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Tom Doherty
University of Tennessee - Knoxville

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New World Camelids

Dr. Tom Doherty, 2011

In North America, llamas and alpacas have become increasingly popular. Veterinary care of llamas and alpacas is frequently sought and many procedures require that they be sedated or anesthetized.

Llamas are New World camelids native to South America and are thought to be domesticated forms of the guanaco, a wild species that lives at altitudes up to 4000 meters. In South America, llamas are found at altitudes from sea level to 4500 meters. Old and New World camelids are thought to originate from common ancestors native to North America.

Peculiarities:

1. Jugular vein is most accessible on right side. Vein is covered by very thick skin – especially in males. For this reason it is easier to give IM medications.
2. They have a complex, 3-compartment stomach.
3. Are less sensitive to *xylazine* than domestic ruminants, but more sensitive than horses.
4. Need to be off food and water for 12-18hrs prior to anesthesia.
5. Adults can be somewhat difficult to intubate.

Adaptation to High Altitude Living:

Red blood cell

- Ellipsoidal in shape
- High hemoglobin concentration
- High affinity for oxygen
- Large RBC count

Oxygen dissociation curve

- Left shift – favors O_2 uptake in lungs
- P_{50} ~ 21mm Hg

Oxygen utilization

- Increased capillary density – favors downloading of O_2 in tissues.
- Can increase cardiac output at low PaO_2

Sedation:

Sedated animals will usually assume the sternal (cush) position. As the level of sedation increases the neck relaxes and rests on the ground. At this level of sedation the animal can usually be rolled into lateral without resistance.

Intramuscular Drugs - Llamas:

Injections are made into the semimembranosus or semitendinosus muscles. Sedation usually develops in 5-10 minutes.

1. *Xylazine*: 0.3 – 0.5mg/kg; IM
2. *Xylazine*: 0.3 – 0.5mg/kg; IM + *Butorphanol* 0.1mg/kg; IM.
   - Effectiveness of *butorphanol* undetermined
   - The animal may still resist being handled and manipulated!
3. *Xylazine* (0.3mg/kg) + *Ketamine* (3mg/kg). This combination will give much more reliable sedation and will allow procedures such as radiography to be performed easily. Recovery should be complete in about 30 minutes.

Intravenous Drugs - Llamas:

Sedation can be achieved by using *xylazine* or another $alpha_2$ agonist at approximately half the IM dose. E.g., *Xylazine*: 0.25mg/kg, IV

General Anesthesia - Llamas:

Intramuscular regimens

1. *Xylazine* (0.4-0.5 mg/kg) + *Ketamine* (4-6 mg/kg); IM
2. Telazol (2 mg/kg) + *Xylazine* (0.25 mg/kg) IM – about 20-30min of anesthesia.

Intravenous regimens

- Approximately half the IM dose of *xylazine* (0.25 mg/kg, IV) & *ketamine* (3-5 mg/kg, IV)
    - The dose of ketamine will depend on the speed of injection. Administering the drug slowly is safer as respiratory depression is less than that after fast administration. However, more ketamine will be needed if injected slowly.
    - Adding *diazepam*/*midazolam* (0.1 mg/kg) to *ketamine* will improve induction.
    - *Give the mixture (*diazepam/ketamine*) slowly to effect* (to prevent apnea)
- *Xylazine* (0.25 mg/kg, IV) initially for sedation + Telazol (1.0 -1.25 mg/kg, IV).
- *Xylazine* is usually given initially to cause sedation ± recumbency and then *ketamine* or *ketamine/diazepam* is administered.

Inhalational Agents:

Inhalation agents, such as isoflurane and sevoflurane, can be used to maintain anesthesia, following induction with an injectable protocol. Also, camelids may be masked induced, but it is much easier to induce with injectable drugs.

- Intubation of the airway is advisable as regurgitation is a possibility.
- **Intubation** can be relatively difficult in adult animals as the larynx is further away. A large llama (~400lb) may take a 16mm tube. Most commonly, a 12-14mm tube is used in adult llamas.
    - *Remove halter* to enable the mouth to be opened wide.
    - A laryngoscope is necessary in most cases.
    - Use of a "guide" in the ET tube facilitates intubation.
    - In larger animals a small stomach tube can be passed down the ET tube and guided into the larynx.
    - In smaller animals a "stallion urinary catheter" is helpful.
    - In still smaller animals, a semen straw with a piece of flexible tubing on the tip is helpful.
- An 80 kg (176 lb) alpaca will usually require a 10mm tube.

Alpacas

Need a greater dose of *xylazine-ketamine* to achieve same end-point. E.g., for general anesthesia the following doses of *xylazine* and *ketamine* are required.

Xylazine (0.6-0.8 mg/kg) IM
Ketamine (6-8 mg/kg) IM

Analgesics:

1. NSAIDs. E.g., *Flunixin meglumine* (1.0 – 1.5 mg/kg) IV. Ketoprofen (1.0 mg/kg, IV, IM)
2. *Morphine* (0.5 mg/kg) IM, q 8hrs for post-op pain control
3. *Butorphanol* (0.02-0.04 mg/kg, IM)
    - Intravenous *butorphanol* may cause behavioral issues