August 2012

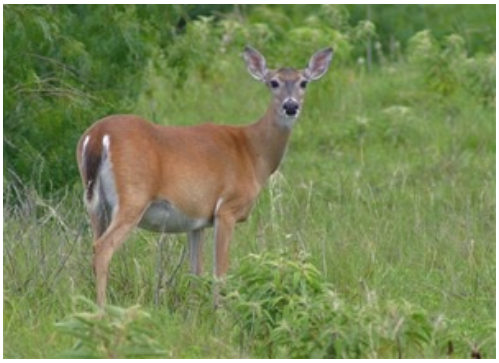
Deer Nutrition - Part 5
The Big Picture

by David G. Hewitt

This final part of the deer nutrition series follows chapters on **energy**, **protein**, **minerals**, and **vitamins**. The objective of this final part is to summarize deer requirements for these primary nutrients and to discuss one more class of nutritionally important chemicals, the consequences of which are becoming increasingly clear. Finally, this e-newsletter series will end with a brief explanation of how deer are able to meet their nutrient requirements from the varied, chemically diverse, and continually changing forages in their environment.

Summary of Nutrient Requirements

The table below summarizes deer nutrient requirements seasonally for deer of different ages and sexes. In general, young deer need higher quality diets than older deer; they also eat more food relative to their body weight (although less food overall because they are small).



Does have high nutrient requirements late in gestation and when raising fawns.

Adult females have exceedingly high requirements during summer when they are either in late gestation or lactating. They attempt to meet these requirements by increasing forage intake and by using protein, energy, and minerals stored in their body. If does cannot meet the high requirements of production, they produce smaller fawns which grow at a slower rate.

Bucks increase intake and will use high-energy foods during autumn as they accumulate fat, perhaps over 30 pounds of fat, in preparation for breeding. During the rut, bucks reduce intake dramatically. All deer reduce requirements and intake during winter, although if adequate food is available, fawns continue to grow.

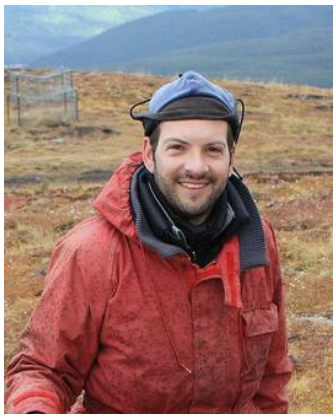
Seasonal nutrient requirements of white-tailed deer by sex and age. Energy is digestible energy and protein is crude protein. Vitamin, mineral, and dry matter intake are expressed on a relative scale (+ = maintenance; ++ = moderate; +++ = high).

Sign Up for eNews

If you received this email from a friend, [click here] to sign up for the Deer Associates eNews!

Save the Date

Killam Lectureship Series*



Featured Speaker -
Dr. Steeve Cote'
Universite' Laval, Quebec, Canada
September 28, 2012
2:00 p.m. to 5:00 p.m.
Texas A&M University - Kingsville

*more information to follow

Visit our Website

http://ckwri.tamuk.edu/research-programs/deer-research-program/

Contact Us

David G. Hewitt
Stuart W. Stedman Chair in White-tailed Deer Research

Season	Nutrient	Fawn	Yearling	Adult female	Adult male
Summer	Energy (kcal/g)	*	2.8	3.3	2.5
	Protein (%)	*	12	14-16	12
	Vitamin/mineral	*	++	+++	++
	Dry matter	*	+	+++	+
Autumn	Energy(kcal/g)	3.0	2.7	2.7	2.3
	Protein (%)	14-16	12	12	10
	Vitamin/mineral	++	+	++	+
	Dry matter	++	++	++	++
Winter	Energy(kcal/g)	2.8	2.3	2.3	2.1
	Protein (%)	12	8	8	8
	Vitamin/mineral	++	+	+	+
	Dry matter	+	+	+	+
Spring	Energy(kcal/g)	2.7	2.7	2.7	2.5
	Protein (%)	12-15	10	10-12	10
	Vitamin/mineral	++	+	++	+
	Dry matter	++	+	+	+

* Fawns obtain nutrients primarily from mother's milk; they increasingly incorporate solid food in their diet after 4 weeks of age and have high nutrient requirements.

Secondary Plant Chemicals

When considering only the primary nutrients shown in the table, it is easy to think of deer foods as composed of energy, protein, vitamins, and minerals. Expand your thinking to include indigestible fiber, and it seems all is covered. However, plants are chemical factories, producing a myriad of compounds ecologists broadly classify as secondary plant chemicals. These compounds are "secondary" because they are not part of the plant's primary metabolic pathways.

The diversity of secondary plant chemicals is dizzying. Hundreds of thousands of unique compounds have been identified and individual plants consumed by deer may contain dozens. The role of these chemicals in the plant's physiology and ecology is similarly diverse, ranging from protecting the plant from pathogens, herbivores, and harmful radiation to providing color to fruit and flowers to attract insects and animals that can disperse the plant's seeds. Traditionally, these chemicals were viewed negatively because some are toxic and some interfere with digestion. Forages that are not palatable to deer, such as leaves of mesquite and coyotillo, are distasteful and even poisonous because of their secondary plant chemicals.

However, the role of secondary plant chemicals in animal nutrition is more complex. Animals may intentionally eat plants with certain compounds to control fermentation rates in the rumen, purge intestinal parasites, counteract toxic properties of chemicals in other plants, and alter various physiological processes. Humans have been using plants for similar purposes for millennia, as medicines and tonics. It should be no surprise that deer have also evolved to use plant chemistry to their benefit.

Ecologists' understanding of the role of secondary plant chemicals in deer nutrition is rudimentary. However, the deer have been dropping hints that these chemicals may be

Texas A&M University-Kingsville
Caesar Kleberg Wildlife Research Institute
700 University Blvd., MSC 218
Kingsville, Texas 78363
361-593-3963
david.hewitt@tamuk.edu

important. CKWRI graduate students Garrett Timmons, Ryan Darr, Kent Williamson, and Luke Garver have shown that deer with access to pelleted supplemental feed continue to eat blackbrush and guajillo. This finding is surprising because leaves of these forages have low to moderate digestible energy and protein and contain a wide array of secondary plant chemicals. In fact, too much guajillo can cause a neurological condition in which animals lose control of their rear legs.

Blackbrush acacia has high concentrations of secondary plant chemicals.

We do not know why deer with ad lib access to pelleted feed eat such plants. One explanation is that pelleted feed is of such high quality that when it is digested by rumen microbes, the deer feel sick because of the acids or ammonia produced. Deer may feel better when they mix pelleted feeds with forage high in fiber or that contains tannin, a secondary plant compound that reduces protein digestion.

We do not know enough about secondary plant chemicals in deer nutrition to make specific management recommendations. However, when in doubt about a species' nutrition, the species' evolutionary history is often a productive place to look for answers. White-tailed deer evolved as browsers and many of the browse and forbs they eat have high concentrations of secondary chemicals. Deer seek out plants with these chemicals even if they are able to meet their requirements with other foods. Thus, there is probably value in providing deer access to such plants. The good news is Texas rangelands produce many forages containing secondary plant chemicals.

Deer Forage Selection

One of the more intriguing aspects of white-tailed deer nutrition is how deer meet their nutrient requirements, given that requirements change over time and the available forages are continually changing in abundance and quality, sometimes quite rapidly. Furthermore, deer must not only obtain the nutrients they require, but must avoid eating too much a plant that could be toxic. Who knew eating would be so complex.

An answer to the eating puzzle comes from research done by Dr. Fred Provenza, emeritus professor at Utah State University. Dr. Provenza has studied animal foraging for several decades and shown that animals receive feedback from the chemicals in their diet after each meal. This feedback provides information that foraging animals use to select a diet to meet their nutrient requirements. In this way, bucks will select a diet different from does, lactating does different from does with no fawns, and adults different from fawns and yearlings.

Mixing a diet to meet each animal's unique nutrient requirements can only be done if animals have several foods from which to select. Different foods should vary in content of nutrients and secondary plant chemicals. Plant chemicals give each forage a unique taste that the deer can correlate to how they felt after eating it. If a deer felt lousy after eating a food, that food may have a toxin and the deer would eat less of that forage in the future. If the deer felt great, the food they ate met some nutrient requirement and the deer are likely to eat more. Eating too much of a food rich in digestible energy or protein can cause malaise and the animal will eat less of such a high quality food in the next meal.

Bottom Line for Deer Management

What does this view of animal foraging mean for a deer manager? A fantastic implication is that managers do not have to formulate a different diet for each age and sex of deer. Managers do not have to change diets seasonally as deer requirements change. Deer are capable of choosing their own diet if given an adequate diversity of forages that vary in nutrients, energy, and secondary plant chemicals.

A manager's job is to provide deer the forage choices necessary to mix an appropriate diet. This means managing herbivore density (livestock as well as deer) so that a diversity of plant species is maintained. Managers should promote a diversity of plant communities and successional stages. They should recognize the value in fertile riparian areas, caliche ridges, and even saline flats because each of these communities produces different forages that give deer choice. Finally, managers should view food plots, pelleted feed, and other supplements as additional high-quality foraging options. Because no supplement, even if touted as "nutritionally balanced", will be perfect for all deer throughout the year, even managers who provide supplement should make high-quality forage the primary goal of their habitat management program.

Texas rangelands provide a cornucopia of forage from which deer can choose a diet to meet their nutrient requirements.

About the Author: David G. Hewitt is the Stuart Stedman Chair for White-tailed Deer Research at Caesar Kleberg Wildlife Research Institute.

Forward this message to a friend