

I. Introduction

Euthanasia is the act of inducing a humane death. A humane death is one that occurs without pain and/or distress. Criteria to consider for a humane death are: loss of consciousness without pain, distress, anxiety or apprehension; rapidly occurring unconsciousness; reliability; compatibility with requirements and purpose of the study; and effect on tissue. For pain to be experienced, the cerebral cortex and subcortical structures must be functional. If the cerebral cortex is rendered nonfunctional (i.e., the animal is unconscious) by any means such as hypoxia, depression by drugs, electric shock or concussion, pain is not experienced. Distress results when stimuli in an animal's environment interfere with its well-being and comfort. Euthanasia generally requires that the animals be handled in some way and proper handling is essential to minimize distress.

Proper handling can only be assured when the personnel performing the euthanasia have been properly trained. This training should provide them with a working knowledge of the normal behavior of the species being euthanatized, an understanding of how handling and restraint affects that behavior and an understanding of how the method to be used produces unconsciousness and death. Personnel must have demonstrated proficiency in the use of a technique before being given the responsibility for using it.

Personnel who perform euthanasia frequently experience strong emotions which can result in a psychological state resulting in job dissatisfaction, absenteeism and careless or callous handling of the animals. The potential impact that performing euthanasia can have on the personnel must be recognized as an important issue, which must be addressed by proper training and counseling where appropriate.

In any given situation the preferred method of euthanasia would be the one that has the least potential for producing pain and/or distress. Selection of the method of euthanasia in any given situation is dependent on the species of animals involved, the available means of controlling the animal, the skill and training of the personnel, the number of animals, and other considerations.

Euthanatizing agents terminate life by three basic mechanisms: (1) hypoxia, direct or indirect; (2) direct depression of neurons for life functions; and (3) physical damage to brain tissue. Euthanatizing agents acting by mechanism 2 depress nerve cells first, blocking apprehension and pain perception; this is followed by unconsciousness and death. Physical methods for euthanatizing animals place an added responsibility on the principal investigator to ensure that those who perform euthanasia be knowledgeable, well trained individuals, because appropriate, consistent application of these methods is essential to produce a humane death.

The methods of euthanasia listed below and the subsequent recommendations were taken from the report of the AVMA Guidelines on Euthanasia as revised in June, 2007. Copies of this report are available at <http://avma.org> under the animal welfare issues section of the web site. In this report the panel classifies methods as being either Acceptable, Conditionally Acceptable or Unacceptable based on the potential for the method to produce pain and distress in the animals being euthanatized or based on the risk to employees performing the euthanasia (e.g. chloroform). All of the physical techniques except focused microwave irradiation are classified as Conditionally Acceptable. Conditionally Acceptable techniques must be approved by the ACC based on the justification in Form A, item 10e and assurances of personnel training must be provided by the investigator in Appendix 3. A group of adjunctive methods are also discussed in the Panel Report. These are unacceptable as a sole means of euthanasia, but may be used with other methods which either render the animal unconscious or assure death after unconsciousness. The Panel Report only covers methods for which there is available scientific information. For methods not included in the report, a member of the veterinary staff should be consulted for advice concerning the possible suitability of the method. If you have any questions concerning this document or the AVMA Panel Report, do not hesitate to call a member of the veterinary staff.

II. Summary of Recommendations for Euthanasia

Inhalant Agents: ^{a,b} - Because in the liquid state most inhalant anesthetics act as topical irritants, animals should be exposed to the vapors of the anesthetic only. Air or oxygen must be provided during the induction period.

<u>Methods of Euthanasia</u>	<u>Species</u>	<u>Remarks on Suitability</u>
Ether	Cats, young dogs, birds, rodents, amphibians, reptile and other small animals	Conditionally Acceptable - its use must comply with state and federal regulations
Halothane	Cats, young dogs, birds, rodents, amphibians, reptile and other small animals	Acceptable – considered the most effective inhalant anesthesia for euthanasia
Methoxyflurane	Rodents and other small Mammals	Conditionally Acceptable
Isoflurane	Cats, young dogs, birds, rodents, amphibians, reptile and other small animals	Acceptable
Nitrous Oxide (NO)	Cats, young dogs, birds, rodents, amphibians, reptile and other small animals	Conditionally Acceptable – when used with other inhalant anesthetics
Enflurane	Cats, young dogs, birds, rodents, amphibians, reptile and other small animals	Acceptable

^a Should not be used alone in dogs and cats < 16 weeks of age;

^b Should be used in accordance with EHSS Policy 2-4-6 covering anesthetic gases

Inhalant Agents - Non-Anesthetics - Most agents in this category require the use of special equipment.

<u>Methods of Euthanasia</u>	<u>Species</u>	<u>Remarks on Suitability</u>
Carbon Dioxide (CO ₂)	Dogs, cats, rodents, rabbits, amphibians, reptiles and other small animals	Acceptable – bottled gas only, requires special equipment. Burrowing animals (rabbits) are extremely tolerant.
Carbon Monoxide (CO)	Dogs, cats, rodents, rabbits, and amphibians	Acceptable – bottled gas only, requires special equipment
Nitrogen (N ₂)/Argon (AR)	Dogs, cats, rodents, and rabbits	Conditionally Acceptable – animals should be anesthetized or heavily sedated.

Non-Inhalant Pharmacologic Agents - Use of these agents requires adequate restraint and mastery of appropriate injection techniques.

<u>Methods of Euthanasia</u>	<u>Species</u>	<u>Remarks on Suitability</u>
Barbituric Acid	Most species	Acceptable - Should be administered by IV whenever practical. IP when IV may be distressful or even dangerous.
Potassium Chloride	Most species	Acceptable - When used in conjunction with anesthesia.
T-61	Mammalian species	Acceptable - When administered IV. Not available in U.S.
Tricaine methane sulfonate (MS 222)	Fish and amphibians	Acceptable
Benzocaine Hydrochloride	Fish and amphibians	Acceptable
2-Phenoxyethanol	Fish	Acceptable

Physical Methods - These methods require that the user have complete mastery of the techniques to be used.

<u>Methods of Euthanasia</u>	<u>Species</u>	<u>Remarks on Suitability</u>
Electrocution	Mammalian species	Conditionally Acceptable - Two step procedure, requires special equipment.
Penetrating Captive-Bolt Pistol	Large animals, dogs and rabbits	Conditionally Acceptable - Requires special skills and equipment.
Cervical Dislocation	Small mammals, birds, rats (200 gm or less) and rabbit under 1 kg	Conditionally Acceptable - In lieu of demonstrated high degree of technical competency, animals must be sedated. Larger rats and rabbits require special demonstrated proficiency. Requires scientific justification.
Decapitation	Small mammals, birds, amphibians, fish and reptiles	Conditionally Acceptable - Should be followed by pithing in poikilotherm. Equipment must be regularly serviced to assure proper function.
Pithing	Some poikilotherms	Conditionally acceptable - Death not immediate unless double pithed.
Microwave	Small rodents	Acceptable - Requires special restraint and focusing equipment. Microwave ovens are absolutely condemned for use.
Maceration	Newly hatched chicks, poults, and pipping eggs	Conditionally acceptable- effective when equipment is properly designed and operated

Adjunctive Methods - When properly done these methods induce unconsciousness, but do not ensure death.

<u>Methods of Euthanasia</u>	<u>Species</u>	<u>Remarks on Suitability</u>
Stunning	Small mammals, fish, amphibians and reptiles	Single blow to head followed by a method that ensures death.
Exsanguination	Most species	Must be rendered unconscious by some other method first.