Title: Euthanasia of Teaching and Research Animals  
Policy Number: 019  
Policy Intent: The purpose of this policy is to describe approved methods for animal euthanasia, while avoiding or minimizing animal discomfort, distress, and pain.

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1. Introduction  
Performing euthanasia correctly is an ethical imperative. Proper euthanasia is quick, minimizes pain/distress and reliably causes death. Practical issues such as degree of technical difficulty, time required to perform the procedure, readily available equipment/resources to perform the procedure, as well as aesthetics and human emotion must be considered. Standardized guidelines for humane euthanasia are detailed in the 2020 AVMA Guidelines on Euthanasia and available HERE.

2. Policy  
A. The term euthanasia means “good death”. Therefore, euthanasia techniques should result in rapid loss of consciousness followed by cardiac or respiratory arrest and the ultimate loss of brain function. In addition, the technique should minimize distress and anxiety experienced by the animal prior to loss of consciousness. The IACUC endorses the AVMA guidelines as the recognized authority with respect to animal euthanasia. The IACUC also recognizes certain research parameters dictate that alternative techniques may need to be evaluated by, and approved by the committee.  
B. Humane Killing: the quickest and most humane means of terminating the life of free-ranging wildlife in a given situation may not always meet all criteria established for euthanasia. These acknowledgements are not intended to condone a lower standard for the humane termination of wildlife. The best methods possible under the circumstances must be applied, and new technology and methods demonstrated to be superior to previously used methods must be embraced.

3. Responsibility  
A. University veterinarians oversee all aspects of animal health, and are assisted by Animal Care Services (ACS) technicians and staff.  
B. Facility Managers ensure implementation of all methods and procedures.  
C. Research staffs are required to follow these guidelines.  
D. Animals should never be euthanatized via CO2 gas or physical methods of euthanasia in animal housing rooms or in the direct presence of conspecifics. Special circumstances such as during quarantine and/or exposure to infectious agents or
aquatic organisms (e.g. fish and amphibians) euthanized by immersion where multiple individuals may be placed in the same euthanizing bath may be exceptions.

4. Acceptable Procedures, Definitions and Terms
This is not intended to be a comprehensive list, but rather a list of procedures, definitions and terms meant to describe those techniques which may be considered controversial by certain segments, but may be the most beneficial to the animal based upon circumstances surrounding the act of euthanasia as defined above.

A. Exsanguination: With an animal under deep anesthesia, withdrawing the maximal volume of blood via cardiac puncture, abdominal aorta puncture, or bilateral transection of the cervical vasculature.

B. Firearms: Should only be used by qualified, trained personnel and in areas where the discharge of firearms is lawful. For wildlife, permission of landowner and all necessary provincial and federal permits are obtained. Gunshot targeted to the heart (chest) or the neck (vertebrae) presents challenges for accurate placement, but may be the best option for free-ranging or other settings where close approach is not possible or where the head must be preserved for disease testing (rabies, CWD or other suspected neurological disease) or museum specimens. Gunshot to the chest or neck may not result in rapid death and may be considered humane killing rather than euthanasia (AVMA Guidelines for the Euthanasia of Animals: 2013).

C. Gaseous Carbon Dioxide (CO2): Must be supplied using a compressed gas tank. As gas displacement rate is critical to the humane application of CO2, an appropriate pressure-reducing regulator and flow meter or equivalent equipment with demonstrated capability for generating the recommended displacement rates for the size container being utilized is necessary. Carbon dioxide exposure using a gradual fill method is less likely to cause pain due to nociceptor activation by carbonic acid prior to onset of unconsciousness; a displacement rate from 30% to 70% of the chamber volume/min is recommended for rodents. Whenever gradual displacement methods are used, CO2 flow shall be maintained for at least 1 minute after respiratory arrest. The use of dry ice as a source of CO2 for euthanasia is not permitted.

D. Inhalant Anesthesia: Anesthetic agent(s) delivered as a volatile gas to the respiratory tract to induce anesthesia. Personnel should minimize their exposure to these agents as some are considered chemical hazards. In the animal facilities, these agents should only be used in a system with an active gas scavenging device or ducted biosafety cabinet. Note: This method is not approved as a sole means of euthanasia. In the case of field research, a vaporizer and scavenging device is not practical. In this instance, the “bell jar” technique is appropriate. The “bell jar” technique utilizes a small container with an isoflurane soaked cotton ball or gauze contained within an object in which the animal cannot come into physical contact with the liquid anesthetic (tea ball). This technique should only be performed in the outside air to prevent release of volatile agents into a closed space. Because anesthesia machines are available to researchers on campus, PI’s that wish to utilize the “bell jar” techniques in lab settings must obtain IACUC approval.

E. Injectable Anesthesia: Chemical agent(s) administered by injection with a needle and syringe to induce anesthesia. Common routes of injection include, but are not limited to, intraperitoneal (IP), intramuscular (IM) or intravenous (IV). Injectable anesthetics are
easy to administer, require minimal equipment, and avoid safety concerns associated with inhalants.

F. Physical Euthanasia: Individuals who perform physical euthanasia on unanesthetized animals must first be trained and certified by IACUC approved designees. Physical euthanasia on unanesthetized animals, irrespective of age, can only be done if the procedure is described in the approved AUP.

1) Cervical Dislocation: cervical dislocation in unanesthetized neonatal and adult rodents is permitted only if it is performed correctly by a trained person, its use is scientifically justified, and it is described in an approved AUP. Manual cervical dislocation is a humane method of euthanasia when limited to rodents weighing less than 200 grams. Personnel using cervical dislocation must be adequately trained, demonstrate their technical proficiency, and must consistently apply this method humanely and effectively.

2) Decapitation: decapitation in unanesthetized neonatal and adult rodents is permitted only if it is performed correctly by a trained person, its use is scientifically justified, and it is described in an approved AUP. When performed properly this technique is nearly instantaneous and is considered humane. Guillotines that are designed to accomplish decapitation in adult rodents in a uniformly instantaneous manner are commercially available. Sharp scissors can be used to decapitate neonatal rodents. Check guillotine and scissors blades frequently to ensure sharpness. The equipment used to perform decapitation should be maintained in good working order and serviced on a regular basis to ensure sharpness of blades. The use of plastic cones to restrain animals appears to minimize stress from handling, minimize the chance of injury to personnel, and improves positioning of the animal in the guillotine. (2013 AVMA Guidelines on Euthanasia)

3) Cardiac puncture is prohibited on conscious animals. Animals must be deeply anesthetized for either exsanguination or injection of euthanasia solution into the heart.

G. Secondary physical method to ensure death: must be performed in rodent and rabbits in order to confirm that animals are dead, one of the following secondary physical methods must be performed on animals that have been anesthetized with approved agents:

1) cervical dislocation;
2) decapitation;
3) thoracotomy [open the chest cavity using sharp scissors or scalpel]; or
4) collection of vital organs.
5) exsanguination
6) immersion in liquid nitrogen
7) lose dose ethanol (finfish, tadpoles)

H. Thoracic Compression: Must only be used as a last choice for small to medium sized animals when a preferred method is not possible (i.e., field work). Thoracic compression must only occur following Isoflurane or CO2 overdose.

5. Euthanasia of sick or injured animals

A. Sick or injured animals that cannot be successfully treated or relieved of pain and distress should be euthanized promptly.
B. Properly trained research personnel are responsible for euthanizing sick, injured or moribund animals as soon as these conditions are recognized.
   1) These animals should not be held for later euthanasia by Animal Care Services personnel.
C. To investigate unexpected illnesses, research personnel may contact ACS to arrange for euthanasia and necropsy of the animals.
D. ACS veterinarians have the authority to euthanize moribund animals, animals experiencing more than momentary or slight pain and/or distress, and non-study related causes leading to uncontrolled pain or distress.
E. If an ACS veterinarian is unable to contact research personnel regarding the care or treatment of a moribund animal, ACS veterinarians or designated representatives are authorized to euthanize the animal.
F. Ensure appropriate emergency contact numbers for all research personnel are posted in the animal facilities.

6. Verification of Death
   A. Verification of death is required prior to disposal of a body by:
      1) Observing for the absence of movement.
      2) Observing for the absence of respiratory and heartbeat activity for at least 3 minutes.
      3) Check for lack of eye and toe pinch reflex.

7. References
• Guidelines of the American Society of Mammologists for the use of wild mammals in research and education [http://www.mammalsociety.org/committees/animal-care-and-use#tab3]