RESEARCH AND INNOVATION
ANIMAL RESOURCES AND CARE
VIRGINIA TECH

Standard Operating Procedure: Anesthesia in Dogs and Cats

These SOPs were developed by the Office of the University Veterinarian and reviewed by Virginia Tech IACUC to provide a reference and guidance to investigators during protocol preparation and IACUC reviewers during protocol review. They can be used as referenced descriptions for procedures on IACUC protocols. However, it is the sole responsibility of the Principal Investigator to ensure that the referenced SOPs adequately cover and accurately represent procedures to be undertaken in any research project. Any modification to procedure as described in the SOP must be outlined in each IACUC protocol application (e.g. if the Principal Investigator plans to use a needle size that is not referenced in the SOP, simply state that alteration in the IACUC protocol itself).

The most current version of these documents can be found on the University Veterinarian website.

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I. Procedure Summary and Goal

a. The purpose of this procedure is to familiarize the individual with the process of inducing an animal for anesthesia.

b. Anesthesia is necessary in veterinary medicine for performing surgeries and diagnostic procedures.

II. Personal Protective Equipment (PPE) and Hygiene

a. Hands should be washed thoroughly or sanitized before and after venipuncture.

b. Personal protective equipment appropriate to the setting should be used.

c. Anesthesia machines should be thoroughly checked for leaks before induction.

III. Supply List

a. See IV catheter SOP for IV catheter supplies

b. See Sedation SOP for premedication supplies

c. Anesthesia machine with adequate level of oxygen in tank

d. Isoflurane

e. Propofol

f. IV fluids with drip set

g. Intubation: Endotracheal tube, lube, 4x4, face mask, laryngoscope, tie gauze

h. Eye lube

i. Stethoscope

j. Pen light

k. Thermometer

l. Anesthetic record and pen

IV. Detailed Procedure

a. Pre-operative Procedure
   i. Withhold food from the animals for 12 hours prior to the procedure.
   ii. See Sedation SOP for pre-medications and IV catheter SOP
   iii. Perform a physical exam on the patient prior to anesthesia
   iv. Calculate premedication drug doses (see sedation SOP) and propofol dose of 6mg/kg.

b. Induction
   i. Preoxygenate the dog for 2-3 minutes before giving the propofol, keep the oxygen on until ready to intubate.
   ii. Double check catheter patency with heparinized saline flush.
   iii. Slowly give 1/3 of the propofol, wait 15-30 seconds, and then start titrating the rest. Make sure that the propofol syringe remains connected to the catheter, in case a quick bolus is necessary. Wait until the lateral palpebral reflex is absent, the medial palpebral reflex is significantly depressed, and the eye globe is rotated before attempting to check the jaw tone. When the eye signs are appropriate, test jaw tone. If relaxed, attempt intubation.

c. Intubation
   i. During laryngoscopy, make sure that the laryngoscope blade is not touching the epiglottis, but only depressing the base of the tongue.
   ii. Pass the endotracheal tube through glottis into the trachea.
   iii. Connect the tube to the breathing circuit
   iv. Turn on the oxygen at the calculated rates
   v. Check the patient's pulse
   vi. Secure the ETT behind the ears with the gauze
   vii. Check the ETT cuff by squeezing the bag until the pressure reaches 20 cm H2O. Add air to the cuff until no leak is heard.
   viii. Turn on the vaporizer
   ix. Listen to both sides of the chest
   x. Turn dog into lateral recumbency
   xi. Pass an esophageal stethoscope
   xii. Start monitoring the dog
   xiii. Fill out the anesthetic record. The vital signs to be recorded in the anesthesia record during this lab include heart rate, respiratory rate, and temperature. Monitor depth of anesthesia.
   xiv. Put in sterile eye lube

d. Recovery
   i. Discontinue the isoflurane
   ii. Move the heating pad to the floor and place the patient there. Disconnect patient before moving.
   iii. If on rebreathing system, connect extension hoses and reconnect the patient. Change the oxygen flow to recovery rates (see Appendix 1 for oxygen flow rates). If on a non-rebreathing system, just reconnect the patient to oxygen.
   iv. Check the patient's pharyngeal region with the aid of the laryngoscope for the presence of fluid (regurgitation).
   v. Untie the ET tube. Do not deflate the cuff until the animal swallows.
   vi. If temperature is below 98ºF, set up a bair hugger.
   vii. Only deflate the cuff and extubate after the patient swallows.

viii. Check the nostrils for airflow after extubation.

ix. Watch the patient until it can stand and walk a few steps

x. Do not remove the IV catheter until the patient is ready to go back to the cage

xi. A clinician or MDL tech will check patient before taking it back.

xii. Finalize the anesthesia record.

e. Supportive Care

i. Heating pads and blankets will be used to maintain rectal temperature > 96°F during the procedure.

f. Post-operative Procedure

i. The animals will be monitored after the removal of all IV catheters.

ii. Heating pads and blankets may be utilized until a rectal temperature of ≥ 99°F is recorded and the animal is able to ambulate from MDL 3 to its housing area.

V. Potential Adverse Effects, Mitigation, or Treatment

a. See IV catheter SOP and Sedation SOP for potential complications

i. Tracheal irritation

ii. Tracheal tear

iii. Apnea

iv. Hypoxemia

v. Hypothermia

vi. Arrhythmias

vii. Low blood pressure

viii. Hypercapnia

ix. Aspiration

x. Cardiac arrest

b. If surgery performed

i. Intra-operative bleeding

ii. Post-operative bleeding

iii. Post-operative infection

c. Avoidance measures:

i. Use tube of proper size, tie in well, inflate cuff carefully not to overinflate, use care during intubation with proper visualization.

ii. Disconnect patients before moving them to avoid excessive traction of the endotracheal tube.

iii. If patient is not intubated yet then intubate and provide 100% oxygen, if patient is intubated then provide manual ventilation and adjust depth of anesthesia until spontaneous breathing returns.

iv. Preoxygenate patients before giving propofol and promptly intubate them. Monitor hemoglobin saturation throughout the procedure and during recovery and maintained on 100% oxygen for at least 10 minutes after discontinuation of isoflurane. Do not remove oxygen if patient is not breathing spontaneously.

v. Use cage pads and heating pads while monitoring body temperature

vi. Monitor ECG; treat arrhythmias as needed at the direction of veterinarian laboratory instructors.

vii. Provide IV fluids during anesthesia and monitor blood pressure. Treat hypotension as directed by veterinary laboratory instructors.

viii. Monitor and ventilate patients manually that are not breathing adequately.

ix. Check the patient's pharyngeal region with the aid of the laryngoscope for the presence of fluid before regaining consciousness. If there is fluid present alert the veterinary laboratory instructors to set up equipment to suction and lavage.

x. Monitor cardiac rhythm with ECG, treat cardiac arrest with CPR as directed by veterinary laboratory instructors. Have basic emergency drugs nearby (epinephrine, atropine and lidocaine)

xi. Pay careful attention to hemostasis during surgery, correct as needed using cautery, direct pressure or ligation of larger bleeding vessels.

xii. Use strict sterile technique.

Guidelines for Appropriate Oxygen Flow Rates		
	Rebreathing System	**Non-Rebreathing System**
Patient Weight	>7 kilograms	<7 kilograms
Induction Flow (Initial 5-10 Minutes of Anesthesia)	40-60 ml/kg/min	150 ml/kg/min
Maintenance Flow	20-40 ml/kg/min	150 ml/kg/min
Recovery Flow	40-60 ml/kg/min	150 ml/kg/min
Minimum Flow (if calculated flow falls below 500ml/min, use 500ml/min)	500 ml/min	500 ml/min