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ACLAM Position Statement on Rodent Surgery

The American College of Laboratory Animal Medicine (ACLAM), representing board-certified veterinary specialists in the field of laboratory animal medicine (LAM), recommends that all institutions that use animals in research, testing, and training develop and implement written standards for performing surgical procedures on rodents and that these standards be established with the guidance of specialists in LAM and/or other relevant veterinary specialties (e.g., anesthesia, surgery, ABVP (small mammals)). These standards must be in full consideration of Russell & Birch's "Three R's" (Replacement, Reduction, and Refinement) and should be approved by the Institutional Animal Care and Use Committee (IACUC) or appropriate oversight body. At a minimum, the written standards should enumerate institutional expectations for 1) qualifications and training of personnel who perform perioperative care and surgical procedures, 2) consultation with the Attending Veterinarian or his/her designee during design of surgical procedures and development of related IACUC protocols, 3) aseptic technique, 4) anesthesia and analgesia, 5) peri-operative care, and 6) record keeping (see related ACLAM Position Statement). These standards should be reviewed periodically and the effectiveness assessed using performance-based standards.

Qualifications and Training

Establishment of formalized rodent surgical training programs is recommended and institutions are encouraged to incorporate inanimate training tools such as audiovisual aids, training models, and use of cadavers in consideration of the 3Rs. Post approval monitoring programs should incorporate methods to confirm that training outcomes can be effectively assessed and that rodent surgeries are conducted as described in approved IACUC protocols.

Consultation with the Attending Veterinarian

Laboratory animal veterinarians, investigators, and the institution's IACUC share the responsibility of ensuring that rodents participating in research receive appropriate veterinary care throughout their lives. General requirements for rodent survival surgery are outlined in the *Guide for the Care and Use of Laboratory Animals* (*Guide*). The Office of Laboratory Animal Welfare (OLAW) and AAALAC International endorse the *Guide* standards for rodent surgery, requiring institutions to have adequate procedures in place for conducting rodent surgery. The *Guide*, the Health Research Extension Act of 1985, and the Animal Welfare Act Regulations enforced by the USDA are consistent in stressing the importance of minimizing pain and distress in animal subjects.

Aseptic technique

Survival surgical procedures must incorporate aseptic technique. Institutional guidance on aseptic technique should include preparation of the animal, sterilization of surgical instruments and supplies, and the surgeon's attire. Non-survival surgeries may be performed with clean rather than aseptic technique.

Aseptic technique is required for survival surgery since animals can develop either gross or inapparent surgical site infection that may affect research outcomes and animal welfare. Asepsis is the use of techniques that prevent entry of microorganisms into sterile tissues below the skin surface and may include steps such as sterilizing surgical instruments and materials, reducing bacterial load on skin with antiseptics, creating a sterile field around the area of incision with sterile drapes, surgeon preparation, and surgical procedure area sanitation. Aseptic technique used in rodents replicate those common in larger animals but may, in certain situations, be modified, such as the "tips only" technique in which it is permissible for sterile tips of instruments to contact the surgical site, yet sterile gloves may be optional, dependent on institutional guidance. Perioperative antibiotics may be indicated in certain circumstances, such as long duration surgeries, contaminated or clean-contaminated procedures, or placement of chronic implants. The use of antibiotics is not an alternative to aseptic technique.

Anesthesia and Analgesia

Pain and distress must be minimized through appropriate use of anesthetics, analgesics, nursing care, and other treatments, as appropriate, and described in the IACUC protocol. The use of peri-operative analgesia is encouraged for rodent surgeries; pre-emptive analgesia is preferred for survival surgery whenever possible. The type of pain, mechanism of action of analgesic agents, and potential confounding effects of analgesia on research findings should be considered.

Unless contraindicated for scientifically justified reasons, analgesia should be considered standard during the perioperative period. In animal models, use of analgesics before initiation of surgical trauma has been shown to block nociceptive stimulation of the CNS, and may provide more pain relief than if administered post-operatively.

Summary

Experimental surgical procedures in rodents induce profound hormonal and metabolic changes as part of a normal stress response. Managing the stress response through sound surgical, anesthetic, and perioperative care practices are essential to safeguard the validity and reproducibility of research results and to ensure the health and well-being of rodents used in surgical models. Investigators and laboratory animal veterinarians promote quality research and high standards of animal health and welfare through intensive surgical training, thorough presurgical planning, and careful execution of IACUC-approved surgery.

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