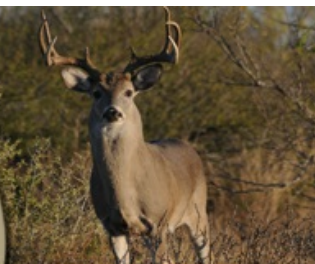




DEER ASSOCIATES ENEWS

News from the Deer Research Program at the Caesar Kleberg Wildlife Research Institute



November 2011

Deer Nutrition - Part 3

Minerals - An Elemental Part of Deer Management?

by David G. Hewitt

This third part in the nutrition series of the Deer Associate's eNews describes what is known about mineral nutrition for white-tailed deer and minerals' role in deer management. Compared to energy and protein, much less is known about mineral nutrition in deer.

What are Minerals?

Minerals are elements, i.e. substances you can find on the periodic table of elements, necessary in a deer's diet to ensure health and productivity. There are 14 minerals required in sufficient quantities to be important. Up to 13 additional elements are necessary in some situations, but typically the required amounts are so small that no special action is necessary. Some minerals, such as mercury, arsenic, and lead, are toxic. The role of some minerals in deer nutrition, such as calcium and phosphorus, is easily understood because these minerals are the primary constituents of bone and antler; their structural role is clearly evident. Other minerals, such as iron and iodine, are no less important but their role is less obvious.

Nutritionists' understanding of mineral requirements for deer is rudimentary. Most work has been done on calcium, phosphorus, and sodium. Some research has been done on copper, zinc, selenium, and iodine. Requirements are particularly difficult to understand because different forms of a mineral may vary in how readily they are absorbed. Furthermore, many minerals may interact such that too much or too little of one mineral could cause a deficiency or toxicity in another. For example, ratios of calcium to phosphorus less than 1 or greater than 5 can cause deficiencies of one mineral or the other, even if both are present in sufficient amounts.

Given these complexities and limitations in understanding, the following is a synopsis of information on mineral nutrition in white-tailed deer.

Calcium (Ca) and Phosphorus (P)

Most Ca and P in a deer's body are in antlers and bone. Calcium is also involved in muscle contractions and acid-base balance. Phosphorus is found in many important enzymes and chemicals in every cell. Phosphorus is more likely than Ca to be limiting for whitetails in South Texas. Because P concentration in forbs is generally sufficient to meet deer requirements, P deficiencies are most likely during drought.



Forbs, such as this erect dayflower, can meet most mineral requirements of white-tailed deer.

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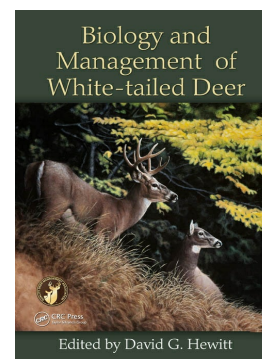
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Student Highlight



Whitney Priesmeyer
Doctoral Candidate

Relative to maintenance, dietary Ca and P requirements more than triple for a gestating or lactating doe, whereas requirements less than double for a buck growing antlers. Thus, just as for energy and protein, producing a fawn is more costly in minerals than is growing antlers. Requirements for antler growth and fawn production would be even higher except that both male and female deer are able to use Ca and P reserves in their bones to meet requirements. Using such reserves causes deer to undergo a seasonal osteoporosis. Porous bones sound bad until you realize this strategy enables deer to spread the increased mineral requirement over a period of several months.

Another strategy deer use to meet Ca and P requirements during times of high demand is eating bones, antlers, and snail shells, which are concentrated sources of Ca and P. CKWRI graduate students observing experimental deer on the Comanche and Faith ranches have observed that deer eat such items most often during summer when mineral requirements are highest.



Shed antlers provide an additional source of minerals for white-tailed deer. This antler was dropped when the deer that had been chewing on it ran from an approaching researcher.

Sodium (Na)

Sodium is important in many biochemical processes in a deer. Sodium deficiencies cause an animal to reduce feed intake and to eat novel foods. Plants have no Na requirement and therefore most plants have low Na concentrations. Sodium therefore is a limiting mineral for herbivores in many areas of the world. Sodium is also one of the few minerals for which animals appear to have a specific appetite (deer probably enjoy salty pretzels as much as you and I). Thus, whitetails in many portions of the species' range use mineral licks and salt blocks, especially during spring and summer. Because deer in South Texas rarely respond to mineral blocks or use mineral licks, Na does not appear to be limiting. Sodium tends to be most limiting in areas of high rainfall because sodium is leached from the environment. Furthermore, areas near oceans may accumulate Na from marine aerosols. Adequate sodium may be one benefit of South Texas's semi-arid environment and persistent southeast breezes off the Gulf.

Copper (Cu) and Zinc (Zn)

Copper and Zn are examples of microminerals because, as opposed to Ca, P, and Na, they are required in the diet in small amounts. Deer health is poor if Cu and Zn are deficient because these minerals are components of many enzyme systems and have a role in immune function. Although there is no indication that deer in South Texas are deficient in these minerals, anecdotal reports from deer breeders suggest high concentrations of Cu and Zn could increase antler size.

As a graduate student, Marc Bartoskewitz tested the effect of Cu and Zn on antler size and immune system function. He found no difference in antler or body size between bucks eating a diet with adequate Cu and Zn compared to bucks eating a diet with high concentrations of Cu and Zn. Interestingly, white-blood cells from deer eating the high Cu and Zn diet responded more rapidly to an antigen (a chemical that will stimulate an immune response) and were less inhibited by stress hormones compared to the control deer. These results were from lab experiments on white-blood cells; the implications for disease resistance in deer are unknown.

Because so little is known about deer mineral requirements, livestock values are often used. However, there are many examples of deer having different mineral requirements than livestock. Often, deer can thrive on mineral concentrations lower than those necessary for livestock. Copper is an example of a mineral that deer can tolerate in excess much better than livestock. The diets Bartoskewitz used in his research would cause lethal Cu toxicity in sheep, but no negative effects were noted in deer.

Iodine (I) and Selenium (Se)

The only other minerals to have received much research attention in white-tailed deer are I and Se. Iodine may be deficient in forages in northern portions of the United States, but there is no indication it is limiting in southern Texas. However, because I is a key component of thyroid hormones that control metabolic rate, deficiencies have a large effect on health and production.

Selenium is necessary to produce enzymes that reduce a deer's susceptibility to mortality from high levels of exertion, such as occurs during capture. Because post capture mortality is low in deer in southern Texas, and because Se appears sufficient in forages, Se supplementation is probably not necessary in our area. Pelleted feeds should have Se added so that captive deer can meet their requirements. Because excess Se is toxic, Se supplementation should be done carefully.

Research Focus: *Effects of supplemental feeding and white-tailed deer density on vegetation dynamics*

[Click here](#) to read Whitney's Bio and Thesis Information

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Managing Mineral Nutrition in Southern Texas

Just as energy appears more limiting than protein for deer in South Texas (see [energy](#) and [protein](#) pieces in this series), current understanding of mineral nutrition suggests that energy is more likely to be limiting than minerals for deer in southern Texas. However, knowledge of mineral nutrition is extremely basic and improved understanding in the future may result in qualifications to this conclusion.

As with other nutrients, the highest dietary concentrations of minerals are required by female deer during late gestation and lactation. Thus, high fawn:doe ratios and large-bodied fawns suggest that minerals are probably not limiting and that bucks should have no problem meeting their mineral needs.

Because forbs are a good source of most minerals, mineral deficiencies are only likely during drought when forbs are scarce. However, many nutrients and energy are likely limiting during drought so that simply addressing mineral deficiencies is not likely to improve antler growth or fawn production. Furthermore, the role of bones, antlers, and snail shells in mineral nutrition is poorly understood. If these sources of Ca and P are important, deer may be less limited by minerals during drought than commonly thought.

Finally, pelleted supplements from reputable companies generally have minerals added to reduce deficiencies. Pelleted feeds appear to have a big influence on fawn production, body weights, and antler size because they provide a foraging choice from which deer can acquire energy, protein, and minerals. Grains, such as corn, are good sources of P, but poor sources of Ca and many other minerals. Thus, grains should only be fed when deer have access to other foods, especially a diversity of forages that are likely to help deer meet their mineral requirements. A wise manager, even if providing a pelleted supplement, might also seek to maintain a diverse forage base, recognizing there is much to be learned about deer mineral requirements.

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