

# RABBITS EAT CARROTS, RIGHT?

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**LESA THOMPSON** examines the nutritional needs of pet rabbits and advises on the consequences of providing inappropriate diets including welfare issues

**THE UK is a nation of pet owners, with 45 per cent of households keeping a companion animal. Although still less popular as pets than fish, dogs and cats, three per cent of UK households own a rabbit.**

Unfortunately, care of rabbits lags behind that of other species, particularly in provision of an appropriate diet. Pet rabbits can live for more than 10 years, but this lifespan is frequently shortened due to poor husbandry.

This article outlines the nutritional requirements of rabbits and some welfare problems that may arise in cases of inappropriate nutrition.

## **Diet in the wild**

Rabbits are herbivores and have evolved to digest materials that are indigestible by many other animals. However, they still require high-quality roughage to maintain condition. This monogastric species utilises hindgut fermentation and caecotrophy – consumption of a type of faeces directly from the anus to extract nutrients from food.

Grass and weeds form the basis of the diet for wild rabbits. The high-fibre component is required for dental attrition and to stimulate gastrointestinal motility.

However, when available, rabbits will select plant parts higher in protein and carbohydrates and lower in fibre – hence they are termed “concentrate selectors”. This selection enables wild rabbits to obtain sufficient energy and protein for survival in the situation where most of their food is of low nutritional value.

Digestive physiology in rabbits relies heavily on a healthy gastrointestinal microflora, particularly in the caecum. This area is colonised during weaning, when the young animals are exposed to, and ingest, microbes present in the dam’s caecotrophs.

## **Appropriate diet in captivity**

Historically, pet rabbits were housed outdoors in a small hutch, fed vegetable scraps, and everyone knew that “rabbits eat carrots”. Bugs Bunny was usually munching on one, so it must be good to feed them to your pet rabbit, right? In fact, although rabbits like to eat carrots, they do not provide balanced nutrition and should only be fed in very small quantities as a treat. Conversely, green carrot tops are much better for rabbits than the orange root vegetable.

As with other species in captivity, the diet of wild animals should be mimicked where possible. This means providing pet rabbits with a high-fibre diet, based on good-quality hay supplemented with leafy greens and weeds. Although “treat” foods such as cereals or carrots can be offered on occasion, these foods can cause problems if given in excess.

Protein requirements are higher at certain life stages – including periods of maximum growth and during lactation – but in general 12 per cent to 16 per cent is adequate for most pets.

Obviously, fresh water should always be available, either in a bowl or sipper bottle.

## **Inappropriate diets**

A pet rabbit’s wild counterpart is a selective feeder, and so will a pet rabbit be if it is permitted. Given the opportunity of eating high-protein, high-carbohydrate foods – usually proprietary rabbit food cereal-type mixes – these animals will consume an inappropriate diet. High levels of carbohydrate adversely affect gastrointestinal motility. Carrots have high sugar content and should be limited to very small quantities.

Similarly, sudden changes in diet cannot be matched by sudden changes in gut microflora. Therefore they will result in gastrointestinal upset. Prolonged weaning periods are advisable as during this time there are major physiological changes underway in the gastrointestinal tract of young rabbits. Use of certain antimicrobial agents may also have devastating effects on the microflora.

Excess amounts of protein can be detrimental to gastrointestinal function.

Insufficient high-quality dietary fibre not only affects gastrointestinal motility, but also helps to wear down the continuously growing teeth of rabbits. Indigestible fibre is required for dental wear, and stimulation of appetite and caecotroph ingestion. Forage also helps prevent boredom in pet rabbits. Fermentable fibre is required for healthy microflora and pH in the caecum, volatile fatty acid (VFA) production and consistency of caecotrophs.

Care should be taken to ensure any plant material offered is not toxic. Hay should be sweet smelling and not mouldy or dusty. Grass should be freshly growing and clippings, which ferment rapidly, should never be offered. Although in general weeds are safe to feed to pet rabbits, some plants are toxic. Other objects encountered in the environment may also be toxic or result in damage to the gastrointestinal tract. Chemicals used on plants, including pesticides and preservatives, may be toxic.

## Consequences of inappropriate diets

Several outcomes are possible in animals fed inappropriate diets. Of these, the most common pertain to physiology of the digestive tract itself – from dental disease in the oral cavity to gastrointestinal disturbances further along the tract. However, gastrointestinal dysfunction will also lead to an increased susceptibility to gastrointestinal pathogens, especially in young rabbits.

Weaning is a crucial time for young rabbits. As their diet changes, so do the ammonia levels and pH of the gastrointestinal tract. There is a general increase in VFAs and an alteration in the proportion of individual VFAs, resulting in a change in microbial flora. Gut colonisation by healthy bacteria – usually from maternal caecotrophs – is important to reduce the susceptibility to bacterial pathogens.

Although infections rarely cause gastrointestinal disease in adult rabbits, animals with poor nutrition may develop a reduced immunity, particularly young animals around the time of weaning, and are susceptible. These infections may include bacteria (for example, *Salmonella*, *Escherichia coli*, *Campylobacter*), parasites (including *Coccidia* or *Cryptosporidium*), and viruses (such as *Coronavirus* or *Rotavirus*).

Similarly, certain antibiotics can result in dysbiosis, with overgrowth of *Clostridia* and *E coli* causing diarrhoea and enterotoxaemia – which may be fatal. Rabbits are particularly susceptible to the following antibiotics: oral penicillin, amoxicillin, ampicillin, cephalosporins, clindamycin, erythromycin and lincomycin.

Several aetiologies may result in an imbalance of the normal flora in the gastrointestinal tract, resulting in diarrhoea. For example, a sudden diet change may cause the large intestinal pH to change. To avoid this, any dietary alterations – including those to an improved diet – should be made gradually over a one to two-week period. If excess sugars are present in the diet, passage of these into the caecum may lead to excessive bacterial fermentation and overgrowth of pathogenic

bacteria.

Rabbits permitted to selectively feed on cereal mix type foods will over-consume high carbohydrate portions. This will inhibit motilin secretion, necessary to stimulate motility in the duodenum and jejunum. Digestion of high levels of carbohydrate will also result in production of excess VFAs, resulting in a decreased pH that affects gastrointestinal microflora balance. Excess glucose (for example, found in carrots or in high-carbohydrate diets) is also a medium for potentially pathogenic bacteria to colonise. Extruded pellet diets, although not balanced for perfect nutrition, do at least prevent the selective feeding seen with cereal-type mixes.

Caecotrophs – comprising microorganisms and products of microbial fermentation such as amino acids, VFAs and vitamins – contain vital nutrients for the rabbit. If rabbits are unable to perform caecotrophy, they are unable to access these nutrients during the second passage through the gastrointestinal tract and problems ensue. Conditions that may make caecotrophy difficult or impossible include dental disease, obesity, arthritis and neurological disease. High-protein diets reduce caecotroph consumption, thereby reducing intake of valuable nutrients, and lead to gastrointestinal motility problems.

If rabbits develop diarrhoea due to gastrointestinal dysbiosis or infection, or if they fail to perform caecotrophy, faecal matter sticks to the perianal fur and skin. This can lead to skin irritation and infection, but also attracts flies and fly strike (myiasis).

Although feeding wild weeds to rabbits is recommended, great care should be taken to ensure those selected are safe. Plants toxic to rabbits include foxglove, iris, ivy, ragwort and yew. Houseplants reported to be toxic to rabbits include amaryllis, cheeseplant, poinsettia and spider plant. Avocado (leaves, fruit, seeds and bark) is toxic to rabbits. Consumed in large quantities, kale, cabbage and spinach may also be potentially toxic.

Locust bean seeds were previously more common as treats than now, but have been associated with fatal gastric foreign bodies.

Rabbits may consume other dangerous items accidentally. Caecal impaction may occur after eating clay cat litter, as the small particles are moved into this region of the gastrointestinal tract where they can solidify. Impaction of the caecum can also be caused by inadequate fibre in the rabbit's diet, as large intestinal motility is inhibited and dehydrated material builds up in the caecum.

Although congenital dental disease occurs in rabbits, the most common form is acquired disease related to poor diet – with inappropriate mineral content and insufficient fibre.

## **Welfare issues**

Besides the obvious physiological requirements of nutrition, other welfare considerations related to diet include the method of food presentation. Animals in captivity with insufficient activities to occupy themselves may become stressed. After weaning, wild rabbits spend most of their time when awake foraging, and enabling pet rabbits to do the same is one way of providing environmental enrichment and reducing stress. Providing hay in a hay rack, suspending apple twigs and offering other edible logs to chew are all safe and stimulating options. Always check branches have not been treated with potentially toxic pesticides or other chemicals, such as varnish or preservative.

Unlike their more common pet compatriots (dogs or cats), rabbits usually do not display overt signs of illness until late in disease, by which time their welfare will be severely affected. For example, it is more difficult to ascertain that a rabbit is eating or defaecating less than the other species.

Rabbits are now more frequently kept as house pets, in close association with their owners, and those owners are more likely to notice any changes in demeanour or condition early in the stages of any disease process. For rabbits housed outside with less contact and observation, subtle signs may be undetected.

Although the breed of rabbit may affect its expected lifespan and susceptibility to various conditions, good husbandry, including appropriate nutrition, is the most important factor for quantity and quality of life in pet animals.

Owner education is best done before purchase or early in the period of ownership, but veterinary advice— on appropriate nutrition and how to detect subtle clinical signs of disease – can help to improve animal welfare at any life stage.

## Further reading

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A pet rabbit's diet should consist mostly of good-quality hay, with fresh greens and a limited amount of extruded pellet.





Selective feeding can occur when offered (lower) cereal-type mix, but cannot occur with (upper) extruded pellet types of proprietary rabbit food.



Incisor malformation thought to be associated with insufficient dietary fibre.





This normal rabbit caecotroph is larger than a hard faecal pellet and has a covering of mucus.

Hay/grass (ad lib)	Good quality sweet meadow hay, such as Timothy hay. Fresh grass (not clippings)		
Weeds/leafy vegetables (20%)	Weeds can include sow thistle, vetches, cow parsley, plantain, chickweed, trefoil; limited quantities of dandelion leaves and clover	Suggested vegetables are broccoli, spring greens, cauliflower leaves, carrot tops (not the actual carrot root), watercress, sprout peelings; limited kale, cabbage and spinach	Tree leaves and branches from fruit trees and hazel can be offered
Pellets (maximum 2%). Extruded pellets are advised as they prevent selective feeding			
Fresh water (ad lib)			

**Table 1.** Suggested rabbit diet