



RANGE

Preventing Selenium Toxicity

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Quick Facts...

“Seleniferous” means high in selenium.

Ranchers should be able to identify selenium-accumulator plants and the symptoms of selenium poisoning in their animals.

Rotational grazing and proper stocking rate are critical management techniques for avoiding selenium toxicity on seleniferous soils.

Information on identifying selenium toxicity can be found in Fact Sheet 6.109 *Diagnosing Selenium Toxicity*.



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Selenium (Se) is among the few elements that plants absorb in sufficient amounts that can be toxic to livestock. Because of a similar atomic structure, Se is incorporated into cellular components in place of sulfur (in sulfur-containing amino acids, for example). This substitution of Se for sulfur can cause chronic Se toxicity resulting in deformity or mortality in birds, fish and mammals. Selenium poisoning is incurable, but several methods exist that, used together, can prevent its occurrence even on seleniferous land.

Know Your Land. Map the seleniferous areas on your land. It is critical for land managers to be able to identify Se-accumulator plants. Note the distribution and concentration of accumulator plants and rock outcrops (especially shale). Soil and plant sampling and measurement of Se levels may be necessary for accurate and detailed mapping. When mapping your ranch, note safe routes for trailing livestock from one range to another.

Fence Livestock Out of Worst Areas. The most effective way to counteract Se toxicity in livestock is to remove animals from the areas where high Se levels occur in soil or water. Close seleniferous areas to livestock production. Areas covered with dense stands of highly seleniferous native range plants should be withdrawn from grazing if possible. Fencing livestock out of seleniferous areas may not be practical when the area makes up a large portion of your ranch. However, fencing off small sections of the most seleniferous soil on your ranch, though expensive, can prevent considerable livestock injury.

Landscape managers should take precautions when grazing livestock on reclaimed mine and disturbance sites, since four-wing saltbush and milkvetch are often planted on such sites because of their soil-stabilizing and nitrogen-fixing characteristics. These plants accumulate Se that can be hazardous to livestock.

Avoid Overgrazing. Since scarcity of good forage forces livestock to feed on seleniferous vegetation, avoid overstocking. Maintain a strong grass community so animals don't have to consume unpalatable plants high in Se. Moderate to light stocking rates allow animals to select higher quality forages. Even at conservative stocking rates, extended grazing periods on areas with high Se contents may cause chronic Se poisoning, either because scarce forage forces animals to eat accumulator plants, or because animals eat enough non-accumulator plants with marginal Se concentrations to trigger toxicity. Conservative stocking rates, combined with frequent moves to fresh pasture, help animals avoid ingestion of toxic Se levels. It is critical to allow sufficient forage regrowth and recovery time before moving animals back into a pasture.

Rotational Grazing. Limit the length of grazing periods on soils with high Se levels. Sufficient water is needed in each pasture to carry the desired number of animals for the desired period of time.

Since grasses are lowest in Se content during fall and winter, use the most seleniferous land for winter range to minimize Se problems. If the seleniferous areas must be used for pasture, delay using them until late summer when Se content of most plants has dropped (plants decrease in Se as they

mature). Breed to calve in early spring, in spite of increased feeding costs, to minimize the toxic effects of seleniferous grasses.

Beware, however, if four-winged saltbush (a facultative accumulator) is growing in a seleniferous area, winter may not be a good time to graze the pasture. Four-winged saltbush normally makes high quality winter forage during a time when other forages are dry and dormant.

Avoid grazing seleniferous areas during drought. When soils are dry, plant roots will grow deeper, and plant Se content often goes up due to higher Se levels in the subsoil. Livestock tend to eat anything that is available during periods of drought, including seleniferous plants.

Weed Management. Manage weeds to enhance grass forages. Destruction of seleniferous native range plants and revegetation with non-accumulator forages may be desirable in some situations. Since many of the Se-accumulating plants are broad-leafed (not grasses), use of a selective herbicide (such as Grazon P+D, Tordon, Escort, or 2,4-D) is a management option when plants reach high densities. Closely monitor fence lines for accumulator plants. Herbicides may be required for several years to achieve effective weed control, although intensive control may not be practical or economical.

In situations where Se-accumulating plants dominate the landscape, a manager may consider inter-seeding the site with non-accumulating species of forage. Such techniques are most successful when weeds are suppressed long enough to allow the establishment of seeded forages.

Soil Additives. Soil additives are rarely effective in preventing Se toxicity. Lowering soil pH will reduce Se availability to plants, ultimately lowering plant Se levels, although pH reduction is often expensive and time-consuming.

Increasing soil organic matter has been shown to lower plant Se levels due to binding of Se by the organic matter. Large and repeated applications of organic materials are necessary to elevate soil organic matter levels adequately.

Sulfate has been shown to compete with selenate for entry into plant roots. Therefore, application of sulfur, gypsum (calcium sulfate), or ammonium sulfate can reduce plant Se levels under some circumstances. However, most Colorado soils are naturally high in sulfate, and the addition of sulfate on a large-scale is rarely economical on rangeland.

Avoid phosphorus fertilization on rangeland. Many phosphorus fertilizers mined in the West have elevated Se levels (up to 300 ppm). Phosphate also displaces Se bound to soil particles and can increase Se uptake by plants.

Feed Supplements. Test hay produced on seleniferous soils for Se. Alfalfa hay can be especially high in Se if grown on seleniferous soils. Grass or alfalfa hay with levels higher than 5 ppm Se should not be fed directly. Supplemental feeds grown on non-seleniferous soils may be necessary to dilute the total dietary intake of Se. Feeding alfalfa hay that contains sulfur amino acids (cysteine, methionine) may reduce the effects of a high Se diet.

It is possible to treat livestock so that Se absorption is reduced and Se excretion is increased. Urinary loss of Se from the body can be enhanced by the administration of bromobenzene to cattle on seleniferous range, but this form of treatment has practical limitations. Provision of salt containing 25 ppm arsenic to cattle on seleniferous range gives some protection from Se toxicity, but observations by ranchers indicate that this control method is ineffective and presents difficulties.

High dietary protein content has shown to reduce Se toxicity in animals fed diets high in Se. However, feeding high protein diets to range animals is usually not practical. Alternatively, a balanced mineral mix that contains sulfur and copper can be beneficial in counteracting a high Se diet.

For more information:

See the reference list included in Fact Sheet 6.109 *Diagnosing Selenium Toxicity*.

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