

ISM-VET-12 啮齿动物麻醉方案兽医推荐

Veterinary Recommended Anesthetic Plans for Rodents

目标 GOAL:

为啮齿动物的手术或存活手术的麻醉计划提供建议。高度鼓励在方案设计阶段与兽医人员协商。To provide recommendations for anesthetic plans for procedures or survival surgery in rodents. Consultation with the Veterinary Staff during the project design phase is highly encouraged.

定义 DEFINITIONS:

麻醉 Anesthesia – A state characterized by a loss of sensation due to the pharmacologic depression of nerve function

全麻 General Anesthesia - a state of unconsciousness with the absence of pain sensation over the entire body. Depth of anesthesia must always be verified (e.g. lack of deep pain response in the limb) prior to creating a surgical incision or performing a painful procedure.

处方 FORMULARY

异氟烷吸入麻醉是一种选择的方法，因为它具有广泛的安全裕度、可靠性、易于管理，以及在暴露后对动物的快速恢复意识。ISOFLURANE inhalant anesthesia for rodent procedures is the METHOD OF CHOICE due to its wide safety margin, reliability, ease of administration, and rapid return to consciousness for animals after exposure has ended.

药品 Drug	剂量 Dose	频率 Frequency	途径 Route	建议方案 Recommendations
异氟烷 Isoflurane	大小鼠，4-5% 诱导, 1-2%维持 麻醉。 Mouse or Rat: 4-5% induction, 1-2 % maintenance	持续 Continuous	吸入 Inhalant	强烈推荐使⽤异氟醚汽化器，因为它可以方便地控制麻醉深度。 此外，该系统还提供了适当的剩余麻醉剂清除，以减少人员暴露。 The use of an Isoflurane vaporizer is strongly recommended as it allows for ease in control of the anesthetic depth. Additionally, the system provides for appropriate scavenging of residual anesthetic required to minimize personnel exposure.

注射式麻醉剂，如氯胺酮/甲苯噻嗪可以提供有效的全身麻醉，但动物的反应根据品系、大小和性别而不同。在整个手术过程中，需要对手术深度时刻关注。从注射麻醉药中恢复的过程可能很漫长，而且在动物正常活动之前，人员必须持续照料。通过外部热源维持体温对于

加速恢复和降低因体温过低造成的术后死亡是很重要的。如果需要额外的麻醉剂来达到足够的手术面，补剂量给药应该只能单独使用氯胺酮，以减少心血管的影响（如呼吸和心脏的抑制）和动物死亡。Injectable anesthetic cocktails such as ketamine/xylazine may also provide effective general anesthesia but the animal's response can be variable based on strain, size and gender. Verification of surgical depth is needed throughout the procedure. Recovery from injectable anesthetics can be lengthy and personnel must be available cage side until animals are moving normally. Maintaining body temperature via an external heat source is important in speeding up recovery and minimizing post-operative death due to hypothermia. If additional anesthetic is needed to reach a sufficient surgical plane, re-dosing should consist of ketamine alone to minimize cardiovascular effects (e.g. respiratory and cardiac depression) and subsequent death of animals.

药品 Drug	剂量 Dose	频率 Frequency	途径 Route	建议方案 Recommendations
氯胺酮和甲苯噻嗪 Ketamine/ Xylazine	大小鼠， 80-110/5-10 mg/kg。 Mouse or Rat: 80-110/5-10 mg/kg.	Once, re-dose with 1/3 to 1/2 of the original Ketamine dose ONLY	静脉注射 IP	1ml Ketamine (100mg/ml) 0.5ml Xylazine (20mg/ml) 8.5ml sterile saline Mice: 0.1ml per 10 gm of body weight will provide a 100 mg/kg Ketamine/ 10 mg/kg Xylazine dose
特拉唑、布托啡诺、 美托咪定 Telazol/Butorphan ol/Dexmedetomidine	小鼠 22-33/0.05- 0.08/1.1-1.7 毫克每千克 Mouse 22 – 33/0.05 – 0.08/1.1 – 1.7 mg/kg	单次 Once	静脉注射 IP	To make: use 2.5 mL dexmedetomidine (0.5 mg/mL) and 2.5 mL butorphanol (10 mg/mL) to reconstitute 100 mg telazol, THEN dilute 1:10 (0.1 mL drug mixture +0.9 mL sterile water. Mice: 0.1 mL per 30 – 45g animal will provide the correct dose range. Reverse with atipamezole.

逆转剂 Reversal

可以使用药物来逆转 Alpha-2 激动剂，从而加快术后恢复或减轻麻醉的深度。Agents are

available to reverse Alpha-2 agonist and thus hasten post op recovery or lighten depth of anesthesia.

试剂 Agent	剂量 Dose	途径 Route
育亨宾 Yohimbine	2.1 mg/kg Mouse	IP
阿替咪唑 Atipamezole	2.5 mg/kg Rat, 1 mg/kg Mouse	IP

术后镇痛 Post-Operative Analgesia

存活手术和外科手术需要仔细考虑手术后的疼痛治疗，同时应提供药物和非药物止痛剂，以配合适当的兽医护理。不使用止痛剂需要得到 IACUC 的批准。Survival procedures and surgeries require careful consideration of post-operative pain management and both pharmacologic and non-pharmacologic analgesics should be provided in keeping with appropriate veterinary care. Withholding of analgesics requires IACUC approval.

附件：

啮齿动物麻醉及术后护理记录模板

EXAMPLE DOCUMENT Rodent Anesthesia and Post-Procedural Recovery Record

The *Guide for the Care and Use of Laboratory Animals 8th Edition* is accepted by OLAW and the NIH and states that “appropriate medical records should...be maintained” as part of “postoperative care” for animals on pg. 119. You should document anesthesia and analgesia use that are part of procedures described in your IACUC-approved animal use protocol. Researchers are encouraged to use this template or a modified version for guidance on independent recordkeeping in laboratory notebooks. An MS Word format is provided so labs can type in procedural descriptions as performed. **In accordance with standard veterinary medical standards, it is not appropriate to pre-fill the times, dates and initials into a rodent anesthesia and post-procedural recovery record.** If applicable, you may use this log to record how *groups* of animals are cared for, if they receive the same doses and procedures. This record does not need to be maintained for each individual animal, but must reflect how each animal is cared for.

手术日期 Date of Procedure: _____	过程描述 Description of Procedure: _____
方案号 Protocol Number: _____	_____
操作内容 Person Performing Procedure: _____	_____
笼卡号 Cage Card Number: _____	_____

麻醉记录 Anesthetic Procedure Log

请记录个体动物麻醉细节，术前止痛药的使用以及动物恢复时间。Record individual animal details for initiation of anesthesia, pre-procedural analgesics, and recovery time of animals.

动物号 Animal ID	体重 Body Wt.	麻醉剂 Anesthetic Agent(s)			止痛剂 Analgesic Agent(s)			手术结束时间 Time Procedure Completed	麻醉苏醒时间 Time Recovered from Anesthesia (awake and sternal)	
		名称 Name(s):	体积比 Vol./% Admin.	给药途径 Route Admin.	给药时间 Time Given	名称 Name(s):	体积 Vol. Admin.		给药途径 Route Admin.	给药时间 Time Given

过程记录 Observations/Comments during the procedure: _____

术后止痛过程记录 Post-Procedural Recovery / Analgesic Administration Log

请记录方案中描述的用于动物恢复的药物使用 Record analgesic administration as described in the animal protocol and any variations from normal during recovery.

日期 Date	时间 Time	止痛药给药记录 Analgesic Drug Administration / Comment Log	Initials