

## CONTROVERSIAL EUTHANASIA METHODS DEFINITIONS, POLICIES AND GUIDELINES

### DEFINITIONS:

- Euthanasia - The term euthanasia is derived from the Greek terms eu meaning "good" and Thanatos meaning "death." A "good death" would be one that occurs without pain and distress. In the context of this report, euthanasia is the act of inducing humane death in an animal. Euthanasia techniques should result in rapid unconsciousness followed by cardiac or respiratory arrest and ultimate loss of brain function. In addition, the technique should minimize any stress and anxiety experienced by the animal prior to unconsciousness. Technical proficiency and humane handling of the animals to be euthanized may minimize stress.<sup>1</sup>
- Humane is defined as "Characterized by kindness, mercy, or compassion, marked by an emphasis on humanistic values and concerns; Synonyms: humane, compassionate, humanitarian, and merciful. The central meaning shared by these adjectives is "marked or motivated by concern with the alleviation of suffering"<sup>2</sup>

### POLICIES AND GUIDELINES

"PHS Policy and USDA Regulations require that an IACUC review and approve the methods of euthanasia which are proposed. These must be consistent with the recommendations of the AVMA Guidelines on Euthanasia or succeeding revised editions, unless there are scientific justifications for alternative methods." "... criteria used to evaluate the appropriateness of a given method include compatibility with the requirements of the research, reliability, irreversibility, the minimization of distress to animals and persons performing euthanasia, and safety to the latter. The species of animal being used and the qualifications of the investigators are also important considerations. Three categories of methods exist: inhalation and non-inhalation pharmacologic agents, and physical methods."<sup>3</sup>

#### 1. Inhalation Agents

- Ether

Ether is the agent upon to which all other inhalation anesthetic agents are compared, as it was the first inhalation anesthetic agent.

Ether is extremely irritating to the mucosal lining of the respiratory tract.

It is stressful to the animal.

It has high explosive potential and is flammable and therefore it requires an explosion-proof hood.

There are also problems with storage and disposal of carcasses when ether is used for euthanasia.

**Policy:**

Ether usage requires strong scientific justification and must have approval by Risk Management and the Office of Animal Care Management/Animal Resource Center and can only be used in an explosion-proof hood.

- **Carbon Dioxide (CO<sub>2</sub>)**

Prolonged carbon dioxide inhalation is an effective and approved method of euthanizing small (less than 800 grams) rodents and small birds when it is done in accordance with the following guidelines. In fact, CO<sub>2</sub> euthanasia has several advantages over other methods of euthanasia. For example, carbon dioxide is a potent central nervous system depressant and thus causes rapid unconsciousness and anesthesia. Carbon dioxide exposure has also been shown to induce analgesia that begins within a few minutes of exposure and lasts for as long as an hour. Carbon dioxide is a relatively inert, inexpensive and easily procured gas that is not very hazardous for exposed humans. Finally, carbon dioxide does not accumulate in or contaminate tissues and has minimal effects on tissue architecture (with the exception of the lungs). Nonetheless, since inhalation of carbon dioxide is known to cause mucosal irritation and thus may cause short-term stress in animals exposed to this gas, a few precautions are warranted.

- a. It is better to prefill the chamber prior to using a 70% CO<sub>2</sub>:30% oxygen gas mixture prior to introduction of the animals so that unconsciousness will be induced in the shortest amount of time. Rodents will be unconscious in about 30 seconds in precharged chambers vs. 150 seconds in chambers filled slowly by continuous flow.
- b. Carbon dioxide concentration in the chamber should be maintained in excess of 70%. At least 50% is required to cause unconsciousness. Some animals can withstand 70% without being anesthetized.
- c. Either 100% CO<sub>2</sub> or 70% CO<sub>2</sub>:30% O<sub>2</sub> may be used. No differences in stress reactions have been observed between inhalation of 70% or 100% CO<sub>2</sub>, although it takes significantly longer to induce unconsciousness with the mixture.
- d. Leave the animals in the euthanasia chamber for at least 5 minutes to assure death. Regardless of how long the animals are exposed to the CO<sub>2</sub>, the chest MUST BE opened or a vital organ removed to prevent the animal from reviving.

Note: The above guidelines apply to rodents and small birds. Larger animals such as rabbits are better euthanized by other methods, although exceptions may be approved with proper justification. Use of CO<sub>2</sub> in rodents less than one week old is not recommended due to the resistance of these animals. Decapitation is recommended.

- **Acceptable Inhalation Agents**

Halothane and isofluorane are acceptable agents with or without pre-medication. As with carbon dioxide, death of the animal must be ensured with a physical method. It is important to minimize potential hazards to personnel by using fume hoods.

## 2. Non-Inhalation Agents

- **Acceptable Non-Inhalation Agents**

Sodium pentobarbital is the most commonly used non-inhalation agent. A surgical method to ensure death must also be used after surgical anesthesia has been reached.

- **Unacceptable Non-inhalation Agents**

When used alone, the injectable agents listed in the following: strychnine, nicotine, caffeine, magnesium sulfate, potassium chloride, cleaning agents, solvents, disinfectants and other toxins or salts, and all neuromuscular blocking agents are unacceptable and are absolutely condemned for use as euthanasia agents.

## 3. Physical Methods

It is strongly advised that anesthesia be used prior to the use of any physical method. Exceptions must be approved with proper scientific justification and training.

Physical methods of euthanasia include captive bolt, cervical dislocation, decapitation, exsanguination, and pithing. However, some of these procedures, namely exsanguination, captive bolt, and pithing are not recommended as sole means of euthanasia.

- **Cervical Dislocation**

This method is primarily reserved for euthanasia of mice and neonatal rats.

“Manual cervical dislocation is a humane technique for euthanasia of poultry, other small birds, mice, rats weighing <200 g, and rabbits weighing <1 kg when performed by individuals with a demonstrated high degree of technical proficiency.”<sup>4</sup> It is strongly advised that anesthesia be used prior to use of any physical method. Exceptions must be approved with scientific justification. Training and certification by a university veterinarian in this technique is required.

- **Decapitation**

This method requires scientific justification when used without prior anesthesia. -Physical hazard to the investigator must be taken into consideration and it is essential that the equipment be properly maintained with appropriate documentation. Training and certification by a university veterinarian in this technique is required.

- **Physical Methods Of Ensuring Euthanasia**

Following chemical euthanasia, a physical method is required to ensure death. Physical methods include exsanguination with anesthesia, pithing, thoracotomy, removal of a vital organ, cervical dislocation and decapitation.

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Footnote 1: [AVMA Guidelines on Euthanasia, June 2007, p. 1](#)

Footnote 2: Microsoft Bookshelf '95

Footnote 3: [Institutional Animal Care and Use Committee Guidebook, OLAW and ARENA, Section C.2.b.](#)

Footnote 4: [AVMA Guidelines on Euthanasia, p. 14](#)