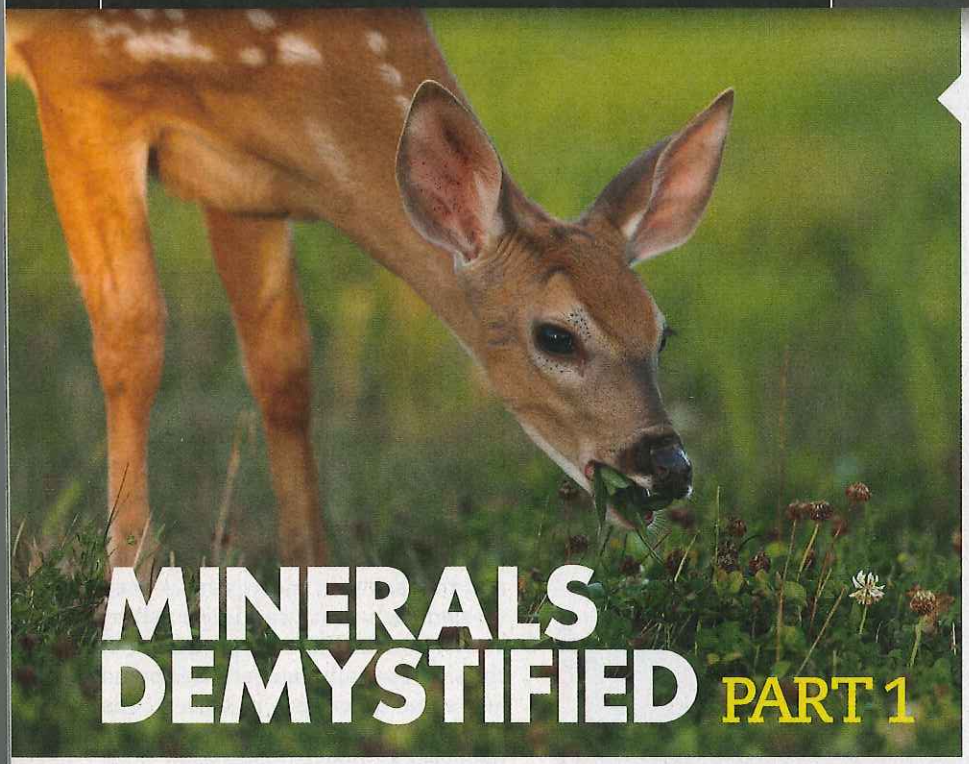
Dr. DEER

BY DR. JAMES C. KROLL



MINERALS DEMYSTIFIED PART 1

Whitetails of all ages satisfy most of their mineral needs through nutritious forages. But even managers with productive food plots often provide extra minerals through supplements. PHOTO BY LINDA ARNDT

Back in 1977, my research team and I were studying buck behavior at North Boggy Slough Hunting and Fishing Club in East Texas. This work involved using dart guns and drop nets to capture mature bucks, then placing radio-collars on them and tracking their movements. As you can imagine, the studies led to many findings about the behavior of whitetails, older bucks in particular.

But research almost always leads to unexpected discoveries as well, and this project was no exception. We kept noticing some of the deer spent an inordinate amount of time in one particular area that was known to be neither a feeding nor a bedding location. Why was this spot special?

What we discovered was a place where a creek made a sharp bend, with the current having washed out an area to expose the soil. There were dozens of fresh deer tracks in that dirt, and even deer teeth marks. Something was going on there.

We took soil samples, and they revealed the "lick" was especially high in phosphorus, an element often lacking in that area. The deer were clearly seeking it out as a dietary supplement. Based on this discovery, we came up with one of the first deer mineral formulations.

Since then, a host of other mineral products have been developed for the growing management market. Many hunters and landowners buy and use them. But what do we really know about the whitetail's mineral needs and the best ways to meet them?

WHAT ARE DEER MADE OF?

If we were to take an entire deer carcass (including internal organs) and analyze its composition, about five percent of the total weight would constitute what we call "minerals." These include a laundry list of chemical elements and compounds, generally comprising two major groups: macro-nutrients and micro-nutrients.

Such labels have nothing to do with the availability of elements — they're based on the amount used or needed. A macro-nutrient is one required in large amounts; a micro-nutrient is used in much smaller amounts, though the substance is still important to deer.

Calcium is an example of a macro-nutrient. It's used in large quantities for a host of activities, including bone development, blood buffering and muscle activity. An "average" deer will consume from 1.5-2 percent of its body weight each day in dry matter. (This isn't the amount of food eaten; it's the weight of what a deer's daily intake would be if you removed all moisture from it.) So if a deer weighs 100 pounds, it takes in 1.5-2 pounds of dry matter daily.

Studies have suggested deer be supplemented with 1 percent calcium: about 0.3 ounce of calcium per day (again, for a 100-pound deer).

Daily demand for macro-nutrients, such as calcium, phosphorus, magnesium, sodium, chlorine, potassium and sulfur is measured in portions of ounces. Meanwhile, daily demand for micro-nutrients, including selenium, cobalt, copper, zinc, iodine, iron, manganese, molybdenum and chromium, is measured in parts per million (ppm). This doesn't mean any given mineral is more important than another, only that the amount needed to satisfy demand varies.

While biology has few ironclad "laws," there are two I've lived by in my deer work. The first is Liebig's Law of the Minimum. It basically states that growth isn't controlled by the total amount of nutrients available, but by the one in least supply. As a whitetail biologist, I'm always trying to identify that one scarce element a herd isn't getting enough of.

On the other side of that coin is Shelford's Law of Tolerance: "In biological systems, each nutrient has a maximum, minimum and optimum tolerance." Simplified, this means a

nutrient can be limiting when it's either too scarce *or* too abundant.

If you wonder how too much of a nutrient can be bad, here's an example. I once wrote that selenium is important to whitetails. But what I didn't stress was that, in excess, this heavy metal could be toxic. After my article was published, an Ohio deer farmer concocted his own feed formula and decided that if a little selenium were good, a lot would be better. As a result, he nearly killed what was at that time the largest known breeder buck in the country! Fortunately, I was able to save the deer by leaching excess selenium from his body.

Based on such experiences, I'm a bit touchy about the topic of mineral supplements, especially those formulated by amateurs who fail to exercise due caution. That said, I feel there's a place for proper mineral supplementation. So this month and next, let's look at some of the more important minerals for whitetails.

MACRO-NUTRIENTS

Calcium is earth's fifth most abundant element. Up to 90 percent of the calcium demand by deer goes into bony tissues, such as the skeleton, teeth and antlers. The remainder is used for many body functions, including milk production, blood clotting, muscle contraction and general metabolism. Hardened antlers are about 22 percent calcium.

The next-highest component of antler is phosphorus, which makes up about 11 percent of the finished product. So any diet containing at least a 2:1 calcium:phosphorus ratio should be beneficial to deer. Of course, there are minimum needs, established as 0.4 percent calcium and 0.3 percent phosphorus.

A mineral supplement with not over 2 percent calcium and 1 percent phosphorus is optimum, though the average deer plant doesn't have these levels of either element. A deer doesn't require this amount of calcium or phosphorus every day; these nutrients are stored in the bones, then pulled out when needed. This is particularly true of the flat bones, such as ribs and skull bones.

Magnesium is an often-ignored macro-nutrient. It's vital to ensuring calcium is available to the system, especially for tooth development. Magnesium also is important for aiding digestion and for transmitting electrical impulses through nerves and muscle tissue. Cattlemen have long known magnesium deficiency can result in a condition known as "grass tetany." Symptoms relate to loss of motor control and nervous twitching. Highly digestible diets such as food plots can cause this condition, as can forages with over 3 percent potassium content or less than 0.2 percent magnesium.

Unlike cattle, sheep or goats, deer have a remarkable ability to balance out their diets with nutrients they're otherwise lacking. And I recently stumbled onto a unique situation in which Michigan whitetails were doing just that.

I've been working with my friend Wayne Sitton for several years, helping him manage the famous Turtle Lake Club deer herd in the upper part of the Lower Peninsula. Wayne and I were easing along one of their woods roads one day when I heard splashing and deer calls from a small river nearby. We sneaked to the river's edge to learn what was happening and were amazed to see dozens of deer running and playing in the water, uttering various vocalizations.

Intrigued, we placed a trail camera on the spot. To our amazement, we found deer came there in droves every day during the growing season to drink from the backwater and eat the mud. Analysis of the soil there showed the same nutrients as from surrounding areas, with one notable exception: high magnesium.

I later discovered the area is known for grass tetany in cattle. Wayne also turned up historical documents referring to that very spot as "The Buck Lick." Whitetails in the area apparently have long instinctively supplemented their diet by visiting a spot rich in that macro-nutrient.

This example illustrates an important point: Deer management is site specific! At Turtle Lake, we've since ameliorated the problem by upping the amount of magnesium in our fertilizing of food plots.

Sodium is another critical macro-nutrient, but one that causes various problems for deer managers. It's essential for a host of bodily activities, including being a natural carrier for trace minerals, moving critical elements through the cell membrane, aiding nerve transmission, heart and other muscle contraction, absorption of amino acids and simple sugars from the small intestine, electrolyte balance and more.

Most animals have an innate craving for sodium, usually provided by common salt. However, the principles of Shelford come home with sodium, especially when it's combined with chlorine to make common salt. So-called "salt licks" have been reported since Biblical times, and many species of ruminants visit them to satisfy their sodium need. However, a high sodium diet is unwise for any species. It can limit consumption of feeds and forages and has been used to do so. For that reason, I limit salt composition of supplements to 30 percent or less.

The two remaining macro-nutrients, potassium and sulfur, often are ignored in supplementing deer diets, probably because most forages provide adequate levels of both. As with sodium, potassium is very important for maintaining blood buffer systems, proper pH balance and proper digestion. Along with sodium and chloride, it helps to form electrolytes, which are electrically charged ions making up a deer's body fluid.

Intercellular potassium concentrations exceed those of sodium by up to 30 times. The element comprises about 5 percent of the body's total mineral content, most of it in muscle. Potassium should be present in daily intake at 0.6-0.7 percent. Diets high in salt increase potassium demand.

Sulfur is a major constituent of amino acids, DNA and RNA. Sulfur can be found in the tendons and cartilage of deer, and it's important for hair growth. If forage is within a range of 0.12-0.18 percent sulfur, that's adequate. However, sulfur can be quite toxic at high levels, as evidenced by its use to control pests such as ticks and chiggers.

NEXT MONTH

In Part 2 of this discussion of deer minerals, we'll take a closer look at micro-nutrients. Included will be tips on how you can determine if your deer need a supplement — and if so, the best ways in which to provide one.