



TITLE: EUTHANASIA METHODS APPROVED BY SPECIES FOR THE UNIVERSITY OF ARIZONA

PURPOSE: To ensure that researchers follow acceptable practices of euthanasia when necessary in the course of animal research.

REVIEW/REVISIONS: Permanent amendment/revisions to this policy must be presented to the IACUC for review before implementation and should be developed by the IACUC Office and/or IACUC membership.

EFFECTIVE DATE: November 1, 2007; **Revised/Re-Approved:**

PERSON(S) RESPONSIBLE: All University Animal Care and Research Investigator personnel charged with euthanizing animals.

POLICY/PROCEDURES:

The University of Arizona IACUC recognizes the **2007 Report of the AVMA Panel on Euthanasia** and the USDA/APHIS approved methods euthanasia as the accepted guidance documents for euthanasia of research animals. When necessary, investigators must include acceptable methods of euthanasia on IACUC protocols following the standards outlined in these documents.

PROVISO:

Investigators may request variance to the established methods herein described. The request must be made in writing for IACUC review and must provide Scientific Justification.

Scientific Justification

Acceptable Scientific Justification may be accomplished by one of the following methods:

- a. A small pilot study consisting of 6-10 animals per group may be incorporated into the protocol to test for significant differences between approved euthanasia methods and the requested variance. The results of the pilot study would then be reviewed by the IACUC before granting final approval of physical methods for euthanasia.
- b. Results of a literature review may be submitted with the protocol. The review should demonstrate that the AVMA approved methods would not work in the specific study being reviewed.
- c. The IACUC may consider an ongoing study as justified if the investigator has provided strong justification that terminating the use of cervical dislocation or decapitation without anesthesia would severely affect the study.

Unacceptable justifications would include:

- a. The study is ongoing and the procedure cannot change midstream without compromising the results; or, this method of euthanasia has been performed for years. Prior data collection would now be made useless. The IACUC would respond by asking the investigator to perform a pilot study as outlined above.
- b. Colleagues at other institutions are using these methods and they are "industry standard."
- c. Current grant requests do not cover a pilot study and no funds are available to perform it. The IACUC is sensitive to this issue. However, we are charged with making sure the University is in compliance with all applicable guidelines and regulations. One suggestion would be to share the cost of the pilot study with several colleagues within or outside the University. The results of the study could be attached to any similar protocol submitted as justification. Another suggestion would be to monitor the "funding sources" link at the Vice President for Research's website for grants that may be available for this purpose (U of A website:



(http://www.vpr.arizona.edu/funding_sources). Since many institutions are affected, publication in a peer-reviewed journal would be highly recommended.

Procedures:

Amphibians and Fish

Method	Dosage	Comments
Benzocaine hydrochloride	400 mg/liter bath	
Pentobarbital sodium	60-100 mg/kg IV, IP, IPP	
Tricaine methane sulfonate (MS222)	3gm/liter bath buffered with 2.1gm/liter sodium bicarbonate	

Birds

Method	Dosage	Comments
Carbon dioxide asphyxiation	≥70%	Cannot use dry ice, only compressed gas.
Cervical dislocation under anesthesia		Requires scientific justification. If needed without anesthesia, must have prior approval of the IACUC.
Decapitation under anesthesia		Requires scientific justification. If needed without anesthesia, must have prior approval of the IACUC. Must use plastic cones for restraint. Must ensure sharpness of blades before each use. Annual certification of guillotines required.
Isoflurane	Saturated cotton ball in closed container or face mask.	Must be used with proper ventilation (e.g., under a fume hood). Bird must only be exposed to vapors, not the liquid.
Pentobarbital sodium	0.2-1.0 ml/kg ICe	

Cats and Dogs

Method	Dosage	Comments
Euthanasia solutions (e.g., Beuthanasia®, Euthasol®, Fatal-Plus®, Sleepaway®, Socumb®, Somlethol®)	1 ml/4.5 kg IV	Needs to be rapidly administered.
Pentobarbital sodium	Cats: 200 mg/kg IV; Dogs: 150 mg/kg IV	Needs to be rapidly administered.
Potassium chloride under anesthesia	1-2 mmol/kg IV or IC	Must be administered in conjunction with prior general anesthesia. Must be administered rapidly.

Horses

Method	Dosage	Comments
Euthanasia solutions (e.g., Beuthanasia®, Euthasol®, Fatal-Plus®, Sleepaway®, Socumb®, Somlethol®)	10-15 ml/45 kg IV	Needs to be rapidly administered.
Penetrating captive bolt		
Pentobarbital sodium	86 mg/kg IV	Needs to be rapidly administered.

Nonhuman Primates

Method	Dosage	Comments
Pentobarbital sodium	100 mg/kg IV	Needs to be rapidly administered.

Rabbits

Method	Dosage	Comments
Carbon dioxide asphyxiation	≥70%	Cannot use dry ice, only compressed gas.
Isoflurane		Must be used with proper ventilation (e.g., under a fume hood). Rabbit must only be exposed to vapors, not the liquid.
Pentobarbital sodium	150 mg/kg IV	Needs to be rapidly administered.



Reptiles

Method	Dosage	Comments
Carbon dioxide asphyxiation	≥70%	Cannot use dry ice, only compressed gas.
Isoflurane		Must be used with proper ventilation (e.g., under a fume hood). Reptiles must only be exposed to vapors, not the liquid.
Pentobarbital sodium	60-100 mg/kg IV, IP	Death may take up to 30 minutes.

Rodents (Mice, Rats, Gerbils, Hamsters, and Guinea Pigs)

Method	Dosage	Comments
Carbon dioxide asphyxiation	≥70%	Cannot use dry ice, only compressed gas.
Cervical dislocation under anesthesia		Requires scientific justification. If needed without anesthesia, must have prior approval of the IACUC. When used in rats, must be <200 g.
Decapitation under anesthesia		Requires scientific justification. If needed without anesthesia, must have prior approval of the IACUC. Must use plastic cones for restraint. Must ensure sharpness of blades before each use. Annual certification of guillotines required.
Isoflurane		Must be used with proper ventilation (e.g., under a fume hood). Rodent must only be exposed to vapors, not the liquid.
Pentobarbital sodium	150-200 mg/kg IP or IV	IC injections may be given if animal is unconscious or anesthetized.

Ruminants

Method	Dosage	Comments
Electrical stunning followed by exsanguination		Can only be used for animals intended for human consumption.
Nonpenetrating captive bolt followed by exsanguination		Can only be used for animals intended for human consumption.
Penetrating captive bolt		Cannot be used for animals intended for human consumption.
Pentobarbital sodium	86 mg/kg IV	Needs to be rapidly administered. Cannot be administered to animals intended for human or animal consumption.
Potassium chloride under anesthesia	1-2 mmol/kg IV or IC	Must be administered in conjunction with prior general anesthesia. Must be administered rapidly.

Swine

Method	Dosage	Comments
Carbon dioxide asphyxiation	≥70%	Piglets only. Cannot use dry ice, only compressed gas.
Electrical stunning followed by exsanguination		Can only be used for animals intended for human consumption.
Nonpenetrating captive bolt followed by exsanguination		Can only be used for animals intended for human consumption.
Penetrating captive bolt		Cannot be used for animals intended for human consumption.
Pentobarbital sodium	86 mg/kg IV	Needs to be rapidly administered. Cannot be administered to animals intended for human or animal consumption.
Potassium chloride under anesthesia	1-2 mmol/kg IV or IC	Must be administered in conjunction with prior general anesthesia. Must be administered rapidly.

Wildlife, Free-Ranging

Method	Dosage	Comments
Gunshot		Firearm and ammunition must be appropriate to the species. Personnel should be skilled and experienced.
Isoflurane		Animals must only be exposed to vapors, not the liquid.
Kill Traps		Cannot be used unless other methods listed are impossible and



		must be justified in the protocol. Trap must be certified by the International Organization for Standardization (ISO). Traps must be checked at least once daily.
Pentobarbital sodium	Match with closest species above (e.g., ruminant, rodent, etc.)	Needs to be rapidly administered. Cannot be administered to animals intended for human or animal consumption.
Potassium chloride under anesthesia	1-2 mmol/kg IV or IC	Must be administered in conjunction with prior general anesthesia. Must be administered rapidly.

Abbreviations

- IC intracardiac
- ICe intracoelomic
- IP intraperitoneally
- IPP intrapleuroperitoneally
- IV intravenously

Note: See also *Animal Care, Handling, and Husbandry Policies #201-11-07 and #202-11-07*