salt Intake (oz/day)							
	0.25	0.33	0.5	1.0	1.25	1.5	1.75	2.0
	Calculated Selenium Intake (mg/day)							
10	0.07	0.09	0.14	0.28	0.36	0.43	0.5	0.57
30	0.21	0.28	0.4	0.85	1.1	1.3	1.5	1.7
50	0.35	0.47	0.7	1.4	1.8	2.1	2.5	2.8
70	0.50	0.66	1.0	2.0	2.5	3.0	3.5	4.0
90	0.64	0.84	1.3	2.6	3.2	3.8	4.5	5.1
120	0.85	1.12	1.7	3.4	4.25	5.1	6.0	6.8

¹Adapted from Van Saun, R. Chapter 9. Nutrition, in The Complete Alpaca, 2nd ed., E. Hoffman, editor.