

# **ANESTHESIA AND ANALGESIA FOR DONKEYS AND MULES**

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## **Preoperative evaluation**

In order to get an accurate preoperative evaluation on a donkey or mule, it is important to recognize some of the differences, from horses, which may impact anesthetic management. Only a few of these differences will be discussed, but hopefully, they will serve as a constant reminder that the anesthetist must be on the look-out for differences rather than ASSuming the patient will behave like a horse.

Behavioral differences will be most obvious in donkeys which have had little handling or training. When well trained, they are very easy to work around, however, this may not be the case. Donkeys do not have the same flight response as the horse; when confronted with something new, they will usually freeze until they have had a chance to observe it (hence their reputation for stubbornness). Patience is required when trying to get them to do something new, like enter a stock. They are also not as easily “bullied” into movement as horses, so be prepared to wait! A nose twitch is often ineffective in restraining donkeys (partially because it usually slides off the nose). However, they may be adequately restrained by snubbing the head rope securely to a stout fixed object.

Mules are generally more difficult to work around than donkeys (unless well trained) and because of their larger size may be more dangerous; it is strongly recommended to have an experienced mule handler available when working around untrained mules. Both mules and donkeys kick without warning and with great accuracy.

Both donkeys and mules are very stoic making it difficult to assess illness; it is likely that they will be much sicker or more painful than casual observation would lead one to conclude. There is a myth that says that donkeys and mules don't colic. This is not true, but mild bouts of colic are probably never observed because of their stoic nature. The animal may be significantly ill before being presented for treatment or surgery, thus the patient is a worse anesthetic risk.

## **Physiological Differences**

Numerous physiological differences have been published between donkeys and horses. Donkeys are desert-adapted and their fluid balance is different; increases in hematocrit seen with dehydration in horses don't occur until donkeys are 30% dehydrated (1) . Therefore, this common method for assessing moderate dehydration will fail.

Although generally fairly resistant to some diseases, donkeys also to be very susceptible to hyperlipidemia when anorexic. Any donkey which has been “off feed” should have triglyceride levels checked. Mule foals are also more likely to have neonatal isoerythrolysis than horse foals.

Some conditions have not been reported in donkeys and mules; hyperkalemic periodic paralysis has not been reported in mules but whether it exists or not is not known; anecdotal reports have said that a mare, who is known positive for this defect, did not produce a mule with the defect..

### **Normal Baseline Values**

Even normal values for temperature, respiratory, and heart rates are slightly different than in the horse (2). The donkey is thermolabile, so body temperature may increase more in a hot climate, or following exercise than would be considered normal for a horse. Heart rates appear to be similar to horses and are a good indicator of stress or pain, even when other indicators (such as appearance) do not show it. Normal resting respiratory rates for donkeys are higher than horses; 20-30 bpm is normal.

Normal baseline values for most hematologic and biochemical indices have been published for donkeys and mules and slight differences from horses are observed (2). The clinician should make sure that “normals” are not extrapolated from horses. Cortisol values are similar to horses but normal ACTH and insulin values are significantly different for donkeys than horses (3). Caution should be used when trying to diagnose Cushing’s disease in donkeys.

### **Preoperative Analgesia**

Adequate preoperative analgesia should be achieved especially for very painful (eg, orthopedic) conditions. Failure to provide preoperative analgesia may result in serious cardiovascular collapse soon after induction of anesthesia. This is probably no different than is seen in horses with chronically painful conditions (eg, chronic laminitis), but it is easier to recognize severe pain in horses which can be treated and managed with non-steroidal antiinflammatories (NSAID’s). Donkeys require higher dosages of NSAID’s or shorter dosing intervals to achieve the same degree of analgesia since they metabolize many drugs more rapidly than horses. This is especially true of miniature donkeys which metabolize flunixin more rapidly than standard donkeys. Under-treatment of pain in donkeys can easily occur because pain is not easily recognized and differences in drug metabolism are not known (4).

### **Premedication and sedation for standing procedures**

All of the same sedative and premedications used in horses have been used in donkeys and mules with relatively good results. Generally, mules require 50% more drug than donkeys or horses to achieve adequate sedation. Standing procedures can be accomplished with any of the same drugs and combinations (eg, acepromazine with xylazine; xylazine with butorphanol) used with lidocaine as would be used for horses. As is also seen with horses, larger doses (2-3 times larger) may be necessary for excited or feral equids. Route of administration will also affect the dose required; generally twice the dose is required when the IM route is the only one possible. The same precautions should be observed with sedated mules or donkeys as for horses; they are still capable of biting or kicking! It is also not uncommon for donkeys to lie down on a preanesthetic

dose of xylazine; they do not fall down, but will deliberately lie down when they feel uncoordinated. Induction drugs can be administered with the donkey in sternal recumbency.

### **Induction drugs and maintenance with injectable anesthetics**

As with horses, a smooth induction is only achieved when the donkey or mule is adequately sedated before administering induction drugs. In general, induction is easier to accomplish because of the small size of most donkeys and some mules. A variety of drugs can be used for induction and maintenance with injectables. Ketamine (following sedation with an alpha-2 agonist) works well, but is metabolized more rapidly in donkeys and mules than in horses so higher doses or shorter dosing intervals must be used. This is especially important in miniature donkeys where a surgical plane of anesthesia will **not** be achieved with horse doses of xylazine and ketamine. If repeat administration of ketamine (by bolus or infusion) is not possible, a local block with lidocaine will ensure adequate analgesia during the latter stage of the procedure even if the donkey is awake. Addition of butorphanol is helpful in producing a slightly longer period of anesthesia when xylazine and ketamine are used.

### **Donkey G-K-X**

The combination of guaifenesin with xylazine and ketamine will produce smooth induction and maintenance in donkeys when used in the following manner: premedicate the donkey with xylazine (1.1 mg/kg IV) or equivalent dose of an alpha-2 agonist (eg, romifidine or detomidine). Induce by rapid infusion (gravity flow) of 1 liter 5% guaifenesin with **2 grams ketamine** and 500 mg xylazine mixed in. Once the donkey has become recumbent, slow the infusion to approximately 1 ml/kg/hr (based on monitoring eye signs, respiratory rate and pattern). Donkeys are more sensitive to the respiratory depression of guaifenesin, this mix delivers more ketamine (which is more rapidly metabolized) with less guaifenesin. For mules, induction can be accomplished with xylazine (1.6 mg/kg IV) followed by ketamine (2.2 mg/kg IV); then the G-K-X can be used for maintenance of anesthesia (5).

Thiopental alone, or in combination with guaifenesin, can also be used in donkeys and mules with good results, although caution in the use of guaifenesin must be used. Other drugs which have been used in donkeys and mules are tiletamine-zolazepam (Telazol). This will provide a slightly longer period of anesthesia and is recommended for miniature donkeys. Propofol can be used for induction and maintenance in donkeys, following sedation with xylazine. Since apnea and desaturation are common problems with propofol, it is not recommended for use unless intubation or oxygen supplementation is available.

As previously mentioned, the author has observed several donkeys which suffered from serious cardiovascular collapse (bradycardia and profound hypotension which responded to anticholinergics and inotropic drugs) within a short time after induction. All of these donkeys had very painful orthopedic conditions (ie, were “three-legged” lame or had

severe laminitis) which may not have been adequately treated with analgesics pre-operatively due to a failure to recognize pain in donkeys.

### **Monitoring anesthesia and support during anesthesia**

Basic monitoring should be similar to the horse with some subtle differences seen in donkeys and mules. Eye signs (nystagmus, corneal and palpebral reflexes and rotation of the eyeball) are helpful and similar, but not as reliable in the donkey. Monitoring blood pressure (either indirectly or directly) is strongly recommended; blood pressures will increase as the patient gets “light” and are a more reliable indicator of depth of anesthesia. When placing an arterial catheter, it is recommended to perforate the (thicker) skin with a needle prior to introducing the catheter; this will prevent “burring” the catheter. Branches of the facial artery, dorsal metatarsal and auricular arteries are good sites for catheter placement to allow direct blood pressure measurement.

Hypotension (defined as a mean arterial pressure less than 60 mm of Hg) should be treated in the same manner as the horse; plane of anesthesia should be decreased if possible, IV fluids should be increased, and an inotrope (such as dobutamine) should be administered until appropriate blood pressure is restored. As previously mentioned, an increase in hematocrit may not be observed with mild to moderate dehydration, so the anesthetist should not rely on this to guide fluid administration.

Respiratory rate and pattern should be carefully observed; normal respiratory rates are faster in donkeys than in horses but the author has observed breath-holding during a painful procedure in donkeys, rather than increasing respiratory rate as would be expected in horses. An increase in respiratory depth and spontaneous “sighing” are usually associated with a very light plane of anesthesia.

Post anesthetic myositis is less likely to occur in donkeys since they have much smaller muscle mass, but could occur in mules, esp. draft types. Appropriate padding of body surfaces and caution to pad exposed nerves (ie, facial and radial) should be taken.

When the donkey is not intubated (as with injectable anesthetics), the anesthetist should be observant that airflow is not compromised by a head position such that the airway is kinked or that excessive nasal tissue obstructs airflow. Straightening the position of the head relative to the neck, or placement of a nasal cannula usually relieves excessive inspiratory noise.

### **Recovery from anesthesia and analgesics**

Since donkeys usually have a calmer manner, recovery from anesthesia is usually not affected by the hysteria which is often seen in horses. However, analgesia should be provided since pain affects the quality of recovery from anesthesia. Donkeys will generally lie quietly until they are able to stand; they may make a half-attempt to stand and lie back down if not coordinated enough. It is generally not necessary to “hand recover” a donkey. Donkeys will also frequently stand hind-end first (like a cow), or get

up on one knee and hind legs first. Mules are more variable in their response to recovery and may require assistance with head and tail ropes (as would be used in horses).

As mentioned previously, although the analgesics used in horses are appropriate for donkeys and mules, the dose or dosing interval need to be adjusted AND the clinician must be more observant about the degree of pain shown by the animal. There is less published information for mules, so careful observation is recommended. There is also not data on the usefulness of transdermal fentanyl (patches) in donkeys. Although fentanyl levels are rapidly achieved in horses via the transdermal route, donkeys have thicker skin which might not absorb fentanyl well, and differences in site might affect absorption (eg, a thick fascial layer on the neck might prevent absorption).

Epidurals with local anesthetics are also very useful for providing anesthesia for procedures of the caudal region or analgesia for post-operative pain. It has been recommended to use the second intercoccygeal space in donkeys and mules rather than the first intercoccygeal space as in the horse.

In conclusion, although it is tempting to treat donkeys and mules like little horses, there are significant differences in physiology, behavior and drug response which must be taken into account in order to provide successful and minimally stressful anesthesia.

## REFERENCES

[www.jvis.org](http://www.jvis.org). Matthews and Taylor. Veterinary care of donkeys

- 1). Matthews, N.S., Taylor T.S. and Hartsfield, S.M. *Anaesthesia of donkeys and mules. Equine vet. Educ., Manual 7* (2005) 102-107.
- 2). **The Professional Handbook of the Donkey, 4th Ed.**, Duncan and Hadrill, Eds., Appendix 1. 2008, Whittet Books,
- 3). Dugat, S.L., Taylor, T.S., Matthews, N.S. et al. *Values for triglycerides, insulin, cortisol, and ACTH in a herd of normal donkeys. J. Eq. Vet. Sci.* (2010), 30:141-144
- 4). Ashley, F. and Whay, B. *Guidance notes for recognizing and measuring pain-related behavior in working donkeys. Appendix 2, Thesis, Univ. of Bristol*, 2008. 229-257.
- 5). Taylor, E.V., Baetge, C.L., Matthews, N.S., et al. *Guaiifenesin-ketamine-xylazine infusions to provide anesthesia in donkeys. J. Eq. Vet. Sci.* (2008). 28:295-300.