CERVIDAE NUTRITION

BASICS

OVERVIEW

- For deer of temperate origin, considerable seasonal fluctuations and variation in food availability result in observable changes in body weight, fatness, and food intake.
- Voluntary feed intake (VFI) in grazing cervid species is influenced by photoperiod, the feed value of the forage, and the stage of the reproductive cycle.
- Deer are generally considered to be “concentrate selectors” because of their tendency to choose the richest parts of consumed plant species, although some may be classified as intermediate.
- Meeting changing nutritional demands is related to seasonality and reproductive status is critical. Optimizing pasture conditions and nutritional supplements can lead to improved growth rate in weanlings and improved reproductive performance in female cervids.
- Monitoring body condition score (BCS), especially during periods of nutritional stress, is the most effective way to monitor the status of a nutritional program and determine if any changes are necessary.
- Stocking rates are critical determinants of sustainable land use.
- Voluntary feed intake (VFI) in grazing cervid species is directly influenced by the feed value of the forage (based on season) and the stage of the deer’s reproductive cycle.
- Many cervids have been shown to have a seasonal cycle of digestive function. Greater rumen mean retention time (MRT) and increased rates of rumen ammonia production occur more often in summer than in winter.
- The purpose of this digestive cycle may be to maintain a constant digestibility as VFI increases during the summer.

SYSTEMS AFFECTED
Gastrointestinal and metabolic

GENETICS
N/A

INCIDENCE/PREVALENCE
N/A

GEOGRAPHIC DISTRIBUTION
New Zealand, Australia, North America; worldwide where captive cervid are raised

SIGNALMENT

Species
Cervidae

Breed Predilections
N/A

Mean Age and Range
N/A

Predominant Sex
N/A

CERVID APPETITE CYCLES

- A basic understanding of the annual appetite cycle is crucial for making appropriate nutritional management decisions in captive populations.
- Cervid species of temperate origin undergo seasonal changes in body condition, with a large proportion of fat being stored during late summer to be later mobilized by males during autumhal rut or by females throughout the winter.
- Changes in body condition are modulated through variations in voluntary food intake (VFI), which is partially regulated by photoperiod.
- At mid-summer, VFI peaks and increased day length causes the hypothalamus to become resistant to leptin, enabling fat deposition.
- As day length decreases (autumn and winter), VFI declines (~20%) and the hypothalamus becomes more sensitive to leptin, allowing fat mobilization to occur.
- In autumn and winter, reduced appetite helps to avoid energy expenditure from unproductive searching for scarce or poor quality food sources and is compensated for by improved efficiency of nutrient absorption, especially crude protein.
- Female cervids mobilize fat reserves gradually, allowing for maintenance of an appropriate body condition during the first two trimesters of pregnancy in winter and early spring when nutritional resources are limited.
- Male cervids mobilize fat reserves rapidly during autumhal rut, devoting the majority of their energy expenditure to roaming and breeding.
- Weanlings (~3 to 4 months) also experience a decline in VFI in the autumn and winter months with maximal weight gain occurring the following spring and summer months.
- Deer and elk nutrition in many regards is similar to sheep nutrition. The importance of feeding varies with the productive cycle of cervidae; however, cervid appetite fluctuates seasonally.
Understanding the annual appetite cycle is extremely important in nutritional management of the herd.

Fetal growth and lactation can increase maintenance nutrient requirements by 70% for energy and 85% for protein during the last trimester of pregnancy. Lactational increases of 45% energy and 75% protein requirements are important when planning a herd’s dietary management.

Cervidae generally give birth from late May to July. Pregnant does consume less feed during the winter months and time their increased nutritional requirements to correlate with the grazing of forage pastures.

Planning for seasonal growth and reproduction of cervidae requires changing nutritional programs throughout the production year.

Stags require maximum nutrients during the winter months. Having lost body condition in their rut, stags increase body condition and appetite during the spring and summer months.

Hinds require maximum nutrition during the summer. During the fall breeding season they must regain body condition. Although the hinds have decreased appetites during the winter, it is imperative that they do not lose body condition.

For calves, during the first winter growth becomes limited, with rapid weight gains following in the spring and summer months.

With calves, in the winter months it is important that dry matter (DM) consumption be monitored closely so that animals eat adequate levels to maintain their body condition.

In temperate production schemes, winter is the period during which higher energy supplements must be provided.

Concentrate or pelleted supplements may be fed to increase the diet’s energy content, but they should not exceed 50% of the ration on an as-fed basis.

**FEEDING RATIOS**

- Pregnant females feed ratio: 8:1.5:0.5, hay: concentrate: nutritional supplement.
- Cervids are considered “concentrate selectors” because of their behavioral tendency to select plants with better nutritive value when browsing.
- Most cervid feeding programs emphasize the feeding of good-quality legume/grass hay or pasture with grain (oats, corn, barley) as a supplemental energy source and a mineral supplement in deficient areas.

Research has shown that grazing on red clover (*Trifolium pretense*) or chicory (*Chicorium intybus*) increased red deer weanling growth during autumn by 26 to 47% and during spring by 10 to 14% compared to traditional perennial ryegrass (*Lolium perenne*)/white clover (*Trifolium repens*) pasture (0.8/0.2). Additionally, pre-weaning growth during lactation was increased by ~20%.

Grazing on the legume, sulla (*Hedysarum coronarium*), in autumn and spring has also been shown to improve growth rate of weanling deer by 33% and 10%, respectively, compared to other pasture-fed deer.

Reduced parasitism has been reported in animals grazing chicory versus perennial ryegrass/white clover, likely due to the plant morphology and/or presence of...
secondary compounds (sesquiterpene lactones) which inhibit the motility of L1 and L3 lungworm and GI nematode larvae.

- Most grass hay feeding programs require additional protein, mineral and vitamin supplementation. Commercial pellet supplements designed for cervids or sheep generally work quite well.
- During the fall feeding of fawns and more mature calves, it is imperative to prepare them for the winter feeding pattern. Needed body weights, condition scores, and gain are important early on in the season.
- Flushing hinds in September may increase the ovulation rate. This is especially true in nutritionally stressed animals.
- Summer pastures should contain a mixture of grasses as well as legumes. These pastures should be tested annually for nutrient content, and deficiencies supplemented on an as-needed basis.
- Deer and elk rarely bloat as compared with domesticated ruminants.

GROWTH ENERGY AND PROTEIN REQUIREMENTS

- Most grass hay feeding programs require additional protein, mineral and vitamin supplementation. Commercial pellet supplements designed for cervids or sheep generally work quite well.
- Pregnant females feed ratio: 8:1.5:0.5, hay: concentrate: nutritional supplement.
- Daily energy requirements can increase by as much as 2.5 times maintenance during the 3rd trimester of pregnancy and peak lactation.
- Dietary protein requirements vary by life stages:
  - Fawns (growth): 14 to 18%
  - Adults (maintenance): 6 to 10%
  - Females (late pregnancy): 11 to 15%
  - Males (antler development): 15 to 16%
  - Red deer require 4 Meal of ME/lb/day for gain.
  - This would be the equivalent of 4.9 Meal of DE or 2.5 pounds of TDN
  - On a grain supplement basis this would require 3.1 lb of corn/lb of body weight gain.

LACTATION REQUIREMENTS

- Red deer require 9.43 Meal ME/lb/day for lactation.
- This would equal 11.5 Meal DE or 5.75 lb TDN.
- 7.19 lb of corn or 10.8 lb of 53% TDN hay would meet this increased demand.
- Fetal growth and lactation can increase maintenance nutrient requirements by 70% for energy and 85% for protein during the last trimester of pregnancy. Lactational increases of 45% energy and 75% protein requirements are important when planning a herd’s dietary management.

FEED CONSUMPTION
• Mature hinds will consume 4.5 to 6 lb of dry matter/day in the winter.
• This diet should consist of good-quality forage fed free choice plus 2 to 3 lb of concentrate/head/day.
• Stags and calves should be fed a ration higher in concentrates because they have a marginal dry matter intake during this period.
• Monitoring a nutrition management program requires regular live weight monitoring and body condition scoring. Setting individual animal and herd target weights allows nutritional and management program evaluation. Target weights should be evaluated on a per-farm basis.
• General purpose mineral and trace element supplements should be available at all times.
• It is important to have multiple feeding supplementation stations. More aggressive animals can dominate a supplement program, leaving more submissive/subordinate animals without needed nutrients.
• Stags lose weight during the breeding period and the more dominant stags in multiple sire herds will lose weight more readily than subordinate stags.
• Stag weight loss is directly related to the amount of energy required for sexual and antagonistic behavior.

BCS stags on a regular basis. During breeding season weight loss can be quite severe.

**TRACE MINERAL REQUIREMENTS**

• General purpose mineral and trace element supplements should always be available.
• Copper (Cu) deficiency can have a significant impact on deer health and performance and usually manifests as clinical disease (enzootic ataxia and osteochondrosis).
  - Cu supplementation strategies can consist of Cu-EDTA injections, Cu-oxide needles, or direct application of Cu to pasture.
  - Chicory contains higher concentrations of copper and cobalt than perennial ryegrass/white clover and may be included in mineral deficient areas.
• Selenium and Iodine deficiencies may also negatively impact reproductive performance if not managed appropriately.

**ASSOCIATED CONDITIONS**

Ruminants on pasture or being supplemented with concentrates should always be monitored for bloat, though this is less common in cervids compared to other ruminants.
• Deer and elk rarely bloat as compared with domesticated ruminants.

**AGE-RELATED FACTORS**

Feeding weanlings During the fall feeding of fawns and more mature calves weanlings, it is imperative to prepare them for the winter-feeding pattern. Needed body weights, condition scores, and gains are important early in the season.

**ZOONOTIC POTENTIAL**

N/A

**PREGNANCY**
• About 65% of a breeding hind’s adult life is associated with pregnancy.
• The 3rd trimester of pregnancy, when the conceptus gains >70% of its ultimate mass, is when nutritional stress is most likely to occur, especially in years with prolonged winters. This can be overcome in captive herds with appropriate nutritional supplementation.
• Nutritional and/or mineral deprivation can negatively affect fetal development and mammary tissue development in most cervid species.
• In red deer, a variable gestation length has been reported, and it is speculated that this allows the fetus to obtain a critical mass before parturition can occur. Fetal growth and lactation can increase maintenance nutrient requirements by 70% for energy and 85% for protein during the last trimester of pregnancy. Lactational increases of 45% energy and 75% protein requirements are important when planning a herd’s dietary management.

RUMINANT SPECIES AFFECTED
Cervidae

BIOSECURITY
N/A

PRODUCTION MANAGEMENT
• Flushing, the practice of heavy concentrate feeding immediately before the breeding season, has been found to induce an earlier first estrus and higher initial ovulation rates in the first cycle in female cervids.
• Understanding the annual appetite cycle is extremely important in nutritional management of the herd. The opportunity to increase live weight gain (LWG) in fawns/calves during late lactation can be improved from 220 to 500 g/d by improving metabolizable energy with dietary supplementation. LWG can be further maximized by feeding these supplements to the fawns/calves during weaning in early autumn.
• It is important to have multiple feeding supplementation stations. More aggressive animals can dominate a supplement program, leaving more submissive/subordinate animals without needed nutrients. Flushing hinds in September may increase the ovulation rate. This is especially true in nutritionally stressed animals.
• Summer pastures should contain a mixture of grasses as well as legumes. These pastures should be tested annually for nutrient content and deficiencies supplemented on an as-needed basis.
• Deer and elk rarely bloat as compared with domesticated ruminants.
• Concentrate or pelleted supplements may be fed to increase the diet’s energy content, but they should not exceed 50% of the ration on an as-fed basis.
• Monitoring a nutrition management program requires regular live weight monitoring and body condition scoring. Setting individual animal and herd target weights allows
nutritional and management program evaluation. Target weights should be evaluated on a per-farm basis.

SYNONYMS
N/A

SEE ALSO
Body condition score
Cervid reproduction
Captive game production
Vaccination and deworming programs for captive cervidae

ABBREVIATIONS
VFI = voluntary feed intake
BCS = body condition score
LWG = live weight gain
MRT = mean retention time
TDN = total digestible nutrients
CP = crude protein
DE = digestible protein
ME = metabolizable energy

Suggested Reading

Authors: Jamie L. Stewart and Scott R.R. Haskell, Clifford F. Shipley and Jamie L. Stewart