

Review Article

Practical feeding and condition scoring for donkeys and mules

F. Burden

The Donkey Sanctuary, Research Department, Slade House Farm, Devon, UK.

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Summary

Donkeys have evolved to thrive on highly fibrous, poor quality foodstuffs and have evolved as browsers as well as grazers. As such, they have different nutrient requirements with significantly lower energy and protein needs when compared with horses. Dietary management of donkeys is essential when kept in a temperate climate as they are prone to obesity and related disorders. A diet based on fibrous forages and limited grazing is usually sufficient for the majority of donkeys and mules. Specialist feeding is discussed in this article.

Introduction

One of the world's most valuable working animals, the domestic donkey, is descended from African wild asses that evolved to live in semi-arid environments with only poor quality, sparse vegetation. To increase their potential food sources, donkeys have evolved as browsers as well as grazers with woody shrubs and trees being potential food sources when grasses and other low vegetation are not abundant (Lamoot *et al.* 2005). Donkeys are trickle feeders, wild donkeys access suitable and sufficient foodstuffs by spending many hours (14–18 h/day) foraging and will travel many kilometres to search out the choicest feedstuffs (Smith and Pearson 2005).

Donkeys are highly efficient at digesting poor nutritional quality fibre and possess a superior digestive efficiency compared to horses when digesting forages such as straw (Wood *et al.* 2005); a study by Pearson *et al.* (2006) showed that donkeys had similar digestive efficiency as cattle when fed straw with much greater efficiency than UK native ponies, but the difference between species becomes less marked when higher quality feeds are given.

The donkey's natural adaptations to survive on poor quality feed when compared to ponies means, that when donkeys are treated as mini horses or kept in the same way

as their horse companions, they may become obese and subsequently develop serious health problems. Key to the formulation of management and dietary plans is awareness that the requirements of donkeys are very different to those of horses and ponies.

Dietary requirements

Daily intake and energy requirements

Feeding recommendations for donkeys and mules have, until recently, been extrapolated from horse nutrition. Using experience and limited donkey research, it was estimated that donkeys required 75% of the nutrients that would be given to a pony of the same size (Svendsen 1997). Research funded by the Donkey Sanctuary established that these guidelines significantly overestimate the digestible energy requirements for maintenance (Carretero-Roque *et al.* 2005; Wood *et al.* 2005). Projects conducted in the UK and Mexico established digestible energy (DE) and dry matter intake (DMI) requirements for mature nonworking donkeys fed fibrous forages (barley straw or maize stover) supplemented with hay or grazing, and investigated seasonal variability. Results suggest a reasonable assumption of voluntary intake for donkeys on such diets is 1.3–1.7% daily of their bodyweight (bwt) in dry matter (DM) depending upon the season (lower value is required in summer) (Carretero-Roque *et al.* 2005; Wood *et al.* 2005). For a 180 kg donkey this equates to 2.5–3.1 kg of DM per day. Example diets are given in **Table 1**. It is worth noting that this DMI is significantly lower than the 2–2.5% recommended for ponies (Anon 2007). For maintenance, donkeys require between 80–95 kJ DE/kg bwt/day with the upper value being required in the winter and again these levels are significantly lower than recommendations for a similar sized pony (c. 140 kJ DE/kg). In reality, donkeys require foodstuffs with low energy values so that they can eat enough to satisfy their natural appetite and need to forage without becoming obese.

Corresponding author email: faith.burden@thedonkeysanctuary.org.uk

TABLE 1: Example diets for mature donkeys fed on fibrous forages with estimated dry matter intakes and practical dietary recommendations. DE values assume a dry matter content of 90% unless otherwise stated, foodstuffs such as haylage should be evaluated for DE levels per kg as fed and if unsure forage analysis is recommended. Feed balancers are proprietary pellet supplements with balanced levels of vitamins, minerals and protein that do not provide significant energy and designed to balance forage only diets

Donkey	MJ, DE/day	Daily DMI requirement	Suggested diet
180 kg donkey maintenance - summer	14.4	2.4 kg	2.1 kg barley straw (5 MJ DE/kg DM) + limited grazing or + 0.5 kg moderate hay (8 MJ DE/kg DM)
180 kg donkey maintenance - winter	17.1	3.1 kg	3 kg barley straw (5 MJ DE/kg DM) + 0.4 kg moderate hay (8 MJ DE/kg DM)
DiETING donkey goal weight 180 kg - summer	13	2.4 kg	2.2 kg barley straw (5 MJ DE/kg DM) + very limited grazing or + 0.2 kg moderate hay (8 MJ DE/kg DM) + feed balancer e.g. Top Spec AntiLam ²
DiETING donkey goal weight 180 kg - winter	15.5	3.1 kg	3.1 kg barley straw (5 MJ DE/kg DM) + very limited grazing or + feed balancer e.g. Top Spec AntiLam ²
180 kg donkey (aged) with dental disease - summer	14.4-15	2.4 kg	2.4 kg short chop hay replacer (7.3 MJ DE/kg DM assuming 85% DM) e.g. Mollichaff Donkey ³ + feed balancer e.g. Top Spec AntiLam ² if required
180 kg donkey (aged) with dental disease - winter	17.1-18	3.1 kg	2.9 kg short chop hay replacer (7.3 MJ DE/kg DM assuming 85% DM) e.g. Mollichaff Donkey ³ = 17.9 MJ + feed balancer e.g. Top Spec AntiLam ² if required

Protein, vitamin and mineral requirements

Studies to establish donkeys' requirements for protein, vitamins and minerals are limited. Preliminary data would suggest that protein requirements are significantly lower than those of horses (Wood 2010). Research suggests crude protein requirements of 40 g CP/100 kg bwt/day; in practice, for most mature healthy donkeys, protein requirements tend to be satisfied once DE requirements are satisfied (Wood 2010). However, provision of additional quality protein to donkeys recovering from surgery or injury may improve recovery times as protein deficiency may limit tissue repair (Frape 2004; Proudman *et al.* 2005). Soya bean meal or alfalfa are excellent sources of digestible protein for convalescent equids.

Recommended vitamin and mineral levels for donkeys have not been established and, generally, appropriate levels of vitamins and minerals are as for horses. For example, care must be taken to balance calcium and phosphorus and to ensure sufficient levels of vitamin supplementation to animals fed primarily on dried forages. Donkeys maintained on dried forages or being fed high levels of oil (>100 ml) may be at risk of Vitamin E deficiency which could increase the risk of equine degenerative myeloencephalopathy (Liu *et al.* 1983; Gandini *et al.* 2004) or equine motor neurone disease (Divers *et al.* 2006), although no evidence is available for donkeys. The levels recommended by the NRC (Anon 2007) as suitable for horses represent an appropriate, optimal level of provision; however, it is the author's opinion, based on practical experience, that donkeys are able to thrive on vitamin and mineral levels lower than those recommended for horses. Provision of adequate vitamins and minerals is best achieved by allowing daily access to fresh grazing with an equine mineral lick or vitamin and mineral supplement or balancer (Smith and Wood 2008);

however, care should be taken when using mineral blocks to ensure individuals do not experience bullying or aversion to such supplements, if concerned, owners are advised to feed a daily supplement.

Body condition scoring and weight estimation

Body condition scoring and monitoring of weight are an essential part of donkey husbandry. Body condition scoring for donkeys and mules requires a different technique to that used in horses as donkeys lay down fat stores in more localised areas and have a different body shape. The donkey has an angular frame alongside a pendulous abdomen which is often incorrectly described as 'pot bellied'. The pendulous abdomen may be due to increased retention of fibre within the gut (Pearson *et al.* 2001) and the related increased volume of the large intestine, abdominal fat or in sedentary animals a slackness of the abdominal muscles. The Donkey Sanctuary has developed a body scoring system for donkeys (**Fig 1**) which provides indicators to look and feel for and equations to allow weight estimation; adult donkeys (weight (kg) = $0.000252 \times \text{height}^{0.24} \times \text{heart girth}^{2.575}$); donkeys <2 years (weight (kg) = $0.000283 \times \text{heart girth}^{2.778}$), all measurements are in cm. When scoring donkeys it is essential to feel the animal; donkeys can have thick coats, especially in winter or when suffering from pituitary *pars intermedia* dysfunction (PPID) and are often deceptive. Areas where fat is commonly deposited include the neck, shoulders, back, rump and barrel as shown in **Figure 2**. Donkeys frequently develop a fatty crest which may fall over to one side of the neck; once *in situ* these deposits rarely disappear even with dieting and should be ignored in a mature animal that is in otherwise good condition. Fat pads are common on the

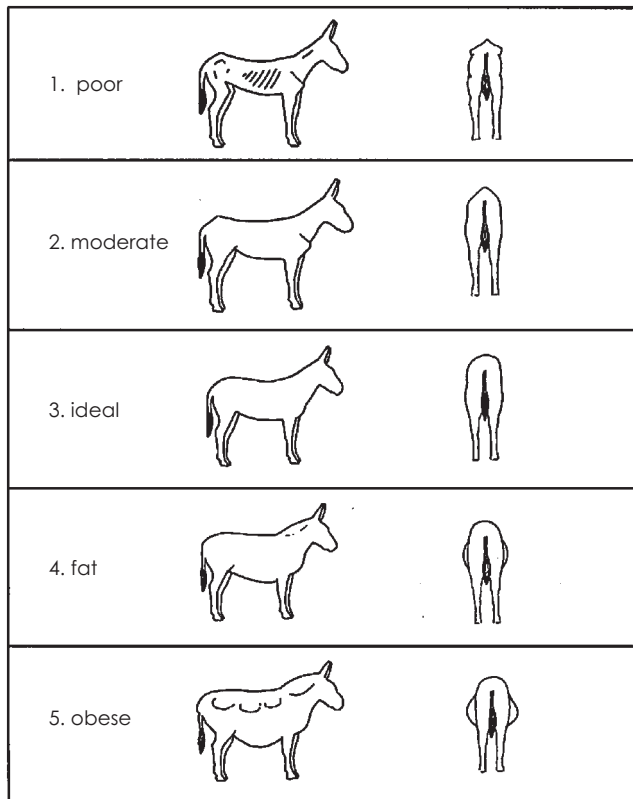


Fig 1: Body condition scoring chart for donkeys, copyright of the Donkey Sanctuary. Further information is available from the Donkey Sanctuary.



Fig 2: An obese mature donkey showing typical fat deposits.

buttocks and barrel as well as significant abdominal fat (up to 8 cm); when such fat pads are longstanding they may become calcified and extremely hard, they will never be lost through dieting and should be ignored when condition scoring. Calcified fat pads are of clinical note, if injured a

lack of blood supply to the area can promote the development of panniculitis which may be difficult to treat (Bell and Thomas 2001). Finally, mules lie somewhere between the horse and donkey with a rump that resembles that of a horse and a barrel and neck which stores fat like a donkey, these differences must be accounted for when condition scoring.

Practical feeding

In temperate climates the most suitable way of providing a low energy diet is straw (barley or wheat). Many veterinarians and owners are reluctant to feed straw to equids due to concerns relating to colic and gastric ulcers. However, studies carried out in a large population of donkeys showed no increased impaction colic (Cox *et al.* 2009) or gastric ulcer risk (Burden *et al.* 2009) associated with such feeding practices in donkeys with healthy teeth. However, care should be taken with donkeys on NSAIDs or those with reduced mobility and dental examinations must be kept up to date. The donkey should also be provided with restricted grazing, hay or haylage and proportions of such forages can be increased for animals struggling to maintain weight; example diets are shown in **Table 1**. Donkeys fed solely on hay or pasture may become obese or have total dietary intake restricted to such an extent that they are at risk of developing gastric ulceration or stereotypies. In addition, a vitamin and mineral balancer may be added and plenty of palatable, clean drinking water.

When feeding donkeys, it is important to consider the surroundings. As donkeys are gregarious animals that form strong bonds, it is often essential to have the friend at least within sight otherwise one or both animals may refuse to eat in spite of their hunger. Another common donkey trait of note is that of sham eating which is frequently seen in sick donkeys (Grove 2008). Donkeys may 'sham eat' for considerable periods of time; the animal appears to mouth and swallow food or may simply nudge it but intakes none. Such behaviour is often a sign of a serious illness and should be investigated promptly. Hyperlipaemia must be considered.

Donkeys may be fed successfully in a group and generally tolerate the presence of other equids well. Dominant donkeys may bully other animals lower in the hierarchy and care should be taken to provide ample feeder space to prevent reduced intake by submissive animals. Further consideration must be given to other animals that may be present whilst donkeys are feeding. Invariably donkeys are bullied at feed time by horses, ponies or mules, and may end up injured or unable to access enough feed to satisfy their requirements.

Inappropriate nutrition

Donkeys are prone to developing conditions such as laminitis, gastric ulceration, hyperlipaemia and fatty liver

disease (Morrow *et al.* 2011). Inappropriate feeding may lead to the development or exacerbation of these problems. Equine feedstuffs based upon cereals or containing high levels of molasses should be strictly avoided as they have been shown to be risk factors for the development of gastric ulcers (Burden *et al.* 2009) and laminitis (Crane 2008) in donkeys and other equids. The practice of intermittent 'meal' feeding is also to be discouraged as it is likely to produce peaks in insulin or increases in gastric pH. Such practices have been associated with hyperlipaemia, gastric ulcers and impaction colic in the donkey (Burden *et al.* 2009, 2010; Cox *et al.* 2009). When managing animals that require extra condition, it is important to encourage increased energy intake throughout the day by providing, for example, higher quantities of hay in the ration or a short-chopped fibre product.

Practical feeding for problem donkeys

The majority of donkeys manage very well on basic rations; however, there are cases which require specialist feeding.

Underweight donkeys

Before dietary changes can be made, a thorough clinical assessment should be carried out. Observation of feeding behaviour, assessment of feeding practices, a thorough dental examination and obtaining a blood sample should all be performed. Blood samples should be used to assess the overall health of the donkey with particular attention being paid to parameters relating to liver and kidney function, PPID and equine metabolic syndrome (EMS). Parasite control should be assessed but should not be relied upon to explain poor body condition. Commonly, dental disease (Du Toit *et al.* 2008), liver disease (Morrow *et al.* 2011) or companion issues are apparent in donkeys with low body condition.

Dental disease

Dental disease is common in donkeys, particularly geriatrics (Du Toit *et al.* 2008), and this often leads to an inability to chew long fibre forages, causing gradual weight loss and associated depression and lethargy; in serious cases, dental pain can lead to a donkey becoming inappetant and predisposed to hyperlipaemia (Burden *et al.* 2010). It is essential to replace long fibre forages with alternative fibre sources that can be easily chewed and digested. Short-chopped products designed for laminitic equines are suitable and many of the low energy products can be used to replace all fibre sources. Chops should be provided frequently throughout the day and be fed to DMI requirements. Feeding of such products *ad libitum* may lead to gorging in the short term; however, intake is often self regulating after a few weeks. For donkeys that don't require such drastic

changes, small, frequent offerings of high fibre nuts and unmolassed sugar beet are ideal feeds to be given alongside forage.

Liver and kidney disease

For donkeys suffering from liver or kidney disease, dietary management is essential. The aim for the donkey with liver disease is to provide a diet low in protein resulting in reduced ammonia production. Such donkeys should be maintained on a diet with <8% protein, a requirement easily met by grass hay, straw and pasture; the feeding of alfalfa or cereal based feeds is inappropriate. Levels of fat within the diet should be controlled and the feeding of supplementary oil is discouraged. For donkeys requiring supplementary feeding, short-chops, unmolassed beet pulp and high fibre cubes are suitable. Kidney disease patients should have a diet low in calcium and protein (<8%) and, where possible, should be maintained on hay and pasture. Legumes such as alfalfa and clover containing high levels of protein and calcium should be avoided. If required, extra energy can be supplied in the form of high oil supplements. Feed balancers designed for native ponies are also useful in such cases.

Nutritional management of the inappetant donkey

Donkeys are particularly prone to developing the frequently fatal disease hyperlipaemia; with this in mind, sensitive nutritional management of the donkey patient is essential.

Donkeys with some voluntary appetite

Many donkey patients will maintain a good appetite and should be provided with a diet similar to that provided in the home. Hospitals may provide straw if this is what the donkey is accustomed to and caution must be exercised with patients on NSAIDs and with limited mobility. In such cases, evaluation of faecal output and gut sounds should be frequently assessed. Research has shown that the most frequent presenting signs when dealing with sick donkeys are inappetance or anorexia (Duffield *et al.* 2002; Cox *et al.* 2008), often accompanied by dullness or lethargy. These signs should prompt a blood sample which should be assessed for elevated triglycerides (triacylglycerols); donkeys identified as hypertriglyceridaemic or hyperlipaemic require prompt treatment (Grove 2008). Nutritional management of sick donkeys often focuses upon the need to stimulate the donkey's appetite and, although molasses and cereal mixes can be used successfully in the short term, they can be detrimental in the long term. Many donkeys can be tempted with fibrous equine feeds by adding tempters such as those described in **Table 2**.

TABLE 2: Tempting additions to encourage appetite in sick donkeys

 Tempters to add to feeds for inappetent donkeys

Peppermint cordial	Yeast extracts
Dried/fresh mint	Bananas; particularly the skin
Ginger; grated or powder	Fruit juices; cherry, apple, carrot
Carrots and apples; grated or chopped	Unmolassed beet pulp (soaked)

Whilst nursing a sick donkey, tempt the animal to eat from the hand as large buckets are often refused. It is important not to underestimate the donkey's natural instinct as a browser, particularly in the case of sick animals. Donkeys that have shown no interest in food may be tempted to eat if led to a nearby hedgerow to browse on brambles and herbs; this natural instinct can often be used successfully in the worst of cases. Attention must also be paid to the natural feeding behaviour described previously, and consideration given to ensuring the sick donkey's companion is close by, even within a hospital setting.

Donkeys without voluntary appetite

When administering treatment by nasogastric tube or oral drenching, the potential for exacerbating or predisposing to hyperlipaemia through resultant stress must be balanced with the clinical needs of the patient. When administering fluids by nasogastric tubing, provision of sufficient potassium should be ensured as it is rapidly excreted and insufficient levels may lead to ileus. Inclusion of 1 g potassium chloride in every litre of fluids should be sufficient, alongside normal tubing preparations. Patients should be fed with a fibre rich product and the addition of pre- and probiotics is beneficial. Finally, consideration should be given to the administration of gastric protectants. In hyperlipaemia cases parenteral nutrition may be indicated and such treatment should begin as rapidly as possible (Durham 2006).

Obesity, laminitis and equine metabolic syndrome

Obesity is a significant welfare problem and may predispose to a number of diseases (Morrow *et al.* 2011). Recent studies have shown that obese donkeys have higher insulin values which, in turn, are significantly associated with a history of laminitis (Du Toit and Trawford 2010). Such results may indicate that obesity and associated hyperinsulinaemia may increase the risk of a donkey developing laminitis, particularly that associated with grazing (Asplin *et al.* 2007). Equine metabolic syndrome (EMS) as characterised by obesity or regional adiposity, insulin resistance and a propensity to develop laminitis is not described in the donkey but ongoing work at

the Donkey Sanctuary would suggest that donkeys are prone to developing this disease. Dietary management of such donkeys is challenging.

Dietary management of obese donkeys

Dieting overweight donkeys is difficult and requires veterinary input at all stages. The diet of the animal is often only an element of the problem with lack of exercise, companion issues and EMS all requiring consideration. A blood sample to check triglycerides (triacylglycerols), insulin and glucose levels should be taken to inform dietary and management changes. A dental examination and assessment of the donkey's ability to tolerate exercise should also be made. Donkeys with high triglycerides ($2 < 4$ mmol/l) should have an exercise programme initiated before dietary changes are made, once levels fall to satisfactory levels dietary changes may be introduced. Donkeys with EMS may be suitable for treatment with Metformin¹ (15–30 mg/kg bwt b.i.d.) and studies have shown success in obese ponies (Durham *et al.* 2008) and (A. Thiemann *et al.* 2011) unpublished data in donkeys also support its use. Dietary management for obese or laminitic animals or those with EMS that have healthy teeth should focus on straw with very limited grazing in the summer, and straw with limited hay in the winter (see **Table 1**). If there are concerns about deficiency, proprietary vitamin, mineral and protein supplements may be fed in small quantities. Pasture must be restricted by strip grazing and owners must be encouraged to be guided more by reducing the area of pasture the donkey has available rather than the grass that they can see; a guide of < 0.2 acre (< 0.08 ha) per donkey of short cropped pasture is reasonable, and benefits from rotation and no less than a total of 0.5 acres (0.2 ha) per donkey should be available. Evidence suggests that fructan levels in grass may only rarely be sufficient to trigger ration induced laminitis due to disrupted fermentation in the hind gut but rather that high nonstructural carbohydrate (NSC) (simple sugars, starch and fructan) levels in grass may lead to increased insulin resistance and the development of endocrine-related laminitis. Nonstructural carbohydrate levels can be high in lush grass but also in frosty grass and grass stressed by drought or overgrazing; therefore, the priority must be to maintain a healthy grass sward. Management by reduction of time at grazing has been shown to have little effect upon the total dietary intake of donkeys (Smith and Pearson 2005) and may lead to them spending every minute at pasture eating rather than exercising and carrying out social behaviours; this is often followed by long periods of confinement which only exacerbates the issue. In order to encourage donkeys to lose weight, they should be exercised whenever possible.

Donkeys and mules should be condition scored and have their weight estimated weekly. Progress when dieting donkeys is slow, and perseverance is important and it often takes weeks for the first amounts of weight to be lost;

however, once this process begins, weight loss should be gradual with goal losses of 2–3% of bodyweight monthly.

Laminitic donkeys

In the acute stages of laminitis it is essential to remove any contributory dietary issues; the donkey should be removed from pasture and given a high fibre, low NSC diet. It is essential to maintain fibre intake as starvation of the donkey is likely to result in a hyperlipaemic laminitic which is disastrous. Straw may be fed but, with decreased mobility, checks must be maintained on gut sounds and faecal output. Alternatively, a short-chopped forage with an NSC level of <10% is ideal to maintain the animal in the short term. Hay may be fed but the clinician should be aware that NSC levels in some hay is high and may be inappropriate. To encourage water intake, haylage can be suitable, but a high fibre product with declared NSC content should be used; sugar levels are often lower in haylage than hay due to fermentation. Finally, sloppy feeds of unmolassed beet are useful to encourage water intake and assist with the administration of drugs. Long-term management of the chronic laminitic is as that for obese animals. Every donkey is prone to laminitis and, as such, all feeding regimes described in this article are suitable for laminitics.

Feeding for pregnancy and lactation

Nutrient requirements for pregnancy and lactation in the donkey have yet to be established, so guidelines extrapolated from horse data should be treated as

estimates only. Pregnant jennies should be fed as normal in the early stages of pregnancy with the addition of a vitamin and mineral supplement if not already being fed (in particular, copper levels should be adequate as evidence correlates deficiency with foal birth deformities) until the final trimester when nutrient requirements rise significantly (suggested diets are given in **Table 3**). In the final trimester, the jenny will have a greater energy requirement, and it is vital to supply quality protein, vitamins and minerals as the foal grows. In order to supply these nutrients, the energy density and quality of forages must be increased. The jenny should have the hay portion of the diet gradually increased until it is forming the majority of the diet. A stud balancer containing vitamins, minerals and protein, but with low NSC levels as designed for native ponies, should be fed at 75% of the levels recommended for ponies of a similar size. If good quality hay is not available, supplementation with alfalfa or unmolassed beet pulp is useful. During pregnancy, digestive tract capacity will decrease which may lead to the jenny being unable to satisfy the energy requirements of herself and the foal. This may leave jennies predisposed to hyperlipaemia and care should be taken to ensure energy requirements are met. A slight increase in condition before foaling is acceptable (BCS 3.5–4) to allow for expected weight loss in the early stages of lactation. Whilst lactating, the jenny should receive adequate, good quality pasture and hay; supplementation with a stud balancer, alfalfa chops or high fibre cubes may also be necessary (suggested diets are shown in **Table 4**). Hyperlipaemia is also a concern with the lactating jenny and owners must be mindful of changes in appetite and provision of adequate feed. The foal should be allowed to pick at the

TABLE 3: Dietary suggestions for pregnant jennies in the final 3 months of pregnancy. DE values are estimates and assume a dry matter content of 90% unless otherwise stated, foodstuffs such as haylage should be evaluated for DE levels per kg as fed and if unsure forage analysis is recommended. Stud balancer refers to a concentrated pellet vitamin, mineral and protein supplement which does not act as a significant source of energy and which is designed to balance a forage only diet

Donkey weight (prepregnancy)	MJ, DE/day	Daily DMI requirement	Suggested diet
180 kg - summer 9 months gestation	16.7	2–2.4 kg	1.1 kg barley straw (5 MJ DE/kg DM) + grazing and stud balancer or + 1.3 kg moderate hay (8.5 MJ DE/kg DM) and stud balancer
180 kg - summer 10 months gestation	17.4	2–2.4 kg	0.4 kg barley straw (5 MJ DE/kg DM) + 1.8 kg moderate hay (8.5 MJ DE/kg DM) + stud balancer
180 kg - summer 11 months gestation	18.6	2–2.4 kg	2.2 kg moderate hay (8.5 MJ DE/kg DM) + stud balancer + grazing <i>If hay is not managed supplement with high fibre cubes, alfalfa chop or unmolassed sugar beet</i>
180 kg - winter 9 months gestation	19.8	2.5–3.1 kg	1 kg barley straw (5 MJ DE/kg DM) 1.7 kg moderate hay (8.5 MJ DE/kg DM) + stud balancer
180 kg - winter 10 months gestation	20.7	2.5–3.1 kg	2.2 kg moderate hay (8.5 MJ DE/kg DM) 0.4 kg barley straw (5 MJ DE/kg DM) + stud balancer
180 kg - winter 11 months gestation	22.1	2.5–3 kg	2.5 kg moderate hay (8.5 MJ DE/kg DM) + 200 g alfalfa chop (9 MJ DE/kg DM) + stud balancer

TABLE 4: Dietary suggestions for lactating jennies. DE values are estimates and assume a dry matter content of 90% unless otherwise stated, foodstuffs such as haylage should be evaluated for DE levels per kg as fed, if unsure forage analysis is recommended. Stud balancer refers to a concentrated pellet vitamin, mineral and protein supplement which does not act as a significant source of energy and which is designed to balance a forage only diet

Donkey weight (prepregnancy)	MJ,DE/ day	Daily DMI requirement	Suggested diet
180 kg lactation 1st month (summer)	27.5	2.4–3 kg	2.4 kg good hay (9 MJ DE/kg DM) + grazing and stud balancer or 0.3 kg alfalfa oil chop (11.2 MJ DE/kg DM) and stud balancer
180 kg lactation 2nd month (summer)	27.3	2.4–3 kg	2.6 kg good hay (9 MJ DE/kg DM) + grazing and stud balancer or 0.2 kg alfalfa oil chop (11.2 MJ DE/kg DM) and stud balancer
180 kg lactation 3rd month (summer)	26.5	2.4–3 kg	2.6 kg good hay (9 MJ DE/kg DM) + grazing and stud balancer or 0.15 kg alfalfa oil chop (11.2 MJ DE/kg DM) and stud balancer
180 kg lactation 4th month (summer)	25.5	2.4–3 kg	2.6 kg good hay (9 MJ DE/kg DM) + grazing and stud balancer or 0.1 kg alfalfa oil chop (11.2 MJ DE/kg DM) and stud balancer
180 kg lactation 5th month (summer)	24.5	2.4–3 kg	2.5 kg good hay (9 MJ DE/kg DM) + grazing and stud balancer or 0.1 kg alfalfa oil chop (11.2 MJ DE/kg DM) and stud balancer
180 kg lactation 6th month (summer)	23.6	2.4–3 kg	2.4 kg good hay (9 MJ DE/kg DM) + grazing and stud balancer or stud balancer
180 kg lactation 1st month (winter)	30.2	2.7–3.1 kg	3 kg good hay (9 MJ DE/kg DM) + grazing and stud balancer or 0.3 kg alfalfa oil chop (11.2 MJ DE/kg DM) and stud balancer
180 kg lactation 2nd month (winter)	30	2.7–3.1 kg	3 kg good hay (9 MJ DE/kg DM) + grazing and stud balancer or 0.2 kg alfalfa oil chop (11.2 MJ DE/kg DM) and stud balancer
180 kg lactation 3rd month (winter)	29.2	2.7–3.1 kg	3 kg good hay (9 MJ DE/kg DM) + grazing and stud balancer or 0.15 kg alfalfa oil chop (11.2 MJ DE/kg DM) and stud balancer
180 kg lactation 4th month (winter)	28.2	2.7–3.1 kg	3 kg good hay (9 MJ DE/kg DM) + grazing and stud balancer or 0.1 kg alfalfa oil chop (11.2 MJ DE/kg DM) and stud balancer
180 kg lactation 5th month (winter)	27.2	2.7–3.1 kg	2.8 kg good hay (9 MJ DE/kg DM) + grazing and stud balancer or 0.1 kg alfalfa oil chop (11.2 MJ DE/kg DM) and stud balancer
180 kg lactation 6th month (winter)	26.3	2.4–3 kg	2.6 kg good hay (9 MJ DE/kg DM) grazing + stud balancer

jenny's feed in preparation for weaning. In general, donkey foals are weaned at approximately 6 months old but individuals will vary.

During the lactation period it is advisable to monitor the foal's growth rate every 2 weeks. Foals should grow steadily and weight and condition should be monitored weekly. If growth is too rapid or stunted, the foal may need restricting (with appropriate vitamin and mineral supplementation) or may need supplementary feeding and expert advice should be sought.

Conclusions

The donkey is supremely adapted to survive on fodder which would simply be inadequate for other equines.

Knowledge of the difference between donkeys and their horse cousins is vital when managing them to avoid disease and behavioural issues. The donkey's ability to digest highly fibrous forages has led to an animal able to survive in the most inhospitable places and unfortunately when living in temperate areas where it is now so frequently kept as a pet this presents challenges. The donkey should be fed a diet high in fibre and low in energy and nonstructural carbohydrates which is best supplied using straw and moderate quality hay and grazing. Dietary management of the donkey is essential to avoid health issues and should be seen as the foundation of a healthy animal. Further information relating to donkey and mule nutrition is available from the Donkey Sanctuary.

Author's declaration of interests

No conflicts of interest have been declared.

Manufacturers' addresses

¹Approved Prescription Services, Leeds, UK.

²Top Spec Equine Ltd., Thirsk, UK.

³Mark Westaway & Son, Paignton, TQ3 1SP.

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