

“Rabbits are now the third most popular mammalian domestic pet in the UK, yet there is relatively little literature relating to the nutrient requirements of the pet rabbit”

The Importance of

Diet in Rabbits



by Anna Meredith
MA VetMB CertLAS DZooMed MRCVS

Head of Exotic Animal Service
Royal (Dick) School of
Veterinary Studies
University of Edinburgh



FEEDING AN APPROPRIATE DIET to a rabbit is probably the single most important factor in maintaining its health.

Rabbits are now the third most popular mammalian domestic pet in the UK. They are also an extremely important livestock species and laboratory model worldwide.

There is a great deal of literature relating to the nutrient requirements of production and laboratory rabbits, but relatively little relating specifically to the pet rabbit.

Pet rabbits have the potential for a much longer lifespan than the short-lived production or experimental rabbit. Many of the diseases commonly seen in pet rabbits can be directly attributed to, or associated with, the feeding of an inappropriate diet and could be largely preventable.

However, in recent years manufacturers have responded to the need for good diets for pet rabbits, and in general the level of awareness of all those involved with keeping pet rabbits has increased.

WHEN CONSIDERING THE DIET of a pet rabbit it is important to be aware of the dietary habits of the wild rabbit.

Rabbits are adapted in terms of their teeth and digestive system to eat a herbaceous diet that is high in fibre, low in fat, and low in starchy carbohydrates.

Wild rabbits in a natural setting select the most tender succulent plant parts that are most nutrient dense.

They are referred to as concentrate selectors, allowing them to meet their dietary requirements in the minimum time above ground when they are prone to predation.

However, the natural diet is not “concentrated” to the same degree as commercial diets and is still naturally high in fibre.

Pet rabbits will generally eat a wide variety of foods but generally show a preference for fibre and often eat hay or straw in preference to a concentrate ration.

However, it can be difficult to persuade a rabbit to eat a new food item once it has become accustomed to a particular diet.

Food preference is influenced by the diet of the mother at weaning. Rabbit kits show a clear preference for the diet of their mother at weaning.

It can be particularly difficult to persuade some rabbits to eat hay if they have not been introduced at an early age.

In the wild rabbits eat at dusk and dawn, and this is reflected in pet rabbits, that are most likely to eat in the early evening or overnight, and may not appear hungry during the day.

The other source of nutrients is the caecotrophs, which are packets of partially DIETARY ITEMS

GRASS AND HAY

Grass provides a balanced source of protein, digestible and indigestible fibre, vitamins and minerals, and ideally pet rabbits should be allowed to graze for several hours a day. However this can be impractical for house rabbits.

Grass is approximately 20 – 40% crude fibre. Grass should be grazed or fed fresh cut. Lawnmower clippings should not be used as they ferment rapidly and can cause digestive disturbance.

Hay should also be considered an essential part of the pet rabbit diet and should be provided ad libitum. Hay can be used as a substitute for grass, or fed in addition.

Species of grass used for haymaking in the UK are ryegrass, timothy, fescues, meadow grass, and Cocksfoot (orchard grass) and are generally referred to as meadow hay, often containing a mixture of species, including some clover.

Fibre content varies from 29.8% (meadow grass) to 35.6% (orchard grass). Protein content of grass hays is generally in the range 6.3% to 16.7%.



Quality will vary depending on the time of year.

Cutting hay before flowering gives the best quality.

Opinion varies as to the best age of hay to feed. Some rabbit keepers recommend feeding hay that is at least 4 months old as young hay may lead to diarrhoea, but others feed new hay with no problems.

Prolonged storage of hay can lead to loss of nutrients, especially vitamins A and D, and especially if the temperature is warm. Good hay is sweet-smelling and with no mustiness.

Lucerne (alfalfa) is used widely in the USA and other parts of the world for haymaking but is not common in the UK.

It is high in protein (16.5%) and calcium and is thus very useful for growing rabbits, but can lead to obesity and urolithiasis in mature animals.

Other legume hays (e.g clover) are similarly high in protein, calcium and energy and are not recommended for the adult pet rabbit.

Straw is not recommended as, although eaten, is low in nutrients and will lead to deficiencies if it is a major part of the diet. The feeding of silage is generally not practical, although it has been approached in some countries.

Anecdotal reports on the use of artificially dried grass in rabbits have been received and rabbits seem to find it very palatable.

Nutrient content is often superior to sun-dried hay, although vitamin D content will be lower and carotene and vitamin E content can deteriorate with time unless stored correctly.





MIXES, PELLETS AND EXTRUDED DIETS

Pet rabbit food has traditionally been sold in the form of mixes consisting largely of flaked, micronised or rolled cereals, legumes, extruded biscuits and grass pellets.

Alfalfa stems are sometimes included to increase fibre content and as a calcium source.

More recently, pellets and extruded diets have been made available for pet use, although pellets have been used for many years for commercial production rabbits

Harcourt-Brown (1996) found that pet rabbits offered mixed diets tend to favour the flaked peas and maize which are high in starch and low in calcium and fibre.

Locust beans are sometimes included as they are sweet and palatable, but can be swallowed whole and cause intestinal obstruction.

Owners tend to discard uneaten items and replenish the feeding bowl regularly so that the complete balanced mixture of ingredients is never consumed.

Pelleted or extruded diets overcome the problem of selective feeding and provide a consistent ration. Extruded diets are now very popular for pet rabbits, incorporating long fibre particles without the pellet becoming crumbly.

The heated extrusion process improves starch digestibility and reduces carbohydrate overload of the hindgut, and extruded diets are more palatable and digestible than pellets.



EDIBLE PLANTS

Plants can be either commercially available or wild. Green leafy plants are recommended. Commercially available examples are broccoli, cabbage, chicory, chard, parsley, watercress, celery leaves, endive, raddichio, bok choy, dock, basil, kale, carrot and beet tops.

Wild plants include bramble, dandelion, chickweed, plantain, sunflower, wild strawberry, dock, yarrow.

Green plants are useful as they provide variety, micronutrients, water and dental wear, but it should be remembered that as they are generally 90-95% water and often relatively low in fibre excessively large amounts would need to be consumed to fulfil daily needs. Therefore they should not be fed in very large quantities.

Any greens should be introduced gradually and preferably fed consistently in order for caecal bacteria to adapt.



“Provide your rabbit with twigs or tree branches. They will enjoy gnawing and stripping the bark”

FOOD INTAKE

Many factors affect food intake, including size, age, environmental temperature and reproductive status. However, there is very little published information for pet rabbits.

Although production rabbits may eat to meet their energy requirements, this is not the case with many pet rabbits that frequently overeat and become overweight or obese.

Conversely, if very low protein and high fibre diets are fed, especially to small breeds, energy intake may be limited and result in poor growth or weight loss.

Disease states usually increase energy needs but decrease food intake.

House rabbits kept in warm ambient temperatures may require less energy than outdoor rabbits, depending on their level of activity.

Neutered rabbits may also require less energy due to reduced activity.

Growing rabbits should be expected to eat up to twice the amount consumed by an adult and lactating does three times the amount. In lactating does, energy needs often exceed capacity for food intake and weight will be lost.

CONCLUSIONS

Feeding the correct diet to rabbits is fundamental to maintaining health, particularly of the dental and digestive systems.

- The best diet for rabbits is one that mimics as closely as possible their natural grass-based diet in the wild.

Grass is approximately 20-25% crude fibre, 15% crude protein and 2-3% fat. The bulk of the diet of the pet rabbit should consist of grass (fresh or freeze-dried) and/or good quality meadow/Timothy hay, and this should be available at all times.

Hay can be fed from racks or nets to minimise contamination and increase the time spent feeding.

- Green foods are also important and a variety should be fed daily to rabbits of all ages. They should be introduced gradually to weaning rabbits.

Examples are broccoli, cabbage, chicory, chard, parsley, watercress, celery leaves, endive, raddichio, bok choy, dock, basil, kale, carrot and beet tops. Wild plants can be given if available, e.g bramble, groundsel, chickweed, dandelion.

All green foods should be washed before feeding.

- Commercial concentrate rabbit diets are not essential in adult rabbits if ad lib hay, grass, and greens are available. Commercial rabbit diets can be too low in fibre and too high in protein, fat and carbohydrate.

However, many owners like to feed these diets for convenience. They should not be fed exclusively or ad libitum, and it must be emphasised that hay or grass should always be available and make up the bulk of the diet.

A good general rule is to feed a maximum of 25g of high-fibre pellets per kg bodyweight per day. For concentrate foods, crude fibre levels of >18%, with indigestible fibre >12.5% are recommended

- Overfeeding of concentrated diets is a significant factor in GI disease and dental disease, and also leads to obesity and boredom.

However, concentrate diets have a role in the feeding of growing, pregnant and lactating and diseased rabbits, and can be used to ensure nutrient requirements are fulfilled in rabbits that are unwilling to consume significant amounts of hay or green vegetables.

- Obesity can predispose to serious health problems including arthritis, osteoporosis, faecal retention around the perineum, urine scalding, flystrike and metabolic disease.
- High fat or high carbohydrate/starchy treats should be avoided completely. These include commercial “treats” such as honey sticks, beans, peas, corn, bread, breakfast cereal, biscuits, nuts, seeds, crisps and chocolate.
- The best treats to feed are hay treats, which are commercially available, or some favourite herbs or greens. Be very careful with feeding other

treats as they can lead to obesity and digestive upsets.

For some tooth wear and mental stimulation you may provide your rabbit with twigs or tree branches. They will enjoy gnawing and stripping the bark.

A general rule is that you can offer branches from any tree that we eat the fruit from. Examples are apple, pear, plum, hawthorn, whitethorn and wild rose. Make sure the tree has not been sprayed with chemicals.

- Fruit should be regarded as a treat item and fed in limited quantities only as it is high in simple sugars and can lead to gastrointestinal disturbance and dental caries.
- Sudden changes in diet must be avoided. Any change in diet should be made gradually over several days to weeks, starting with small amounts of the new item and gradually increasing them, whilst making a corresponding decrease in the unwanted item if necessary.

Ad lib hay should always be available, and it is especially important to ensure that weanling rabbits eat plenty of hay.

A sudden change in diet and lack of fibre combined with the stress of movement is a significant cause of morbidity and mortality in young rabbits over the period of weaning and moving to a pet shop or new owner.

When purchasing a rabbit it is important for a new owner to be informed of the rabbit's diet so that any changes can be introduced gradually

- Frosted or mouldy food, and lawnmower clippings should not be fed as these can lead to severe digestive disturbances.

- Dietary supplements consisting of vitamins and minerals are not generally necessary if the correct diet is fed. They should be used only under direction of a veterinary surgeon.
- Fresh drinking water must be available at all times. Drinking bottles are easier to keep clean than water bowls, and avoid wetting the dewlap, which can lead to a moist dermatitis.

Vitamin B complex B-group vitamin requirements are supplied in sufficient quantity for pet rabbits from caecotrophs. Diets for commercial production rabbits are commonly supplemented with thiamine, pyridoxine, riboflavin and niacin.

• Vitamin D	1000 IU/kg	
• Vitamin E	0.05%	(50mg/kg)
• Calcium	0.5 - 1.0%	(5-10g/kg)
• Phosphorus	0.4-0.8%	(4-8g/kg)
• Magnesium	0.3%	(3g/kg)
• Zinc	0.05%	(50mg/kg)
• Potassium	0.6%	(6g/kg)
• Sodium	0.2-0.25%	(2-2.5g/kg)
• Chloride	0.17-0.32%	(1.7-3.2g/kg)
• Iron 3	0-100 ppm	
• Copper	5-20 ppm	
• Manganese	8-15ppm	
• Selenium	0.05ppm	
• Iodine	0.4-2ppm	
• Cobalt	1.0 ppm	

Table 1:

Nutrient requirements of pet rabbits

- Protein – 12-16% (120-160g/kg)
- Fibre - 20-25% (200-250g/kg)
- Fat - 2.5-4% (25-40g/kg)
- Vitamin A 10,000 IU/kg

REFERENCES AND FURTHER READING

The Nutrition of the Rabbit

Ed de Blas and Wiseman
CABI Publishing, Wallingford

Rabbit Feeding and Nutrition

Cheeke PR
(1987) Academic Press

Donoghue S (1994) Nutrition and Pet Rabbits

In: Practical exotic Animal Medicine

The Compendium Collection 1997 Rosenthal KL (Ed) pp104-111
Veterinary Learning Systems, Trenton USA

Textbook of Rabbit Medicine

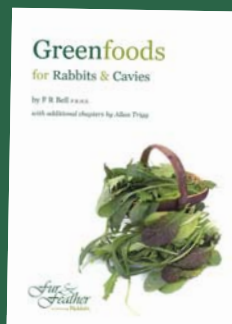
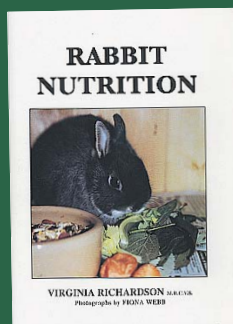
Harcourt-Brown FM (2002)
Butterworth Heinemann, Oxford

NRC (1977) Nutrient requirements of Rabbits

2nd revised edition.
National Academy of Sciences.
Washington DC

Special reader offer for this issue only!

Buy *Greenfoods for Rabbits & Cavies*
and *Rabbit Nutrition*
for just £10.75 (RRP £13.45)



Call 01473652 789 between 1 - 31 June to qualify,
or send cheque (made payable to Fur & Feather)
to Elder House, Chattisham, Ipswich. Suffolk IP8 3QE



“In the wild rabbits eat at dusk and dawn, and this is reflected in pet rabbits, that are most likely to eat in the early evening or overnight, and may not appear hungry during the day”