1. PURPOSE

This Standard Operating Procedure (SOP) describes methods for anesthetizing rabbits.

2. RESPONSIBILITY

Principal Investigators (PIs) and their research staff, veterinary care staff.

3. INTRODUCTION

3.1. Perform a thorough physical exam and obtain an accurate weight.
3.2. Withhold food, not water, for a short period of time (1–2 hours) prior to anesthesia.
3.3. Keep animals warm by providing a heat source and monitoring temperature until the animal has recovered from anesthesia. Care should be taken to not overheat or burn the animals.
3.4. Never leave an anesthetized animal unattended.
3.5. Rabbits can be anesthetized with either inhalant gas or injectable drugs. The use of endotracheal intubations and inhalant gases is the preferred method of anesthesia whenever possible.

4. MATERIALS

4.1. Material or equipment to provide or conserve body heat (e.g. heating disc or pad, warm-water circulating pad)
4.2. Ophthalmic ointment (natural tears) or surgical tape
4.3. Gas anesthesia machine (calibrated within the last 12 months) with adequate gas scavenging system or filter
4.4. Anesthesia mask
4.5. Intra-venous catheter
4.6. Isoflurane
4.7. Butorphanol (10mg/mL) *Controlled Drug
4.8. Dexametomidine (0.5mg/ml)
4.9. Atipamezole (5mg/ml)
4.10. Ketamine (100mg/mL) *Controlled Drug
4.11. Xylazine (20mg/mL)
4.12. Acepromazine (10mg/mL)
4.13. Alfaxolone (10mg/ml)
4.14. Propofol (10mg/ml)
4.15. Midazolam (5mg/ml) *Controlled Drug
4.16. Xylocaine spray
4.17. Sterile lubricant (e.g., water soluble jelly)
4.18. Endotracheal tubes, cuffed
4.19. Laryngoscope
4.20. Plain gauze rolls
5. PROCEDURES

5.1. Provide analgesia prior to any painful procedure (Refer to SOP 102).

5.2. Apply ophthalmic ointment (natural tears) or surgical tape to both eyes to prevent dryness and damage to the cornea.

5.3. Place an intravenous catheter (marginal ear vein):
   5.3.1. To provide IV fluid therapy and venous access during anesthesia.
   5.3.2. It is recommended to apply EMLA cream over the venipuncture site at least 15 minutes prior to placing the catheter.

5.4. Sedation:
   5.4.1. Used for short periods of restraint for non-painful procedures (e.g., blood collection) or prior to induction and gas anesthesia.

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose</th>
<th>Route</th>
<th>Duration of Effect</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butorphanol</td>
<td>0.2mg/kg</td>
<td>IM</td>
<td>30 minutes</td>
<td>May be mixed in same syringe.</td>
</tr>
<tr>
<td>Acepromazine</td>
<td>0.75mg/kg</td>
<td></td>
<td></td>
<td>Laryngeal reflexes preserved.</td>
</tr>
<tr>
<td>Dexmedetomidine</td>
<td>0.05 to 0.2mg/kg</td>
<td>IM</td>
<td>Dose dependant</td>
<td>Profound drop in heart rate. Reversed with equal volume of Atipamezole</td>
</tr>
<tr>
<td>Ketamine</td>
<td>20-35 mg/kg</td>
<td>IM</td>
<td>30-60 minutes</td>
<td>First, inject acepromazine and xylazine, mixed in the same syringe. Then, inject ketamine in a different muscle.</td>
</tr>
<tr>
<td>Xylazine</td>
<td>3 mg/kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acepromazine</td>
<td>0.75 mg/kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ketamine</td>
<td>25 mg/kg</td>
<td>IM</td>
<td>30-45 minutes</td>
<td>Can be mixed in the same syringe.</td>
</tr>
<tr>
<td>Midazolam</td>
<td>0.05-2 mg/kg</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5.5. Induction prior to inhalant anesthesia to facilitate intubation:

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose</th>
<th>Route</th>
<th>Duration of Effect</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfaxolone</td>
<td>3-5 mg/kg</td>
<td>IV, IM</td>
<td>30-45 minutes</td>
<td>Administer to effect to facilitate intubation. May cause respiratory depression.</td>
</tr>
<tr>
<td>Propofol</td>
<td>1-2 mg/kg</td>
<td>IV, IM</td>
<td>Until discontinued</td>
<td>Administer to effect to facilitate intubation. May cause respiratory depression.</td>
</tr>
<tr>
<td>Isoflurane</td>
<td>3% to 5%</td>
<td>Mask</td>
<td>Until discontinued</td>
<td>0.8 to 1.5 L/min. Initially, use a loose fitting mask to minimize CO₂ re-inhalation. Then switch to tight fitting mask.</td>
</tr>
</tbody>
</table>

5.6. Intubation:
   5.6.1. It is recommended to pre-oxygenate for 1 to 5 minutes with a tight fitted mask with 100% oxygen to avoid apnea during induction and intubation.
   5.6.2. Placement of an endotracheal tube is recommended for delivery of isoflurane anesthesia.
   5.6.3. Cuffed endotracheal tubes are preferred for animals weighing over 2kg as they reduce the possibility of aspiration of saliva or stomach contents.
   5.6.4. Intubation:
       5.6.4.1. Lubricate endotracheal tube with sterile lubricant.
5.6.4.2. With the animal in sternal or dorsal recumbency, extend the neck and head so that they are in a straight line.

5.6.4.3. Pull the tongue forward so that the epiglottis is visible.

5.6.4.4. Use the laryngoscope to disengage the epiglottis from the soft palate, exposing the glottis and vocal chords.

5.6.4.5. Spray the larynx with 2% xylocaine and wait 1 minute to help decrease laryngospasm (spasmodic closing and opening of the glottis).

5.6.4.6. Insert the endotracheal tube (with the convex side facing upwards) gently into the proximal larynx.

5.6.4.7. Gently rotate the endotracheal tube 180° and apply gentle pressure to insert into the trachea. Confirm proper placement by checking for the animal’s breath as it exits the endotracheal tube during exhalation.

5.6.4.8. Secure the endotracheal tube by tying a piece of gauze around the tube then behind the animal’s head.

5.6.4.9. Inflate the cuff of the endotracheal tube.

5.6.4.10. Verify adequate ventilation of both lungs by auscultation.

5.7. Isoflurane anesthesia:

5.7.1. Induction:

5.7.1.1. Adjust the oxygen flowmeter to 0.8 to 1.5 L/min.

5.7.1.2. Adjust the isoflurane vaporizer to 3% to 5%.

5.7.2. Maintenance:

5.7.2.3. Adjust the flowmeter to 400 to 800mL/min.

5.7.2.4. Adjust the isoflurane vaporizer to 1.5 to 3%.

5.7.2.5. Monitor parameters (heart rate, oxygen saturation, respiration rate, temperature) every 5 minutes.

5.7.3. Recovery:

5.7.3.1. Turn off the isoflurane vaporizer but keep the animal on oxygen for 2 to 5 minutes or longer if oxygen saturation levels are low.

5.7.3.2. Monitor temperature at end of surgery and warm animal up if necessary to speed up recovery time.

5.7.3.3. Deflate endotracheal cuff and stay close to the animal as long as the animal is intubated.

5.7.3.1. Remove the endotracheal tube as soon as the animal shows signs of impending arousal, i.e., when reflexes begin to return.

5.7.3.2. Remove IV catheter prior to placing the animal back in its cage.

5.7.3.3. Monitor the animal in its home cage to ensure it regains full consciousness.

6. REFERENCES


3.3. Keep animals warm by providing a heat source until the animal has recovered from anesthesia. Care should be taken to not overheat or burn the animals.

5.2. Apply ophthalmic ointment (natural tears) or surgical tape to both eyes to prevent dryness and damage to the cornea.

5.5.1. Induction (if injectable anesthetics not previously administered)

5.5.1.1. Placement of an endotracheal tube is recommended for delivery of isoflurane anesthesia.

5.5.1.2. Cuffed endotracheal tubes are preferred as they reduce the possibility of aspiration of saliva or stomach contents.

5.5.2. Intubation:

5.5.2.1. Lubricate endotracheal tube with sterile lubricant.

5.5.2.2. Use the laryngoscope to disengage the epiglottis from the soft palate, exposing the glottis and vocal chords.

5.5.2.3. Spray the larynx with 2% xylocaine to help decrease laryngospasm (spasmodic closing and opening of the glottis).

5.5.2.4. Use the laryngoscope to disengage the epiglottis from the soft palate, exposing the glottis and vocal chords.

5.5.2.5. Insert the endotracheal tube (with the convex side facing upwards) gently into the proximal larynx.

5.5.2.6. Insert the endotracheal tube (with the convex side facing upwards) gently into the proximal larynx.

5.5.2.7. Gently rotate the endotracheal tube 180° and apply gentle pressure to insert into the trachea. Confirm proper placement by checking for the animal's breath as it exits the endotracheal tube during exhalation.

5.5.2.8. Secure the endotracheal tube by tying a piece of gauze around the tube then behind the animal's head.

5.5.2.9. Inflate the cuff of the endotracheal tube.

5.5.2.10. Verify adequate ventilation of both lungs by auscultation.

5.5.1.3. Both drugs can be mixed in the same syringe.

5.5.1.4. Inject intramuscularly.

5.5.1.5. Animal will be adequately sedated after 15 minutes.

5.5.1.6. Duration of sedation is approximately 1 hour.

Drug: Butorphanol-acepromazine, Dose: 0.2mg/kg - 0.75mg/kg, Route: IM, Duration: 30 minutes, Comments: May be mixed in same syringe. Laryngeal reflexes preserved.

Drug: Dexametomidine, Dose: 0.05 to 0.2mg/kg, Route: IM, Duration: Dose dependant, Comments: Profound drop in heart rate. Reversed with equal volume of Atipamezole

Drug: Dexmedetomidine, Dose: 0.5mg/ml

Drug: Midazolam (5mg/ml)

Drug: Xylocaine spray

Drug: Endotracheal tubes, cuffed

Drug: EMLA cream and cover with plastic cling wrap (e.g. Saran® wrap) over the venipuncture site at least 15 minutes prior to placing the catheter. Observe the animal to prevent removing or swallowing of the plastic.

Drug: Alfaxolone, Dose: 3-5 mg/kg, Route: IV, slowly, IM, Duration: 30-45 minutes, Comments: Administer to effect to facilitate intubation.

Drug: Propofol, Dose: -2 mg/kg, Route: IV, slowly, Duration: Until discontinued, Comments: Administer to effect to facilitate intubation. May cause respiratory depression.

Drug: Ketamine, Midazolam, Dose: 25 mg/kg, 0.05-2 mg/kg, Route: IM, Duration: 30-45 minutes, Comments: Can be mixed in the same syringe.

Drug: Alfaxolone, Dose: 3-5 mg/kg, Route: IV, slowly, IM, Duration: 30-45 minutes, Comments: Administer to effect to facilitate intubation. May cause respiratory depression.

May cause respiratory depression.

Transfer

Turn off the isoflurane vaporizer but keep the animal on oxygen for 2 to 5 minutes or longer if oxygen saturation levels are low.

Remove the endotracheal tube as soon as the animal shows signs of impending arousal, i.e., when reflexes begin to return.

5.5.3.3. Transfer: Monitor the animal to their cage once it begins to move and allow to recover fully in its home cage to ensure it regains full consciousness.


2020.05.13

4.4. Tight-fitting mask

4.5. Intra-venous catheter

4.13. Alfaxolone (10mg/ml)

4.14. Propofol (10mg/ml)

4.15. Midazolam (5mg/ml)

4.16. Xylocaine spray

4.17. Sterile lubricant (e.g., water soluble jelly)

4.18. Endotracheal tubes, cuffed

4.19. Laryngoscope

4.20. Plain gauze rolls

5.3. Place an intravenous catheter (marginal ear vein):

5.3.1. To provide IV fluid therapy and venous access during surgery.

5.3.2. It is recommended to apply EMLA cream and cover with plastic cling wrap (e.g. Saran® wrap) over the venipuncture site at least 15 minutes prior to placing the catheter.

5.3.3. To provide analgesia prior to any painful procedure (Refer to SOP 102).

5.4. Intubation:

5.4.1. Placement of an endotracehela tube is recommended for delivery of isoflurane anesthesia.

5.4.2. Cuffed endotracheal tubes are preferred as they reduce the possibility of aspiration of saliva or stomach contents.

5.4.3. Intubation:

5.4.3.1. Lubricate endotracheal tube with sterile lubricant.

5.4.3.2. With the animal in sternal or dorsal recumbency, extend the neck and head so that they are in a straight line.

5.4.3.3. Pull the tongue forward so that the epiglottis is visible.

5.4.3.4. Use the laryngoscope to disengage the epiglottis from the soft palate, exposing the glottis and vocal chords.

5.4.3.5. Spray the larynx with 2% xylocaine to help decrease laryngospasm (spasmodic closing and opening of the glottis).

5.4.3.6. Insert the endotracheal tube (with the convex side facing upwards) gently into the proximal larynx.

5.4.3.7. Gently rotate the endotracheal tube 180° and apply gentle pressure to insert into the trachea. Confirm proper placement by checking for the animal’s breath as it exits the endotracheal tube during exhalation.

5.4.3.8. Secure the endotracheal tube by tying a piece of gauze around the tube then behind the animal’s head.

5.4.3.9. Inflate the cuff of the endotracheal tube.

5.4.3.10. Verify adequate ventilation of both lungs by auscultation.

5.2.3. Anaesthesia protocols:

5.2.3.1. To provide IV fluid therapy and venous access during surgery.

5.2.3.2. It is recommended to apply EMLA cream and cover with plastic cling wrap (e.g. Saran® wrap) over the venipuncture site at least 15 minutes prior to placing the catheter. Observe the animal to prevent removing or swallowing of the plastic.

5.2.3.3. Both drugs can be mixed in the same syringe.

5.2.3.4. Inject intramuscularly.

5.2.3.5. Animal will be adequately sedated after 15 minutes.

5.2.3.6. Duration of sedation is approximately 1 hour.

Drug: Atipamezole (5mg/ml)

Drug: Dexmedetomidine (0.5mg/ml)

Drug: Midazolam (5mg/ml)

Drug: Xylocaine spray

Drug: Endotracheal tubes, cuffed

Drug: EMLA cream and cover with plastic cling wrap (e.g. Saran® wrap) over the venipuncture site at least 15 minutes prior to placing the catheter. Observe the animal to prevent removing or swallowing of the plastic.

5.1.6. Duration of sedation is approximately 1 hour.

5.1.5. Animal will be adequately sedated after 15 minutes.

5.1.4. Inject intramuscularly.

5.1.3. Both drugs can be mixed in the same syringe.

5.1.2. Dose: Atipamezole 0.5mg/kg, Acpromazine 0.75mg/kg.

5.1.1. Placement of an endotracheal tube is recommended for delivery of isoflurane anesthesia.

5.1.0. Cuffed endotracheal tubes are preferred as they reduce the possibility of aspiration of saliva or stomach contents.

Drug: Ketamine, Dose: 25 mg/kg, 0.05-2 mg/kg, Route: IM, Duration: 30-45 minutes, Comments: Can be mixed in the same syringe.

Drug: Alfaxolone, Dose: 3-5 mg/kg, Route: IV, slowly, IM, Duration: 30-45 minutes, Comments: Administer to effect to facilitate intubation. May cause respiratory depression.

Drug: Propofol, Dose: -2 mg/kg, Route: IV, slowly, Duration: Until discontinued, Comments: Administer to effect to facilitate intubation. May cause respiratory depression.

Drug: Butorphanol-acepromazine, Dose: 0.2mg/kg - 0.75mg/kg, Route: IM, Duration: 30 minutes, Comments: May be mixed in same syringe. Laryngeal reflexes preserved.

Drug: Ketamine, Midazolam, Dose: 25 mg/kg, 0.05-2 mg/kg, Route: IM, Duration: 30-45 minutes, Comments: Can be mixed in the same syringe.

Drug: Alfaxolone, Dose: 3-5 mg/kg, Route: IV, slowly, IM, Duration: 30-45 minutes, Comments: Administer to effect to facilitate intubation. May cause respiratory depression.

Drug: Propofol, Dose: -2 mg/kg, Route: IV, slowly, Duration: Until discontinued, Comments: Administer to effect to facilitate intubation. May cause respiratory depression.

Drug: Butorphanol 0.5 mg/kg, Acepromazine 0.75mg/kg.

Drug: EMLA cream and cover with plastic cling wrap (e.g. Saran® wrap) over the venipuncture site at least 15 minutes prior to placing the catheter. Observe the animal to prevent removing or swallowing of the plastic.

Drug: Alfaxolone, Dose: 3-5 mg/kg, Route: IV, slowly, IM, Duration: 30-45 minutes, Comments: Administer to effect to facilitate intubation.

Drug: Propofol, Dose: -2 mg/kg, Route: IV, slowly, Duration: Until discontinued, Comments: Administer to effect to facilitate intubation. May cause respiratory depression.
<table>
<thead>
<tr>
<th>Date</th>
<th>Section</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020.12.07</td>
<td>5.3.1</td>
<td>To provide IV fluid therapy and venous access during surgery anesthesia.</td>
</tr>
<tr>
<td>2020.12.07</td>
<td>5.3.2</td>
<td>It is recommended to apply EMLA cream and cover with plastic cling wrap (e.g., Saran® wrap) over the venipuncture site at least 15 minutes prior to placing the catheter. Observe the animal to prevent removing or swallowing of the plastic.</td>
</tr>
<tr>
<td>2020.12.07</td>
<td>5.4</td>
<td>Sedation: [Moved Ketamine-Xylazine-Acetpromazine and Ketamine-Midazolam to this section from 5.5]</td>
</tr>
<tr>
<td>2020.12.07</td>
<td>5.5</td>
<td>Injectable anesthesia: Induction prior to inhalant anesthesia to facilitate intubation: 5.5.1. Can be used alone for short, non-invasive procedures. [Moved Ketamine-Xylazine-Acetpromazine and Ketamine-Midazolam to section 5.4]</td>
</tr>
<tr>
<td>2020.12.07</td>
<td>5.6.1</td>
<td>It is recommended to pre-oxygenate for 1 to 5 minutes with a tight fitted mask with 100% oxygen to avoid apnea during induction and intubation.</td>
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<td>2020.12.07</td>
<td>5.6.3</td>
<td>Cuffed endotracheal tubes are preferred for animals weighing over 2kg as they reduce the possibility of aspiration of saliva or stomach contents.</td>
</tr>
<tr>
<td>2021.01.13</td>
<td>3.2</td>
<td>Withhold food, not water, for a short period of time (1–6 hours) prior to anesthesia.</td>
</tr>
<tr>
<td>2021.01.13</td>
<td>3.3</td>
<td>Keep animals warm by providing a heat source and monitoring temperature until the animal has recovered from anesthesia. Care should be taken to not overheat or burn the animals.</td>
</tr>
<tr>
<td>2021.01.13</td>
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<td>Rabbits can be anesthetized with either inhalant gas or injectable drugs. The use of endotracheal intubations and inhalant gases is the preferred method of anesthesia whenever possible.</td>
</tr>
<tr>
<td>2021.01.13</td>
<td>5.4.1</td>
<td>Used for short periods of restraint for non-painful procedures (e.g., blood collection) or prior to induction and gas anesthesia.</td>
</tr>
<tr>
<td>2021.01.13</td>
<td>5.6.4.5</td>
<td>Spray the larynx with 2% xylocaine and wait 1 minute to help decrease laryngospasm (spasmodic closing and opening of the glottis).</td>
</tr>
<tr>
<td>2021.01.13</td>
<td>5.7.2.1</td>
<td>Use a tight-fitting mask connected to the Bain circuit to intubate the rabbit.</td>
</tr>
<tr>
<td>2021.01.13</td>
<td>5.7.2.3</td>
<td>Monitor parameters (heart rate, oxygen saturation, respiratory rate, temperature) every 5 minutes.</td>
</tr>
</tbody>
</table>