

Practical, hands-on nutritional support with the information you need to provide for your patients, teach your clients, and understand veterinary clinical nutrition for exotics.



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Dawn Hromanik graduated with a BS in Animal Science from Oklahoma State University where she worked as an animal caretaker in Laboratory Animal Science at the College of Veterinary Medicine and as a lab technician in the nonruminant nutrition laboratory at the Department of Animal Sciences. Following graduation, she worked for a farmers' cooperative feed company as a Livestock Production Specialist developing feeding rations and animal health programs. She is currently Director of Nutrition and Product Development for Oxbow Pet Products. Dawn's special area of interest is nutritional management of uroliths in guinea pigs and rabbits.

Additional Reading

1. Chiou PW, Chang LinBY: Effect of different components of dietary fiber on the intestinal morphology of domestic rabbits. *Comp Biochem Physiol* 108A(4): 629-638, 1994.
2. Irlbeck NA: How to feed the rabbit (*Oryctolagus cuniculus*) gastrointestinal tract. *J Anim Sci* 79 (E Suppl):343-346, 2001.
3. Van Soest PJ: Allometry and ecology of feeding behavior and digestive capacity of herbivores: A review revisited. *Proc Comparative Nutrition Society*, 2002, p 5.
4. Oregon State University, Forage Information System. Available at <http://forages.orst.edu/>. Accessed Dec 21, 2002.



Application of Hay Science

ONE WAY VETERINARIANS CAN improve the nutritional management of their small herbivore patients is to educate their clients about hay.

Feeding Physiology

Herbivores are physiologically designed to eat and digest plant material. Free-ranging rabbits and guinea pigs are ground-dwelling prey animals that eat small meals frequently throughout the day. They are hindgut fermenters that have a small

stomach, complex cecum and relatively rapid rate of transit through the digestive tract. The microbial population in their digestive tract is designed to gain maximum digestibility from fibrous plant material. In captivity, it is the fiber content of hay that stimulates peristalsis and supports bacterial growth and gastrointestinal pH for proper digestion.

Hay Science

Hay is simply dried, preserved, fibrous plant material. Fiber has been referred to as an essential non-nutrient. A common term used to indicate the digestibility of hay is "acid detergent fiber" (ADF). ADF is a measurement of the cell wall mass of the plant minus the hemicellulose or the interior of the cell. Although stems contain the highest amount of ADF, or indigestible fiber, it is the physical coarseness that provides the peristaltic stimulation commonly referred to as the scratch factor. Research has shown that the thickness of the intestinal wall, villi height, crypt depth and cecal VFA production varies in rabbits depending on the source of fiber.¹

Animals that require hay in their diet

- Rabbits
- Guinea pigs
- Chinchillas
- Degus
- Prairie dogs
- Richardson ground squirrel
- Wallabies
- Savannah desert tortoises

Animals that benefit from hay in their diet

- Gerbils
- Hamsters
- Rats



Choosing Hay

The type of hay to feed depends on the maturity of both the animal and the hay.

All grass hays, such as timothy, orchard, oat, brome and Johnson grass, are suitable for small mature herbivores, because they contain protein and calcium levels appropriate to adult maintenance diets in these species. Legume hays, such as alfalfa (lucerne), clover, vetch, peanut and pea, have relatively high protein and calcium contents, which make them beneficial for growing and lactating animals but unsuitable for maintenance. Some legume hays also contain high levels of oxalic acid, which may lead to precipitation of calcium oxalate in the urine of some animals.

The earlier the hay is cut in its life stage or maturity, the more leaves it will contain, because as a grass plant grows taller, the stem lengthens and thickens to support a seed head. An immature cutting will result in hay with an extremely high leaf content that is softer and more palatable to small animals. This is not always a benefit, as the leaves of the plant contain a higher amount of structural carbohydrate and crude protein when compared to the stem. The crude fiber

content in the leaves can be lower than 20%. The ADF fiber is also lower, decreasing the peristalsis effect. An animal that is consistently allowed to selectively eat the leaves may actually have a low dietary fiber intake. The ideal balance is found in grass hay with an equal ratio of stems and leaves; this maximizes palatability while providing the ADF content needed for good intestinal health and motility.

Maturity, harvesting methods, storage conditions, soil fertility and weather play a large part not only in the nutritional value of the hay but in the palatability to the animal and visual appeal to the owner. Hay should be green in color and have a fresh aromatic scent to encourage consumption. It should not be overly dry, brown, damp, moldy or dusty.

Comparison of Stages in Cutting Hay

Immature Hay	Mature Hay
Lower fiber content (can be <20% crude fiber)	Higher fiber content
Lower ADF content	Higher ADF content
Higher protein level	Lower protein level
More leaves	Higher stem content
May cause soft stools in some animals	May not be as palatable

Tips for Increasing Hay Consumption

Proper feeding must take into consideration not only the physiological and nutritional needs of the animal but the psychological needs as well.

- Introduce a variety of grass hays at an early age to increase acceptance.
- Offer hay in generous amounts, at a least half a body size in volume per day.
- Offer hay in multiple locations and in a variety of containers to encourage play.
- Use hay as bedding or place hay in preferred lounging areas.
- Understand species-specific idiosyncrasies. Guinea pigs prefer to eat off the ground. Rabbits often eat more hay when it is placed in the litter box.
- Do not remove hay unless it is soiled. Frequent changing of hay encourages the pet to be a selective and eat only the leafy parts and ignore the stem.
- Stimulate the senses and make foraging a tactile and enriching experience. For example, fill a wading pool with hay to allow burrowing.
- Hide pelleted food or healthy treats in the hay to promote foraging behaviors.
- Shred carrots into a pile of hay and make a “tossed hay salad.”
- Lightly mist hay with flavored water.
- As a last resort, steam hay to increase the moisture content, make it tender and intensify the aroma and flavor.

To steam hay: Bring a pot of 1 inch of water to a boil. Place a handful of hay into a steaming basket, and steam for 10-15 seconds. (Fruit juice can be added to the water for flavor.)