



White-tail Deer Nutrition

Stop that junk food.

Wildlife & Fisheries

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Just what is nutrition? Is it which kinds of acorns a deer prefers? Is it how many pounds of forage a deer consumes in 1 day? Is it whether we should supplement our deer with a feed ration? Actually, nutrition is none of those things and all of those things. Nutrition is the study of how animals turn their food into living body tissue. Nutritionists are really not as much interested in what a deer eats as what nutrients are in that food.

The nutrients of concern are water, protein, carbohydrates (starch, sugar, and fiber), lipids (fat and oil), minerals, vitamins, and of course, energy. In order to ensure that a deer herd has an adequate diet, we need to know the nutrient requirements of deer, how much food is available, and the nutrient content of that food.

Unfortunately, nutrition is not an exact science. Probably no other species of wildlife have been studied as much as the white-tailed deer, and yet we still do not know enough about their nutrient requirements. We do know that their requirements vary depending on whether they are male or female, whether they are fawns, yearlings, or adults, whether they are growing, the season (environmental factors such as extreme heat or cold), and their physiological state (such as pregnancy, lactation, or antler growth).

Complicating matters further are the facts that food availability, by species and amount, changes seasonally, the nutrient content of foods varies by season, and the deer themselves vary their intake over the year. Matching up all of these factors can be difficult and frustrating to the nutritionist, but it is also fascinating work. The following information will briefly review the nutrients required by deer and some of the factors affecting those requirements.

Water

Water is the most critical of all nutrients. Animals and humans average about 70-75 percent of their body weight as water. Studies have shown that deer can survive about a month with little or no food, but animals have been known to die in as little as three days without water.

Research has shown that deer will lose weight and stop feeding with even a moderate restriction in water.

Deer get their water from three sources: free water, such as ponds, streams, and the dew on plants; preformed water, or that contained in plants; and metabolic water, which is produced in

the animal's cells as part of metabolism. Deer are believed to need about 3 to 6 quarts of water a day, depending on the outside temperature. It is possible, but we are not sure, that with lush forage available, deer may not need free water at all.

Protein

Protein makes up the building blocks of animal tissue. These building blocks are the amino acids. Protein is needed for normal maintenance, such as blood, body cell replacement, growth, reproduction, and lactation. Even antler growth requires protein, as the velvet antler prior to mineralization is made almost entirely of a protein called collagen.

The protein requirement of weaned white-tailed deer fawns is believed to be about 13-20 percent, and possibly is even higher. Adults have fairly low maintenance requirements, probably about 8-12 percent. Deer can get by with very little protein, or food at all, in the winter. Pregnancy increases requirements slightly, particularly in the first 2 trimesters. In fact, the average fawn at birth contains only 525 grams of protein, and that is produced over a 6-month gestation period.

Lactation places the greatest protein demands on a deer. The milk of white-tailed deer averages 8.2 percent protein on a wet basis or 36.4 percent on a dry matter basis. Does without adequate protein during lactation will probably not produce poor quality milk, but simply less milk. Does with twins have an even higher protein requirement, probably around 18 percent in the diet.

A buck's hardened antlers are about 45 percent protein. We know that body growth occurs before and takes precedence over antler growth, so if protein is in short supply, the deer will have smaller antlers. In general, we believe a diet of 13-16 percent protein is optimal for antler development.

Carbohydrates

Actually, no animal has a specific requirement for carbohydrates. The soluble carbohydrates (starches and sugars), are the major source of energy for nearly all herbivores (plant-eating animals) and omnivorous (plant and meat eaters), such as we humans. Since the deer is a ruminant (a cud-chewer with a four-chambered stomach), like a cow or sheep, it can digest fiber, better known as cellulose. Since deer are primarily browsing animals, their diets contain forbs, brush (leaves, twig ends, buds, bark), some hard and soft fruits, and a small amount of grass. In short, they eat little starch, but a lot of fiber.

Fiber is useful to deer not only for energy, but also for keeping the rumen healthy. Just like dairy cattle, deer need a fibrous diet, and could not exist for long solely on a concentrated ration. This is important when we consider supplementing deer. A deer consuming a pile of corn could go into toxic acidosis, just like any other ruminant. Supplemental feeds, if used at all, should be food plots, or pelletized, mixed-grain, high-fiber rations.

Lipids

Lipids are quite simply defined as fats, if they are solid at room temperature, or oils, if they are liquid at room temperature. Deer have no specific requirements for lipids, but the fats and oils in their diets do provide an important source of energy. In fact, lipids have 2.5 times the amount of energy per gram as do proteins or carbohydrates. Thus, the oils in foods like acorns are important as an energy source. Deer milk is 7.7 percent fat, nearly double that of cows milk.

Deer build layers of fat during the summer and fall to prepare for winter. But they do not need fat in the diet to do that. They convert the energy in carbohydrates to saturated adipose fat, then use that fat during hard times. This is a natural phenomenon, and one of the reasons the nutrient requirements and food intake of deer in the winter is so low. Adipose, or depot fat, is readily available to burn for energy when needed, and fat in the muscle, known as marbling, is very low in deer.

Minerals

You would think we would know a great deal about the mineral requirements of deer. Unfortunately, due to the difficulties of working with wild animals, and the lack of adequate facilities and large numbers of deer for this work, our knowledge of the mineral requirements of deer is sketchy at best.

The total mineral content of a deer's body is only about 5 percent. The major minerals we are concerned about are calcium and phosphorus. These are obviously needed for bone and antler growth, but also for milk production, blood clotting, muscle contraction, and general metabolism.

Hardened deer antlers are about 22 percent calcium and 11 percent phosphorus. The many studies of the mineral requirements for antler growth have yielded conflicting results, partly because of small numbers of deer involved, and because of the sometimes overriding influence of genetics on antler growth. Early studies indicated that 0.09% Calcium (Ca) and 0.27% Phosphorus (P) were the minimum required for antler growth. A later study showed a diet of 0.64 percent Ca and 0.56% P necessary for antler growth. Pennsylvania State later found that 0.20 percent P was adequate. At Mississippi State we found P levels as low as 0.14-0.29 percent were adequate. Michigan State has found that 0.45 percent P is optimal for fawns.

One of the reasons these mineral levels seem so low, and may be so variable, is the fact that bucks can store minerals in their skeletons, and transfer them to the antlers when needed. In fact, during antler mineralization, male deer undergo an "osteoporosis," or removal of minerals from their bones, similar to that which happens in elderly women. The difference is that after the antlers harden, the minerals lost from the bones are replaced from the diet.

Unfortunately, we know even less about the deer's possible requirements for other macro- or micro-minerals. Deer may need sodium (Na), as they will often use salt licks. We don't know if this is because they are lacking this mineral, or perhaps it just tastes good. In some areas of the

country selenium deficiencies, which lead to a condition known as white muscle disease, have been suspected. We really have little information on the need for other trace elements.

Vitamins

Our knowledge of vitamin requirements of deer is also pretty sketchy. Vitamins are classified as either fat-soluble (vitamins A, D, K, and E) or water-soluble (C and B vitamin complexes). Fat-soluble vitamins are stored in the body, and can in some cases become toxic. Water-soluble vitamins are not stored and are needed by most animals on a daily basis. Fortunately for the deer, the microorganisms in the rumen (bacteria and protozoa) produce all the vitamin K and B complex the deer needs. Ruminants also have no need for vitamin C.

Vitamin A is converted from a compound in plants called carotene. Deficiencies of vitamin A have been reported in deer. Deficiencies can lead to blindness and poor reproduction. Unfortunately, we really don't know much about the vitamin A requirements of deer.

There has been some work done on vitamin D. Circulating levels of vitamin D in the blood vary with the antler growth cycle in bucks. That makes sense because vitamin D is needed for calcium absorption and metabolism in all animals. We do not know the requirements for vitamin D in deer, and there have not been reports of vitamin D deficiency symptoms in deer.

Energy

Energy is not really a nutrient. It is a property of other nutrients. Protein, lipids and carbohydrates have energy, whereas water, vitamins and minerals do not. Energy is usually expressed in terms of calories (c), or actually kilocalories (Kcal), short for 1000 calories. Some cattlemen may be familiar with the TDN system (Total Digestible Nutrients), where energy is expressed as a percent of the diet or pounds per day.

Energy is probably the most variable of the requirements, because it is so dramatically affected by the environment. Energy is required for basal metabolism, which is that needed to maintain body temperature in a normal environment, and to allow for respiration and a small amount of activity. Actual energy requirements are generally about twice maintenance. There are of course additional energy requirements for growth, reproduction, pregnancy, lactation and antler growth. Just as important, there are additional requirements for daily activity (walking, browsing, avoiding predators, or running from hunters). Deer need dramatically more energy to maintain their body temperature in cold weather, especially if they are forced to move during that time to seek food or avoid danger.

It has been estimated that the maintenance energy required by a 120-pound doe in winter is about 3,192 Kcal/day of digestible energy. Standing increases the energy costs over lying down by about 9 percent.

Energy - Feed Intake Relationships

An interesting thing about energy requirements is that they are directly related to body weight. That is, as the deer gets larger, of course it needs more energy, but it actually needs less per

unit of body weight. This is also reflected in the whitetail's food intake patterns. The larger the deer, the less it eats per unit of body weight. More importantly, energy requirements and food intake vary seasonally.

Both bucks and does consume the most food in late summer and early fall. This may be the most critical food period for deer. Bucks are growing their antlers and developing fat for the winter rut, does are lactating or weaning their fawns, and fawns are shifting from a milk diet to solid food.

Once winter begins and the breeding season starts, both bucks and does reduce food intake. They focus on the rut, and even though rutting and winter temperatures require more energy, they have prepared by storing fat earlier in the year. Deer can easily lose 15-30 percent of their body weight in winter, and recover with the spring green-up.

Supplemental Feeds and Food Plots

The critical nutritional times for deer are really spring and late summer-early fall. Deer seldom need supplemental foods at other times for basic survival. Yes, in some northern states, during prolonged severe winters, there are die-offs, but this is fairly rare. Deer have developed an ability to get by on reduced food in the winter. Supplemental feeds (corn, pelletized feed rations) can be used to feed deer and are sometimes misused in Mississippi to bait deer for harvest. Food plots can be used to attract deer for hunting, and this can be a valuable management tool for harvest of does. However, if you plan to actually supplement the nutrition of the deer, then food plantings should be available year round, with both cool and warm season plantings available on 1-2 percent of an area. Of course, pay special attention to the late summer-early fall and late winter-early spring periods, when the deer need supplemental plantings most.

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