

FIELD ANESTHESIA

Lori A. Bidwell, DVM, DACVAA, CVA
Assistant Professor
Large Animal Clinical Sciences
College of Veterinary Medicine
Michigan State University
East Lansing, MI 48824

Many minor and surgical procedures can be performed in the field under sedation or general anesthesia. Sedative and anesthetic protocols should be selected based on each patient. Drugs and dosages appropriate for adult horses are not necessarily appropriate for neonates, foals or donkeys although most dosages are extrapolated from adult protocols. A brief physical exam should be performed on every horse prior to sedation or anesthesia with a minimum of auscultation of the heart and lungs.

Whenever sedating or anesthetizing a horse, foal or donkey, it is imperative that the handler is paying attention to the situation and understands the risks and concerns associated. Owners or handlers should be warned of the risk of sudden aggression with alpha-2 agonist drugs (Peters DF, et al. 1998). The occurrence of aggression appears to be dose dependent, therefore the handler should have a firm grip on the halter when higher doses are being used. In addition, any horse can have an adverse reaction to a drug or an intra-arterial injection can inadvertently occur. Therefore, it is not recommended to have a child or someone inexperienced handling the horse during a procedure.

When preparing for field sedation and anesthesia, drugs recommended to have available for sedation include xylazine or detomidine, acepromazine and butorphanol. Induction and maintenance of anesthesia can be performed using ketamine, diazepam or midazolam and guaifenesin. Adjuncts to have available include propofol, epinephrine, atropine and lidocaine. Table-1 provides commonly used anesthetic and analgesic drug doses for horses and donkeys.

Commonly Used Drugs

The alpha-2 adrenergic agonists (xylazine, romifidine, detomidine and dexmedetomidine) have good sedative and analgesic properties with dose dependent duration. Administration produces a transient hypertension followed by bradycardia and hypotension. Use in neonates can result in decreased cardiac output because they are unable to alter stroke volume when faced with bradycardia ($CO = HR \times SV$) (Kerr et al. 2009). The sedation from these drugs is fast but the onset of analgesia is delayed and dissipates prior to sedation.

Acepromazine is a phenothiazine tranquilizer that produces sedative effects, being particularly useful in anxious horses. This drug has a synergistic effect when combined with an alpha-2 agonist resulting in increased sedation and potentially increased

analgesia. In human patients, anxiety levels play a role in pain perception (Hoeger Bement et al. 2010). The drug has a slower onset with peak effect at 15 minutes post administration. For needle anxious horses, acepromazine plus detomidine can be administered by the sublingual route to produce mild sedation that will allow non-invasive procedures. The handler must allow 40-45 minutes for the sedation to take effect. The typical dose for a 1,000 lb horse is 30-50 mg acepromazine plus 20-30mg detomidine sublingual.

Butorphanol is an opioid with agonist/antagonist properties that produces significant short duration visceral analgesia. Onset is quick and duration is between 20-50 minutes. Head pressing and stall walking can occur after administration but can be minimized if combined with an alpha-2 agonist drug.

The benzodiazepines diazepam and midazolam are useful muscle relaxants with minimal to no analgesic properties. These drugs have a fast onset of action and last between 20-30 minutes. These drugs are useful as a premedication in neonates but should be used in adults and donkeys as an adjunct to induction of anesthesia. Guaifenesin is a centrally acting neuromuscular blocking agent that produces dose dependent muscle relaxation. Benzodiazepines and guaifenesin typically have minimal effects on respiration or blood pressure. Due to manufacturing changes, guaifenesin is no longer commercially available except from compounding pharmacies. An alternative to guaifenesin for the combination called “triple drip” (50gm guaifenesin, 500mg xylazine and 1gm ketamine) is 50mg midazolam or diazepam in 1L 0.9% NaCl or LRS.

Ketamine is a dissociative drug used for induction. There is no muscle relaxant property associated with ketamine, therefore a high dose of alpha-2 agonist must be used for premedication or guaifenesin or a benzodiazepine must be combined for induction. Ketamine has analgesic properties and an anesthetic duration of approximately 20 minutes.

Protect the horse's eyes during anesthesia, either using a towel around the head or sterile ophthalmic lubrication (using both is ideal). Adults should be recovered in an open, grassy area or in a stall without wall feeders or buckets. It is advisable to have a halter and lead shank attached to the horse when recovering outdoors. Although many horses rise into sternal prior to standing, some horse can rise quickly and attempt to run away.

Foals

Sedative and anesthetic doses in foals should be selected that minimize cardiovascular depression while providing appropriate sedation or anesthesia and pain management. Neonates (up to 1 week of age) will lie down when they feel tired, therefore sedative doses will result in recumbency and many procedures can be performed without additional intravenous anesthetics. For procedures like a joint tap or flush, 100-200 mg ketamine IV will maintain anesthesia for approximately 15-20 minutes. An alternative for induction is propofol; a drug used frequently in small animal cases. The dose for induction is 2mg/kg IV and results in anesthesia of 5-10 minutes duration. Propofol can

also be used as an adjunct to maintain anesthesia for longer procedures. The dose is 0.05-0.1 mg/kg IV. For longer procedures in foals, triple drip can be used as a maintenance anesthetic but minimal dosing is recommended. Deliver a slow drip rate to effect, as recovery is prolonged in a dose-dependent manner. Foals do not need to be fasted prior to sedation or anesthesia.

The mare should remain with the foal for the entire procedure if possible. If this is not possible, have the mare remain with the foal until it is recumbent. For sedation of the mare, administer 150 mg xylazine (or an equivalent dose of romifidine or detomidine) IV + 15 mg acepromazine IV at least 10-15 minutes prior to separation. Recovery from anesthesia can be aided by holding the foal down until signs of arousal occur. Assist recovery with a hand on the tail when they attempt to stand.

Donkeys

Donkeys are generally less sensitive to anesthetic and sedative drugs than horses; therefore dosages should be calculated at 1.5 times the dose used in a typical horse. Donkey behavior is more like a cow than a horse and they are precise when placing a kick. Guaifenesin should be used with caution in donkeys due to sensitivity to the muscle relaxant effects. In contrast to horses, donkeys will get hypotensive and apneic rapidly with a bolus of guaifenesin. In addition, recovery is prolonged in a dose dependent manner. Donkeys typically recover well from short duration anesthesia – they roll to sternal recumbency until they are prepared to stand.

Table-1 Dosage Chart

Drug	Concentration	Dose	Route	Notes
Acepromazine	10 mg/ml	0.02-0.05 mg/kg	IV or IM sublingual	Slow onset
Bupivacaine	7.5 mg/ml	1-2 mg/kg	Local	
Buprenorphine	0.3 mg/ml	0.006 mg/kg	IV, IM or buccal mucosa	
Buscopan		0.3 mg/kg	IV	For choke, works on distal 1/3 of esophagus
Butorphanol	10 mg/ml	0.02-0.05 mg/kg	IV or IM	
Dexmedetomidine	1 mg/ml	2. 5-5 ug/kg	IV or IM	
Detomidine	10 mg/ml	5-40 ug/kg	IV, IM or PO	
Diazepam	5 mg/ml	0.02-0.08 mg/kg	IV	
Ephedrine	50 mg/ml	0.03-0.05 mg/kg	IV	

Flunixin Meglumine	50 mg/ml	1 mg/kg	IV, IM or SQ	
Guaifenesin	50 mg/ml	50-100 mg/kg	IV infusion	
Ketamine	100 mg/ml	2.2 -2.5 mg/kg	IV	
Lidocaine	20 mg/ml	0.5-2 mg/kg	IV or local block	
Midazolam	5 mg/ml	0.05-0.1 mg/kg	IV or IM	
Morphine	15 mg/ml	0.1-0.3 mg/kg	IV , IM or SQ	
Oxytocin		1.1-2.2 units/kg	IV	For choke, works on proximal 2/3 of esophagus
Phenylbutazone	200 mg/ml	2.2-4.4 mg/kg	IV or PO	Injectable is only to be administered IV
Propofol	10 mg/ml	2mg/kg	IV	Induction
Telazol	100 mg/ml	1-2 mg/kg	IV	Induction
Triple Drip		Horse: 50gm guaifenesin + 1gm ketamine + 500mg xylazine in IL LRS Donkey: 12.5mg guaifenesin + 500mg ketamine + 250mg xylazine	IV infusion	Horse: Bolus initially and then drip to effect Donkey: Drip to effect 50mg diazepam or midazolam instead of guaifenesin
Xylazine	100 mg/ml or 20 mg/ml	0.3-1 mg/kg IV 1-2 mg/kg IM	IV or IM	
Yohimbine		0.12 mg/kg	IV or IM	

References

Hoeger Bement M, Weyer A, Keller M, Harkens AL, Hunter SK. Anxiety and stress can predict pain perception following a cognitive stress. *Physiol Behav* 2010;101:87-92

Kerr CL, Boure LP, Pearce SG, McDonald WN. Cardiopulmonary effects of diazepam-ketamine-isoflurane or xylazine-ketamine-isoflurane during abdominal surgery in foals. *Am J Vet Res* 2009;70:574-580

Peters DF, Erfle JB, Slobojan GT. Aggressive behavior associated with the use of xylazine and detomidine. *Proceedings: The Annual Convention of the American Association of Equine Practitioners*. 1998. pp 284-186