

Arizona State University
Institutional Animal Care and Use Committee
STANDARD INSTITUTIONAL GUIDELINE

POST-OPERATIVE CARE

It is the policy of the IACUC that animals undergoing survival surgery will receive appropriate post-operative care as presented in these guidelines.

A. Post-operative Phases

1. Acute Post-operative Care: This phase is often considered to be the most critical, as recovery from the anesthetic involves dynamic changes in physiological processes that can result in crucial disturbances. The animal is maintained in a warm, dry, comfortable recovery area appropriate for the species under frequent observation by trained personnel. This observation includes monitoring thermoregulatory, cardiovascular, and respiratory functions at regular time intervals that may be decreased as the patient begins to display behavior indicative of full recovery from anesthesia (e.g., ocular reflexes, righting, normal movement). The animal may be moved to its appropriate vivarium room once it is consistently ambulatory and able to reach both food and water.
2. Long-term Post-operative Care: Management beyond the acute phase involves follow-up care to ensure that the patient returns to as normal of a physiological and behavioral state as possible. This stage includes observation of the animal's attitude and demeanor, assessment of its physiological functions (urine/fecal output), and monitoring of its physical capabilities. Additionally, surgical sites should be observed regularly, bandages changed as necessary, and sutures or staples removed at the appropriate time.

B. Post-operative Facilities

1. Recovery Room
 - a. Acute post-operative care is best accomplished in a dedicated room or area near the surgical space large enough to provide space for all animals undergoing surgical procedures. This space must be easily accessible for personnel who are responsible for post-operative monitoring to ensure that proper care, as outlined above, is provided.
 - b. Post-operative patients should be housed in clean cages designed to avoid injury to the animal and of appropriate size for the species. Individual housing may be warranted depending on the species, the procedure(s) performed, and the expected post-operative status.

C. Post-operative Procedure Guidelines

1. Injectable reversal agents are available to use for alpha-2-adrenergic agents and benzodiazepines. While they are effective at reversing the effects of those medications, there is no reversal for ketamine. An animal that is given the reversal agent will still be under the effects of ketamine, and will still need to be monitored during recovery.

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2. Thermometers should be used to monitor body temperature, especially for non-rodent mammals.
3. Heat lamps, heating pads, hot water bottles, increased ambient room temperature, or heated cages should be provided to minimize hypothermia yet not induce hyperthermia. Careful attention should be paid to the temperature of the environment to ensure that it is within the correct parameters for the species. While provisioning of external heat is critical for a fast and uneventful recovery, there can be no hot spots that could injure the animal, since heat avoidance behavior is non-existent or subdued during recovery. Researchers need to inspect the heating pads to ensure they provide the expected temperature as they tend to be less dependable over time.
4. Supplemental intravenous, subcutaneous, or intraperitoneal fluid therapy should be considered, especially for lengthy procedures.
5. For larger species, a source of oxygen, various-sized endotracheal tubes, a laryngoscope, resuscitation breathing bags, and suction should be available for the maintenance of adequate ventilatory function.
6. Emergency drugs (e.g., epinephrine, corticosteroids, lidocaine, antihistamines) appropriate to the species being used should be readily available.
7. Analgesics and antibiotics should be provided as described in the IACUC protocol.
8. Sutures or staples should be removed once tissue has healed significantly and by the date indicated in the approved IACUC protocol. Drains and dressings should be checked and changed regularly.

D. Post-operative Patient Evaluation

1. Careful observation by trained personnel is essential during all phases of post-operative care.
2. Acute post-operative care
 - a. Attention should be given to the animal's vital signs (e.g., ventilatory rate, mucous membrane color, capillary refill time, and pulse).
 - b. Until the animal has recovered from anesthesia, it should be positioned for optimal respiratory function.
 1. Mammals should be rotated or turned every 10-15 minutes to facilitate respiration and avoid dependent edema.
 2. Birds should be recovered as upright as possible to enable maximum function of the air sacs.
 3. Turtles should be kept in ventral recumbency to keep the viscera from compressing the lungs.
 4. Lizards, snakes, amphibians, and fish should be in ventral recumbency.

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3. Long-term evaluation should include:
 - a. Observation of the animal's attitude and demeanor to assess potential post-operative issues such as pain or other complications. Such observations should be compared to what is normal for that individual. Changes in facial expression is a reliable way to assess pain in various species. Facial grimace scales have been developed for mice, rats, and rabbits with more species being added in the future. More information can be found at <https://www.nc3rs.org.uk/3rs-resources/grimace-scales>.
 1. Potential signs associated with pain and distress:
 - a. Decreased food and water consumption
 - b. Self-imposed isolation/hiding
 - c. Rapid, open-mouth breathing
 - d. Biting, aggression
 - e. Increased/decreased movement
 - f. unkempt appearance (rough, dull hair coat or feathers)
 - g. Abnormal posture/position (hunched, head pressing)
 - h. Dehydration, skin tenting, sunken or squinting eyes
 - i. Twitching, trembling
 - b. Monitoring of surgical sites for signs of infection, dehiscence, or self-inflicted trauma. These issues should be corrected promptly. If the damage is too severe, then euthanasia may be required. Unless corrective surgeries and treatments are included within the approved protocol, investigators must consult with the DACT veterinary team before performing any surgeries or treatments not included in the protocol.
 - c. Monitoring of physiological functions (e.g., breathing, eating, urination, defecation) to ensure they are within normal limits and that post-operative pain is adequately controlled.
 - d. Observation of the patient's physical capabilities to ensure normal ambulation and balance.

References

1. Council NR. Guide for the Care and Use of Laboratory Animals: Eighth Edition. Washington, DC: The National Academies Press. 2011.
2. Bernal, J., et al. Guidelines for Rodent Survival Surgery. J Invest Surg. 2009; 22:445-451