

Therapeutics in veterinary care of the donkey

Knowledge of donkey-specific disease presentation, behaviour, anatomy and physiology is beneficial when choosing appropriate medications and routes of administration in this species. While many selected therapeutic agents will be the same as those used in the horse, being aware of certain nuances will ensure that the donkey receives the best possible care. Clinicians and owners alike may benefit from drug administration tips. As there are limited drugs licensed for use in the donkey, use of the prescribing cascade is usually warranted. This article mentions the use of therapeutics in mules where appropriate.

<https://doi.org/10.12968/ukve.2023.7.1.32>

Rebekah Sullivan BVSc PgCertVPS Cert AVP (EM), Lead Veterinary Surgeon in Medicine, Veterinary Department; **Polly Vogel** BSc BVSc MRCVS, Veterinary Surgeon, Veterinary Department, The Donkey Sanctuary, Sidmouth, Devon. rebekah.sullivan@thedonkeysanctuary.org.uk

Key words: donkeys | therapeutics | administration | health | medication | mules

There are over 44 million donkeys globally (The Donkey Sanctuary, 2022) and a large number exist in the UK as pets, companions and working animals. Knowledge about the veterinary care of donkeys, including medication use, weight assessment and consideration of specific behaviours, is important for ensuring optimum health and welfare.

There are limited medications licensed for donkeys in the UK and many drug dosages are extrapolated from horses, so medicines may need to be prescribed under the cascade (UK Government, 2021). Donkeys are considered food-producing animals in the European Union and they are prescribed prohibited substances or those on the essential substance list (part II of section IX) this must be completed on the animal's passport.

Dose rates, ranges and dosing intervals may be different with donkeys in comparison to horses, and can even vary within the species, and there is limited data to aid with therapeutic decisions (Grosenbaugh et al, 2011).

Accurate analysis of a donkey's weight to calculate drug doses can be challenging, as appearance and body condition scores (BCS) can be deceptive. Thicker hair coats, particularly in the winter months, may obscure the true size of the donkey. While weighing scales may be easily accessible in a clinic setting, in ambulatory practice, clinicians should make use of donkey-specific weight estimation guides, as horse weight tapes are not suitable. A guide to condition scoring and weight estimation in a standard size donkey can be found at <https://www.thedonkeysanctuary.org.uk/sites/uk/files/2018-12/condition-scoring-and-weight-estimation-of-the-donkey-20181211.pdf> (The Donkey Sanctuary, 2018).

Donkeys are notorious for stoical behavioural tendencies. In practice, this may manifest as masking of subtle signs of disease. A donkey that is overtly clinically unwell, or even simply presenting with a change in behaviour and appetite, should be taken seriously and seen sooner rather than later. While many donkeys are beloved

pets, it is not uncommon to be presented with a donkey that receives little regular handling. In such cases, careful consideration of appropriate routes of administration and owner capability and adherence will need to be made when selecting drugs.

Donkeys are usually strongly bonded to a companion and separating them for any length of time risks undue stress and hyperlipaemia. Plans for drug dosing regimes should seek to avoid such separation. When intending to place long stay catheters, or sub-palpebral lavage systems for example, be aware that a well-meaning companion donkey may try to remove them. Staff at the Donkey Sanctuary have managed such cases by separating companions over a partition so that they remain in full visual contact.

When assessing the clinical presentation of a donkey and when monitoring response to administered analgesia, the difference in basic physiological parameters from the horse should be noted (*Box 1*).

This article discusses the basics of therapeutics in donkeys to aid routine first opinion and referral practice in the UK. Drug dos-

Box 1. Normal reference ranges for temperature, pulse, respiration and blood results in the donkey

- Heart rate: 36–52 beats per minute
- Respiratory rate: 12–28 breaths per minute
- Rectal temperature: 36.5–37.8°

When analysing blood samples, donkey and mule-specific reference ranges should be used where available. The Donkey Sanctuary laboratory haematology, biochemistry, basal adrenocorticotrophic hormone and insulin reference ranges can be found at: <https://www.thedonkeysanctuary.org.uk/sites/uk/files/2020-02/parameters-for-haematology-and-biochemistry.pdf>

ages for commonly prescribed medications are included. If there is no peer-reviewed evidence base, the dosages given are based on the experience of The Donkey Sanctuary's veterinary team. Detailed descriptions of drug dosages for specific indications is outside the scope of this article and the reader is signposted to other references for further information.

Pharmacology

Donkeys and mules have evolved to survive in an arid desert environment, with different body water compartmentalisation and greater water conservation efficiency through intestinal water conservation and reduced urine output compared to horses. These physiological adaptations may impact the pharmacokinetics and dynamics of therapeutic agents. The hepatic metabolism of certain drugs is more rapid in donkeys than horses (Grosenbaugh et al, 2011). Furthermore, a longer gut transit time and increased feed efficiency may affect drug absorption (Thiemann and Sullivan, 2019).

Mendoza et al (2019) described allometric scaling and its relevance in donkeys. Allometric scaling refers to the concept that basal metabolic rate is negative to body mass so, in summary, altered basal metabolic rates and body water distribution in donkeys are likely to impact the validity of extrapolating drug dosages from horses. In practical terms, many medications will need to be dosed more often as they have faster clearance, with care being taken to ensure that toxic doses are not reached. It is typically the dosing interval, rather than the dosing quantity, that requires altering.

Handling and medication administration

It is not uncommon for donkeys to be unused to handling, which can precipitate difficulties in administering medications. Donkeys are adept at pivoting and compressing handlers against a hard surface such as a stable wall. Spending some time demonstrating handling techniques to an owner is time well spent. When administering any form of injection, the donkey should have a head collar on and be held by a confident handler. Use of an ear twitch is unacceptable and inhumane. In some circumstances a nose twitch may be used as a last resort, but responses to their use are variable and therefore not recommended. Although many donkeys are considerably shorter and less heavy than their horse counterparts, they are still capable of inflicting injury and the use of hard hats should be considered where owner or clinician safety is at risk. Mules carry a further risk, particularly given that knowledge and understanding of working with these animals can be limited.

Anatomically, donkeys typically have smaller muscle masses than horses and ponies, so care should be taken when administering large volumes of intramuscular medications. The pectoral muscles should not be used, as the muscle mass here is considerably smaller than in a horse and can be very painful when injected into. Where several intramuscular injections are required over a period of days, the site should rotate around the body to include both sides of the neck and rump.

Donkeys have a thick cutaneous colli muscle which can conceal the jugular groove, making intravenous injections harder than in horses. Clipping of the coat, using the upper or lower third of the jugular groove and careful palpation of the site before intravenous

drug administration is important to avoid inadvertent subcutaneous or intra-arterial injection.

Oral medications, including tablets and powders, may be given in a feed. Staff at The Donkey Sanctuary have significant success with giving medications in a bread 'sandwich' using marmite or jam as a filler. For those animals that refuse a sandwich with bread, ginger biscuit sandwiches can also be very successful. Care needs to be taken to not give too many sugary treats when an animal is on long-term medication. In the short term, if a donkey refuses all offers of medication via feed or sandwiches, then drenching will likely be necessitated, as for other equids. As donkeys are at greater risk of stress-induced hyperlipaemia, the risks vs benefits of any drenched medications will need to be considered. In the case of anthelmintics, a one off drench is deemed preferable to hiding the product in feed in order to ensure the correct dose for weight is administered.

Preventative care

Donkeys and mules should receive annual veterinary checks and be part of a practice vaccination scheme. Donkeys can be very susceptible to equine influenza. Influenza and tetanus vaccinations should be given as per manufacturer recommendations for horses.

As with all equids, a tailored faecal worm egg count monitoring and de-worming protocol should be part of the routine care of donkeys and mules. Ivermectin, fenbendazole and pyrantel are the only licensed anthelmintics in the UK for donkeys currently. Other anthelmintics have been used off-licence. In line with good anthelmintic stewardship, donkeys should only be treated if there is clinical need, and as an adjunct to other preventative care measures including pasture management. Bell et al (2021) reviewed endoparasite control in donkeys. A specific difference in dosage from horses was found with flukicides:

- Triclabendazole 18mg/kg bodyweight per os, or if ineffective;
- Closantel 20mg/kg per os (repeated after 8–10 weeks as adulticide only).

Follow-up fluke egg checks are advised as a result of growing resistance issues.

Analgesia

Donkeys have traditionally been classed as stubborn, which is a common misunderstanding of their stoicism; a characteristic of a prey species used for successful predator avoidance. Clinical signs of pain or the true extent of an illness may be masked until the donkey is in advanced stages of a disease, or in extreme pain. The stress of untreated pain can precipitate poor recovery from illness or surgery, and risks hyperlipaemia. Too many donkeys and mules are either underdosed with analgesia or given none at all. Donkeys and mules undergoing routine surgical procedures such as castration must always be given perioperative analgesia.

Assessing and managing pain with appropriate medication is vital. Pain scoring is implemented in all inpatients and cases at The Donkey Sanctuary and such scoring systems are useful for monitoring response to analgesia. van Dierendonck et al (2020) described a validated facial and composite pain scoring system for assessing acute pain in donkeys. van Loon et al (2021) discussed the use of a donkey-specific chronic pain scale and the reader is directed to this reference for further information.

Table 1. Therapeutics in donkeys

Drug	Dose	Route/s	Comments
Phenylbutazone	2.2mg/kg twice daily	Intravenous, per os	Miniature donkeys may require dosing at 8-hour intervals owing to their even more rapid metabolism
Flunixin	1.1 mg/kg twice daily	Intravenous, per os	Used frequently for analgesic purposes in donkeys and mules, especially in acute dental, ocular and gastrointestinal conditions, as well as perioperatively. Clinicians should be particularly aware of masking worsening clinical signs with flunixin use in donkeys, especially if using for longer than 3 days, although the smaller weight of donkeys can make use of flunixin oral medication more affordable
Paracetamol	20–25 mg/kg twice daily	Per os	Useful adjunct in particularly painful cases
Meloxicam	N/A	N/A	Not currently advised for use in donkeys by the authors, owing to a suspected short half life and rapid metabolism, reducing its efficacy in this species
Carprofen	0.7–1.3mg/kg once daily	Per os	Useful for managing long-term osteoarthritis pain and/or when struggling with compliance of twice daily dosing. Carprofen is metabolised more slowly and only given every 24 hours. The authors use 50mg tablets prepared for the small animal market, as the average standard size donkey found in the UK typically weighs 150–200kg. Clinicians must ensure that they use non-flavoured tablets, rather than the meat-flavoured ones that are sometimes prescribed to improve palatability for canine patients
Firocoxib	As for horses	As for horses	Has been shown to have good oral bioavailability but rapid clearance in donkeys, hence frequent dosing intervals may be indicated (Mendoza et al, 2019)

A number of different non-steroidal anti-inflammatory drugs (NSAIDs) routinely used in equine medicine are equally valid in donkeys. The key is to be aware of differing drug interval requirements (Table 1).

When using NSAIDs for long-term pain management, regular pain scoring and quality of life discussions should be held with owners. Medication reviews should include an assessment of the whole donkey, not just the area of focus.

As in horses, opioids are used for perioperative analgesia and as part of multimodal pain relief management. Butorphanol, buprenorphine and morphine have all been used at standard equine doses. Fentanyl patches have not been met with consistent success at The Donkey Sanctuary, owing in part to the difficulty in adhering the patches to donkey skin and the risk of patches being removed by an inquisitive companion.

Sedation and anaesthesia

Several detailed reviews of sedation and anaesthesia in the donkey and mule have been written and these should be referred to for in depth information (Evans and Crane, 2018; Matthews and van Loon, 2019). Salient points are given below:

- Donkeys can be successfully sedated with a combination of alpha-2-agonists and opioids via the intravenous route using the same doses as in horses
- Be aware that mules may require a larger initial dose relative to body weight. A rule of thumb is to estimate a 30–50% increase in the dosage
- Correct handling allows for successful sedation but with a particularly nervous or needle-sensitive donkey or mule, oral sedation may need to be given by the owner before the vet arrives to minimise fear and enhance sedation efficacy
- Alternatively, intramuscular dosages may be given if intravenous access is challenging. This will often allow sedation to be ‘topped up’ intravenously once the animal is more relaxed

- A key take home message is that sedatives and induction agents, including ketamine, are usually metabolised more quickly in donkeys (even more so in miniatures), so the ‘top up’ interval is likely to be shorter. It is crucial that the clinician monitoring anaesthesia is aware of this
- Donkeys appear to have greater sensitivity to guaiphenesin but metabolise it more quickly. Guaiphenesin-ketamine-xylazine combinations can be very useful for practical field anaesthesia maintenance (Matthews and van Loon, 2019), but the clinician should be familiar with monitoring guaiphenesin anaesthesia and calculate the toxic dose based upon the (typically) smaller weight of a donkey.

Trazodone and fluoxetine are widely used in small animal practice and are gaining interest in equine medicine for the alleviation of anxiety in animals undergoing stressful procedures and for generalised fear. These drugs may be beneficial for donkeys and offer them an improved emotional experience when undergoing veterinary procedures. However, there is no data on their efficacy or safety in this species.

Antimicrobials

As for any species, use of antimicrobials should be conserved to those cases where there is high clinical suspicion of a bacterial aetiology and, where possible and appropriate, cytology and culture and sensitivity testing should be used. Indications for antimicrobial use and dosing do not differ significantly from those in other equids.

The effect of antimicrobials, orally or systemically administered, on the gut microflora has not been extensively studied in donkeys. However, research has indicated that the gut flora of donkeys differs from that of horses (Edwards et al, 2020). Consequently, the use of probiotics designed for horses cannot be extrapolated to donkeys. Where dysbiosis is a concern, there is likely some merit in considering transfaunation from another donkey, rather than relying on commercially available preparations.

Topical medications

Topical medications are most frequently required for the treatment of ocular pathologies in the donkey. While there are few differences in terms of drug selection, handlers should be aware of the challenges in administering ocular medication. Some donkeys may not even be used to having a head collar placed. A useful technique for supporting the donkey's head and applying eye drops is shown in *Figure 1*.

Management of certain skin conditions may also necessitate topical drug application, the most common indication being the treatment of certain types of sarcoids. It is very important to clip a wide margin around the area of treatment, to prevent inadvertent distribution of drug in the long hair coat. Clipping also has the advantage of revealing any further local skin pathology.

Treatment of endocrine disease

Research into the clinical presentation and management of pituitary pars intermedia dysfunction in donkeys is ongoing. As with horses, where laboratory test results and clinical signs are indicative of a pituitary pars intermedia dysfunction diagnosis then treatment with pergolide may be instigated. Owners should be counselled to remain vigilant for changes in appetite or behaviour, particularly during the first few weeks to months of therapy, as donkeys appear to have an increased tendency to become inappetent with pergolide therapy, in the authors' experience. Blood triglyceride levels should be checked if there are any concerns.

Equine metabolic syndrome does also appear to be present in the donkey and mule population, with regional adiposity, laminitis and obesity present in suspected cases with either elevated basal insulin or elevated insulin post-Karo light syrup administration. The authors advise that careful diet control and encouragement of exercise should be the focus of treatment. It is important to address any issues of discomfort arising from foot or joint pain to encourage better compliance with increased exercise.

Many owners, and indeed clinical staff, may be unaware of the differing nutritional requirements of the donkey. Donkeys are extremely efficient at extracting nutrition from their diet and the average healthy animal does not require energy dense feedstuffs. Donkeys with adequate dental function should have ad-lib access to straw, with straw making up 50–75% of forage intake, supplementing with grass or hay depending on the grazing season. See <https://www.thedonkeysanctuary.org.uk/what-we-do/knowledge-and-advice/for-owners/feeding-your-donkeys> for further nutritional information.

Similarly, many owners are perplexed with how to exercise a donkey. Initially, ensuring that a donkey is trained to use a head collar and lead rope and can be led on short walks on a daily basis, is a good start. Providing a stimulating environment to explore may also encourage greater mobilisation, provided that no poisonous or energy rich plants may be accessed.

Miscellaneous

Immunomodulating drugs such as corticosteroids and azathioprine have been prescribed for use in donkeys and mules where clinical need has indicated. At the time of writing, use of such medications is not known to be different from that in the horse. While some don-



Figure 1. Examples of handling positions for safe administration of topical eye medication.

keys seem to tolerate inhalers well, use of inhaled medications in the management of lower airway disease may be facilitated in head shy or nervous donkeys by the use of a nebuliser (*Figure 2*).

The use of oral proton pump inhibitors such as omeprazole, for the management of gastric ulcer disease needs to be carefully considered, as it is not appropriate to withhold feed from a donkey for the >8 hours required to achieve an empty stomach for maximum drug efficacy. Use of intramuscular omeprazole preparations has recently started at The Donkey Sanctuary, but there have been no formal studies to assess the efficacy.

Coping with management changes

Management changes that are required as a result of veterinary treatment, such as short-term box rest for laminitis, can be particularly challenging with donkeys and mules. One of the main concerns is the increased risk of stress. If increased stress reduces appetite then the risk of hyperlipaemia is heightened. Therefore, it is important to make owners aware of the risks of management changes and signs of hyperlipaemia. Cases of colitis have also been seen in donkey patients that have had substantial management changes and it is proposed that gut dysbiosis may be a contributing factor.



Figure 2. Use of a nebuliser in a donkey.

Where possible, ensure that the donkey has access to their usual foodstuffs and that food intake is carefully monitored. Of course, cases of acute laminitis need to have their food rations carefully controlled when on box rest, as for any equid – the take home message is keep things the same but reduce the quantity if necessary. Hand-picked grass or soaked nuts can encourage donkeys to eat. It is advisable to check serum triglyceride levels if donkeys have not been eating and/or if there are concerns relating to demeanour and behaviour. As it is essential that any bonded companions are kept with the donkey patient, they will also need close monitoring for behavioural and appetite changes. Encouraging clients to discuss how their donkeys are coping with the changes regularly will ensure subtle signs of stress are picked up more rapidly. If pain management is a concern, then pain scoring can be discussed and demonstrated with the client and they can be actively encouraged to do this daily and update the practice, or organise a visit if the score goes above an agreed level.

Providing daily or changeable enrichment, such as giving them wellington boots or straw stuffed hard plastic ‘treat’ balls, can support donkeys who have had a large management change and provide benefit to their mental wellbeing. Encouraging clients to spend time grooming or being with their donkeys may also reduce stress levels and boredom. See <https://www.thedonkeysanctuary.org.uk/what-we-do/knowledge-and-advice/for-owners/environment-enrichment> for further detail and enrichment ideas.

Conclusions

Donkeys and mules can require medication for a variety of disease processes. Knowledge of donkey-specific physiology, anatomy and behaviour can greatly improve the efficacy of medications in these species and compliance with drug dosing regimes from owner and patient alike. Large knowledge gaps remain in the pharmacokinetics and dynamics of many commonly used therapeutics. The recognition, management and treatment of pain in the donkey is becoming well documented and it is critical to ensure adequate analgesia in this species to reduce complications such as fear, distress and hyperlipaemia. **EQ**

References

- Edwards JE, Schennink A, Burden F et al. Domesticated equine species and their derived hybrids differ in their fecal microbiota. *Anim Microbiome*. 2020;2(1):8. <https://doi.org/10.1186/s42523-020-00027-7>
- Evans L, Crane M. Sedation, anaesthesia and analgesia. In: *clinical companion of the donkey* (1st edn). Leicestershire: Troubador Publishing Ltd; 2018.
- Grosenbaugh DA, Reinemeyer CR, Figueiredo MD. Pharmacology and Therapeutics in donkeys. *Equine Vet Educ*. 2011;23(10):523–530. <https://doi.org/10.1111/j.2042-3292.2011.00291.x>
- Matthews N, van Loon JPAM. Anesthesia, sedation, and pain management of donkeys and mules. *Vet Clin North Am Equine Pract*. 2019;35(3):515–527. <https://doi.org/10.1016/j.cveq.2019.08.007>
- Mendoza FJ, Perez-Ecija A, Toribio RE. Clinical pharmacology in donkeys and mules. *Vet Clin North Am Equine Pract*. 2019;35(3):589–606. <https://doi.org/10.1016/j.cveq.2019.08.011>
- The Donkey Sanctuary. Factsheet: owners. condition scoring and weight estimation of the donkey. 2018. <https://www.thedonkeysanctuary.org.uk/sites/uk/files/2018-12/condition-scoring-and-weight-estimation-of-the-donkey-20181211.pdf> (accessed 2nd March 2022).
- The Donkey Sanctuary. Why donkeys matter. 2022. <https://www.thedonkeysanctuary.org.uk/what-we-do/why-donkeys-matter> (accessed 1st January 2022).
- Thiemann AK, Sullivan RJE. Gastrointestinal disorders of donkeys and mules. *Vet Clin North Am Equine Pract*. 2019;35(3):419–432. <https://doi.org/10.1016/j.cveq.2019.08.001>
- UK Government. Guidance –The cascade: prescribing unauthorised medicines. 2021. <https://www.gov.uk/guidance/the-cascade-prescribing-unauthorised-medicines#full-publication-update-history> (accessed 2nd February 2022).
- van Dierendonck MC, Burden FA, Rickards K, van Loon JPAM. Monitoring Acute Pain in Donkeys with the Equine Utrecht University Scale for Donkeys Composite Pain Assessment (EQUUS-DONKEY-COMPASS) and the Equine Utrecht University Scale for Donkey Facial Assessment of Pain (EQUUS-DONKEY-FAP). *Anim*. 2020;10(2):354. <https://doi.org/10.3390/ani10020354>
- van Loon JPAM, de Grauw JC, Burden F, Vos KJ, Bardelmeijer LH, Rickards K. Objective assessment of chronic pain in donkeys using the donkey chronic pain scale (DCPS): A scale-construction study. *Vet J*. 2021;267:105580. <https://doi.org/10.1016/j.tvjl.2020.10558>