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# Anesthetic Management of Donkeys and Mules (15 July 2000)

**N.S. Matthews and T.S. Taylor**

Department of Veterinary Small Animall Medicine and Surgery, The Texas Veterinary Medical Center, Texas A&M University, College Station, Texas, USA.

**Introduction**

Donkeys and mules are easily recognized as looking different from horses. However, most of us seem to have difficulty in recognizing the many other differences, which exist between horses, donkeys and mules. A little background may help in identification and appreciation for how they are different from horses. The donkey or burro (*Equus asinus*) has been associated with mankind throughout recorded history. It is still widely used (recent estimates put their number at 44 million) in many parts of the world for work and transport of all kinds of goods [1]. Donkeys are desert-adapted animals, who survive where horses cannot. Reasons which have been advanced for their hardiness and survival include: desert-adaptations to water shortages, the ability to rehydrate quickly when water is presented, greater variability in thermoregulation to reduce stress from variation in ambient temperature, willingness to eat feeds unpalatable to horses, and perhaps, differences in susceptibility to diseases highly fatal to horses [2,3]. Physiologically, donkeys are known to have different fluid-balance and partitioning of fluids than does the horse [4]. This affects the way they distribute drugs, including anesthetics. Based on what we know about the pharmacokinetics of some drugs in donkeys, we believe that they may also metabolize some drugs faster than horses, which affects anesthetic drug duration.
Behaviorally, the donkey is very different from the horse [5]. Donkeys do not seem to share the horse's immediate flight response; they will often face a frightening object and freeze (hence their reputation for stubbornness). The best advice (usually ignored) is to plan to take more time in first introducing the animal to new experiences. Behavioral differences are also seen in their responses to injections, twitches, leading, and other common procedures related to anesthesia. If you are not familiar with these differences, it is well worthwhile to enlist the help of an experienced donkey or mule person. If no such person is available, and you have a choice between an experienced horse person and experienced cattle person, choose the one who has worked with cattle! Be aware of the fact that both donkeys and mules are extremely intelligent and kick without warning with excellent aim! Donkeys and mules are very trainable and have excellent memories for what they have learned (both good and bad!). By nature, their disposition is quite sedate; therefore, recovery from anesthesia and surgery is almost always smooth and without excitement.
Physiologically, mules (the hybrid of *Equus asinus* and *Equus caballus*) seem to be more like the horse, although not identical. Therefore, they may range in appearance and temperament depending on the type of horse used in the breeding (e.g., Thoroughbred vs. Percheron). They also look more horse-like and mule owners will be insulted if you call their mule a donkey (as will donkey owners if you call their donkey a mule)! Donkeys and mules are differentiated by size and range from miniature (less than 85 - 90 cm) to standard (90 to 135 cm) to Mammoth (donkeys >135 cm) or Draft (mules). In the United States, the registering organization for all types is the American Donkey and Mule Society (2901 N. Elm St., Denton, TX 76201, USA) which also serves as the parent organization for all local clubs.
As with other *Equidae* species, there is a wide variation in behavior depending on how accustomed to people the animal is (feral versus domesticated), and how much training and handling it has had. In our experience, feral or unhandled animals will require much higher drug doses to achieve the same results (estimated 1.5 to 2 times the usual dose), and if drugs must be administered by the intramuscular route (instead of intravenous

route), dosages are higher yet (estimated 3 times the usual dose).

**Preanesthetic Evaluation**

In performing a preanesthetic evaluation of the patient, it is important to realize that there are differences between donkeys, mules and horses. Donkeys will only appear sick when they are very significantly ill. The use of a hematocrit to evaluate the degree of dehydration may be used, however it is important to recognize that donkeys can dehydrate significantly (12 - 15%) before hematocrit will increase [2]. Normal hematologic and biochemical values are reported for donkeys [6], and there are differences from normal horse values. References for mules are very limited and old enough that they may not represent current diagnostic techniques. Baseline values for heart and respiratory rate are also slightly different from horses. Heart rates may range from 35 - 55 bpm (depending on degree of fitness and anxiety), while respiratory rates are higher at rest; 20 - 35 bpm and will vary with ambient temperature (respiratory rate increases to reduce the amount of water expended for evaporative cooling). Daily body temperature may vary by 3 degrees C [4].

**Restraint and Injection Techniques**

Generally, donkeys and mules don't appreciate needles at all! Use of a twitch appears to be much less effective than in horses. A donkey will usually stand still if it is tied with the rope very short to a stout object which it has already determined it can not budge (so it is advantageous to give them some time to accept being tied before trying to proceed. Donkeys may also be more safely restrained in a chute or with a squeeze gate than would a horse (they are more like cattle in their response to restraint; accepting it rather than unreasonably fighting restraint). Tying up one leg or hobbles may also be effective for restraint; once the animal has determined that it is restrained: it will usually not continue to fight the rope.

The jugular vein lies in the same anatomic location as in the horse, but donkey skin is thicker than horse skin. Therefore, it is necessary to change the angle of needle placement slightly when attempting venipuncture for drug administration or catheter placement; angle deeper (i.e., more perpendicular to the skin). It also seems better to lay the needle on the skin and insert slowly by increasing the pressure gradually, instead of quickly "slapping" the needle through as you would in the horse. Often, the mule or donkey will lean into the needle.

**Preanesthetics**

Although the pharmacokinetics of xylazine have not been researched in mules, they appear to require approximately 50% more xylazine (1.6 mg/kg IV) or detomidine (0.03 mg/kg IV) to produce good sedation than most donkeys or horses. However for unhandled or feral donkeys and miniature donkeys, the higher doses should also be used. Injectable anesthesia is most satisfactory when butorphanol (0.04 mg/kg IV) or diazepam (0.03 mg/kg IV) are combined with xylazine or detomidine to increase the sedation produced. Acepromazine (0.04 mg/kg IV) has also been used satisfactorily for tranquilization of donkeys and mules.

**Injectable Anesthesia**

Ketamine (2.0 - 3.0 mg/kg IV) can be used in donkeys and mules for short procedures, following sedation (as above). The half-life of ketamine is shorter than in the horse, so it may be necessary to administer additional doses [7] however, increasing ketamine above 3.3 mg/kg has been associated with rough recoveries [8]. The use of a local anesthetic in combination with injectable anesthesia will reduce the need to redose as frequently. Prolonging anesthesia with the combination of guaifenesin/ketamine/xylazine (often called G/K/X or "triple drip") may be used, but careful monitoring is necessary. Donkeys have a lower tolerance for guaifenesin; they require approx. 40% less to produce recumbency than do horses. However, we have used the combination of guaifenesin and thiopental for induction of anesthesia in donkeys and mules; the combination is administered "to effect" with careful monitoring to prevent excessive depth of anesthesia.

Xylazine premedication followed by Telazol (1.0 mg/kg IV) is effective for producing anesthesia in donkeys and mules. Recumbency time is longer than xylazine-ketamine combinations. Recoveries are satisfactory in donkeys, but we have observed occasional rough recoveries in mules [9].

Miniature donkeys appear to be more difficult to anesthetize than standard donkeys and mules. Standard doses of xylazine, butorphanol and ketamine DO NOT usually produce acceptable surgical anesthesia for longer than 5 min. However, xylazine (1.1 mg/kg IV) with butorphanol (0.04 mg/kg IV) followed by Telazol (1.1 - 1.5 mg/kg IV) produces sufficient anesthesia to allow short surgical procedures (approx 20 min duration). Propofol also provides good anesthesia in miniature donkeys. Following premedication with xylazine (0.8 mg/kg IV), a bolus of propofol (2.0 mg/kg IV) is administered. For procedures longer than 10

min, additional propofol can be given as intermittent boluses (0.2 mg/kg/min). We are continuing to investigate drug combinations and dosages, which produce field anesthesia in donkeys, and mules lasting long enough to facilitate the surgical procedure, without resulting in prolonged recoveries. Differences in drug kinetics as well as behavioral differences between donkeys and horses seem to make it difficult to find the optimal field anesthetic.

**Inhalant Anesthesia, Maintenance and Monitoring**

Inhalant anesthetics produce very satisfactory anesthesia in donkeys and mules. The minimum alveolar concentrations (MAC-values) for halothane and isoflurane in donkeys are very similar to those reported for horses and ponies [10]. Studies have not been done in mules, but our clinical experience is that concentrations needed are very similar to those used in horses or donkeys. Endotracheal intubation is performed manner as in the horse. Although not anatomically documented, the size of the trachea may be smaller than for a horse of similar size, so it is wise to have a range of endotracheal tubes available.

Donkeys and mules are generally very stoic, so it is easy to inadvertently maintain them at too light a plane of anesthesia. Eye signs (e.g., nystagmus, palpebral and corneal reflexes) do not seem to be as reliable for judging depth of anesthesia as in the horse; the eye tends to remain quiet until the animal moves, instead of seeing nystagmus first. Monitoring blood pressure will fairly reliably indicate depth of anesthesia as it will in the horse; increases in blood pressure are generally seen as the plane of anesthesia decreases. Blood pressure can be measured non-invasively, or invasively with a catheter placed into an artery. In some donkeys, it is difficult to palpate the branch of the transverse facial artery usually found under the zygomatic arch. However, they usually have large palpable auricular arteries which can be catheterized. Respiratory rate and character appears to be different in donkeys; normal respiratory rate is higher than for horses and there is less thoracic excursion (the character of respiration is similar to that of cattle). Donkeys may hold their breath in response to pain, instead of increasing respiratory rate. Other supportive care (e.g., use of IV fluids, treatment of hypotension) should be as for the horse. Donkeys do not hemoconcentrate until they are extremely dehydrated (more than 15%), so the need for fluid therapy must be evaluated by other means than packed cell readings. Physical exam and history may be helpful, but donkeys are also fairly stoic about not showing signs of illness. It is wise to assume that the animal is sicker than it may appear. Donkeys are also very susceptible to hyperlipidemia if they become anorexic for any reason [11].

**Recovery**

Donkeys rarely get hysterical about anything, so recoveries from anesthesia are almost always quiet and smooth. It is generally impossible to make a donkey get up before it is ready. A rough recovery would be strong evidence that the animal was painful, having difficulty breathing, or that there was some other underlying problem occurring. Occasionally, young donkeys may need a "boost" on the tail to stand; sometimes they will get up rear-legs first, like a cow. Mules vary more, depending on the influence of the horse portion; mules bred for racing tend to be "flightier" whereas draft mules are usually quiet. Overall, most mules are quite sensible if well treated, and can be left to self-recover from anesthesia.

Phenylbutazone or flunixin can be used to provide analgesia for donkeys and mules. The half-life for phenylbutazone is much shorter than for the horse, but more of the active metabolite (oxyphenbutazone) is produced [12]. It appears to be difficult to produce toxicity with phenylbutazone in donkeys even when they are maintained on high (horse) doses for prolonged periods of time (Tex Taylor, unpublished observations). Flunixin has similar characteristics; in standard donkeys the half-life is about half as long as in the horse [13]; the half-life is even shorter in miniature donkeys. Dosing intervals may need to be shorter than in the horse for optimal analgesia.

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