

## **TAB F SECTION 20**

### **GUIDELINES FOR HUMANE EUTHANASIA OF ANIMALS**

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#### **INTRODUCTION**

The practice of veterinary medicine is complex and involves diverse animal species. Whenever possible, a veterinarian experienced with the species in question should be consulted when selecting the method of euthanasia, particularly when little species-specific euthanasia research has been done.

The recommendations in this report are intended to serve as guidelines for veterinarians who must then use professional judgment in applying them to the various settings where animals are to be euthanatized.

In the context of this report, euthanasia is the act of inducing humane death in an animal. It is our responsibility as veterinarians and human beings to ensure that if an animal's life is to be taken, it is done with the highest degree of respect, and with an emphasis on making the death as painless and distress free as possible. 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 absence of pain and distress cannot always be achieved. This report attempts to balance the ideal of minimal pain and distress with the reality of the many environments in which euthanasia is performed.

It is imperative that death be verified after euthanasia and before disposal of the animal. An animal in deep narcosis following administration of an injectable or inhalant agent may appear dead, but might eventually recover. Death must be confirmed by examining the animal for cessation of vital signs, and consideration given to the animal species and method of euthanasia when determining the criteria for confirming death.

#### **GENERAL CONSIDERATIONS**

In evaluating methods of euthanasia, the 2000 AVMA panel on euthanasia used the following criteria: (1) ability to induce loss of consciousness and death without causing pain, distress, anxiety, or apprehension; (2) time required to induce loss of consciousness; (3) reliability; (4) safety of personnel; (5) irreversibility; (6) compatibility with requirement and purpose; (7) emotional effect on observers or operators; (8) compatibility with subsequent evaluation, examination, or use of tissue; (9) drug availability and human abuse potential; (10) compatibility with species, age, and health status; (11) ability to maintain equipment in proper working order; and (12) safety for predators/scavengers should the carcass be consumed.

#### **PHYSICAL METHODS**

Physical methods of euthanasia include captive bolt, gunshot, cervical dislocation, decapitation, electrocution, microwave irradiation, kill traps, thoracic compression, exsanguination, stunning, and pithing. When properly used by skilled personnel with well-maintained equipment, physical methods of euthanasia may result in less fear and anxiety and be more rapid, painless, humane, and practical than other forms of euthanasia. Exsanguination, stunning, and pithing are not recommended as a sole means of euthanasia, but should be considered adjuncts to other agents or methods.

Some consider physical methods of euthanasia aesthetically displeasing. There are occasions, however, when what is perceived as aesthetic and what is most humane are in conflict. Physical methods may be the most appropriate method for euthanasia and rapid relief of pain and suffering in certain situations. Personnel performing physical methods of euthanasia must be well trained and monitored for each type of physical technique performed. That person must also be sensitive to the aesthetic implications of the method and inform onlookers about what they should expect when possible.

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Since most physical methods involve trauma, there is inherent risk for animals and humans. Extreme care and caution should be used. Skill and experience of personnel is essential. If the method is not performed correctly, animals and personnel may be injured. Inexperienced persons should be trained by experienced persons and should practice on carcasses or anesthetized animals to be euthanized until they are proficient in performing the method properly and humanely. When done appropriately, the panel considers most physical methods conditionally acceptable for euthanasia.

### **Penetrating captive bolt**

A penetrating captive bolt is used for euthanasia of ruminants, horses, swine, rabbits, and dogs.<sup>8</sup> Its mode of action is concussion and trauma to the cerebral hemisphere and brainstem.<sup>9,10</sup> Captive bolt guns are powered by gunpowder or compressed air and must provide sufficient energy to penetrate the skull of the species on which they are being used.<sup>9</sup> Adequate restraint is important to ensure proper placement of the captive bolt. A cerebral hemisphere and the brainstem must be sufficiently disrupted by the projectile to induce sudden loss of consciousness and subsequent death. Accurate placement of captive bolts for various species has been described.<sup>9-12</sup> A multiple projectile has been suggested as a more effective technique, especially for large cattle.<sup>9</sup>

A nonpenetrating captive bolt only stuns animals and should not be used as a sole means of euthanasia.

*Advantage*—The penetrating captive bolt is an effective method of euthanasia for use on the farm when use of drugs is inappropriate.

*Disadvantages*—(1) It is aesthetically displeasing. (2) Death may not occur if equipment is not maintained and used properly.

*Recommendations*—Use of the penetrating captive bolt is an acceptable and practical method of euthanasia for horses, ruminants, and swine. It is conditionally acceptable in other appropriate species. The nonpenetrating captive bolt must not be used as a sole method of euthanasia.

### **Gunshot**

A properly placed gunshot can cause immediate insensibility and humane death. In some circumstances, a gunshot may be the only practical method of euthanasia. Shooting should only be performed by highly skilled personnel trained in the use of firearms and only in jurisdictions that allow for legal firearm use. Personnel, public, and nearby animal safety should be considered. The procedure should be performed outdoors and away from public access.

For use of a gunshot to the head as a method of euthanasia in captive animals, the firearm should be aimed so that the projectile enters the brain, causing instant loss of consciousness.<sup>3,12-14</sup> This must take into account differences in brain position and skull conformation between species, as well as the energy requirement for skull bone and sinus penetration.<sup>9,15</sup> Accurate targeting for a gunshot to the head in various species has been described.<sup>14,16-19</sup> For wildlife and other freely roaming animals, the preferred target area should be the head. The appropriate firearm should be selected for the situation, with the goal being penetration and destruction of brain tissue without emergence from the contralateral side of the head.<sup>20</sup> A gunshot to the heart or neck does not immediately render animals unconscious and thus is not considered to meet the panel's definition of euthanasia.<sup>21</sup>

*Advantages*—(1) Loss of consciousness is instantaneous if the projectile destroys most of the brain. (2) Given the need to minimize stress induced by handling and human contact, gunshot may at times be the most practical and logical method of euthanasia of wild or free-ranging species.

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*Disadvantages*—(1) Gunshot may be dangerous to personnel. (2) It is aesthetically unpleasant. (3) Under field conditions, it may be difficult to hit the vital target area. (4) Brain tissue may not be able to be examined for evidence of rabies infection or chronic wasting disease when the head is targeted.

*Recommendations*—When other methods cannot be used, an accurately delivered gunshot is a conditionally acceptable method of euthanasia.<sup>14,22-25</sup> When an animal can be appropriately restrained, the penetrating captive bolt is preferred to a gunshot. Prior to shooting, animals accustomed to the presence of humans should be treated in a calm and reassuring manner to minimize anxiety. In the case of wild animals, gunshots should be delivered with the least amount of prior human contact necessary. Gunshot should not be used for routine euthanasia of animals in animal control situations, such as municipal pounds or shelters.

### **Cervical dislocation**

Cervical dislocation is a technique that has been used for many years and, when performed by well-trained individuals, appears to be humane. However, there are few scientific studies to confirm this observation. This technique is used to euthanize poultry, other small birds, mice, and immature rats and rabbits. For mice and rats, the thumb and index finger are placed on either side of the neck at the base of the skull or, alternatively, a rod is pressed at the base of the skull. With the other hand, the base of the tail or the hind limbs are quickly pulled, causing separation of the cervical vertebrae from the skull. For immature rabbits, the head is held in one hand and the hind limbs in the other. The animal is stretched and the neck is hyperextended and dorsally twisted to separate the first cervical vertebra from the skull.<sup>4,11</sup> For poultry, cervical dislocation by stretching is a common method for mass euthanasia, but loss of consciousness may not be instantaneous.<sup>32</sup>

Data suggest that electrical activity in the brain persists for 13 seconds following cervical dislocation,<sup>26</sup> and unlike decapitation, rapid exsanguination does not contribute to loss of consciousness.<sup>27,28</sup>

*Advantages*—(1) Cervical dislocation is a technique that may induce rapid loss of consciousness.<sup>6,26</sup> (2) It does not chemically contaminate tissue. (3) It is rapidly accomplished.

*Disadvantages*—(1) Cervical dislocation may be aesthetically displeasing to personnel. (2) Cervical dislocation requires mastering technical skills to ensure loss of consciousness is rapidly induced. (3) Its use is limited to poultry, other small birds, mice, and immature rats and rabbits.

*Recommendations*—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. In lieu of demonstrated technical competency, animals must be sedated or anesthetized prior to cervical dislocation. The need for technical competency is greater in heavy rats and rabbits, in which the large muscle mass in the cervical region makes manual cervical dislocation physically more difficult.<sup>29</sup>

Those responsible for the use of this technique must ensure that personnel performing cervical dislocation techniques have been properly trained and consistently apply it humanely and effectively.

### **Decapitation**

Decapitation can be used to euthanize rodents and small rabbits. It provides a means to recover tissues and body fluids that are chemically uncontaminated. It also provides a means of obtaining anatomically undamaged brain tissue for study.<sup>30</sup>

Although it has been demonstrated that electrical activity in the brain persists for 13 to 14 seconds following decapitation,<sup>31</sup> more recent studies and reports indicate that this activity does not infer the ability to perceive pain, and in fact conclude that loss of consciousness develops rapidly.<sup>26-28</sup>

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Guillotines that are designed to accomplish decapitation in adult rodents and small rabbits in a uniformly instantaneous manner are commercially available. Guillotines are not commercially available for neonatal rodents, but sharp blades can be used for this purpose.

*Advantages*—(1) Decapitation is a technique that appears to induce rapid loss of consciousness.<sup>26-28</sup> (2) It does not chemically contaminate tissues. (3) It is rapidly accomplished.

*Disadvantages*—(1) Handling and restraint required to perform this technique may be distressful to animals.<sup>5</sup> (2) The interpretation of the presence of electrical activity in the brain following decapitation has created controversy and its importance may still be open to debate.<sup>26-28,31</sup> (3) Personnel performing this technique should recognize the inherent danger of the guillotine and take adequate precautions to prevent personal injury. (4) Decapitation may be aesthetically displeasing to personnel performing or observing the technique.

*Recommendations*—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 reduce distress from handling, minimizes the chance of injury to personnel, and improves positioning of the animal in the guillotine.

Those responsible for the use of this technique must ensure that personnel who perform decapitation techniques have been properly trained to do so.

### SPECIAL CONSIDERATIONS

#### **Equine euthanasia**

Pentobarbital or a pentobarbital combination is the best choice for equine euthanasia. Because a large volume of solution must be injected, use of an intravenous catheter placed in the jugular vein will facilitate the procedure. To facilitate catheterization of an excitable or fractious animal, a tranquilizer such as acepromazine, or an alpha-2 adrenergic agonist can be administered, but these drugs may prolong time to loss of consciousness because of their effect on circulation and may result in varying degrees of muscular activity and agonal gasping. Opioid agonists or agonist/antagonists in conjunction with alpha-2 adrenergic agonists may further facilitate restraint.

In certain emergency circumstances, it may be difficult to restrain a dangerous horse or other large animal for intravenous injection. The animal might cause injury to itself or to bystanders before a sedative could take effect. In such cases, the animal can be given a neuromuscular blocking agent such as succinylcholine, but the animal must be euthanatized with an appropriate technique as soon as the animal can be controlled. Succinylcholine alone or without sufficient anesthetic must not be used for euthanasia.

Physical methods, including gunshot, are considered conditionally acceptable techniques for equine euthanasia. The penetrating captive bolt is acceptable with appropriate restraint.

#### **Animals intended for human or animal food**

In euthanasia of animals intended for human or animal food, chemical agents that result in tissue residues cannot be used, unless they are approved by the US Food and Drug Administration.<sup>33</sup> Carbon dioxide is the only chemical currently used for euthanasia of food animals (primarily swine) that does not result in tissue residues. Physical techniques are commonly used for this reason. Carcasses of animals euthanatized by barbituric acid derivatives or other chemical agents may contain potentially harmful residues. These carcasses should be disposed of in a manner that will prevent them from being consumed by human beings or animals.

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Selection of a proper euthanasia technique for free-ranging wildlife must take into account the possibility of consumption of the carcass of the euthanatized animal by nontarget predatory or scavenger species. Numerous cases of toxicosis and death attributable to ingestion of pharmaceutically contaminated carcasses in predators and scavengers have been reported.<sup>7</sup> Proper carcass disposal must be a part of any euthanasia procedure under free-range conditions where there is potential for consumption toxicity. When carcasses are to be left in the field, a gunshot to the head, penetrating captive bolt, or injectable agents that are nontoxic (potassium chloride in combination with a nontoxic general anesthetic) should be used so that the potential for scavenger or predator toxicity is lessened.

### **Euthanasia of nonconventional species: zoo, wild, aquatic, and ectothermic animals**

Compared with objective information on companion, farm, and laboratory animals, euthanasia of species such as zoo, wild, aquatic, and ectothermic animals has been studied less, and guidelines are more limited. Irrespective of the unique or unusual features of some species, whenever it becomes necessary to euthanatize an animal, death must be induced as painlessly and quickly as possible.

When selecting a means of euthanasia for these species, factors and criteria in addition to those previously discussed must be considered. The means selected will depend on the species, size, safety aspects, location of the animals to be euthanatized, and experience of personnel. Whether the animal to be euthanatized is in the wild, in captivity, or free-roaming are major considerations. Anatomic differences must be considered. For example, amphibians, fish, reptiles, and marine mammals differ anatomically from domestic species. Veins may be difficult to locate. Some species have a carapace or other defensive anatomic adaptations (eg, quills, scales, spines). For physical methods, access to the central nervous system may be difficult because the brain may be small and difficult to locate by inexperienced persons.

### **ZOO ANIMALS**

For captive zoo mammals and birds with related domestic counterparts, many of the means described previously are appropriate. However, to minimize injury to persons or animals, additional precautions such as handling and physical or chemical restraint are important considerations.<sup>2</sup>

### **WILDLIFE**

For wild and feral animals, many recommended means of euthanasia for captive animals are not feasible. The panel recognizes there are situations involving free-ranging wildlife when euthanasia is not possible from the animal or human safety standpoint, and killing may be necessary. Conditions found in the field, although more challenging than those that are controlled, do not in any way reduce or minimize the ethical obligation of the responsible individual to reduce pain and distress to the greatest extent possible during the taking of an animal's life. Because euthanasia of wildlife is often performed by lay personnel in remote settings, guidelines are needed to assist veterinarians, wildlife biologists, and wildlife health professionals in developing humane protocols for euthanasia of wildlife.

In the case of free-ranging wildlife, personnel may not be trained in the proper use of remote anesthesia, proper delivery equipment may not be available, personnel may be working alone in remote areas where accidental exposure to potent anesthetic medications used in wildlife capture would present a risk to human safety, or approaching the animal within a practical darting distance may not be possible. In these cases, the only practical means of animal collection may be gunshot and kill trapping.<sup>1,34-38</sup> Under these conditions, specific methods chosen must be as age-, species-, or taxonomic/class-specific as possible. The firearm and ammunition should be appropriate for the species and purpose. Personnel should be sufficiently skilled to be accurate, and they should be experienced in the proper and safe use of firearms, complying with laws and regulations governing their possession and use.

Behavioral responses of wildlife or captive nontraditional species (zoo) in close human contact are very different from those of domestic animals. These animals are usually frightened and distressed. Thus,

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minimizing the amount, degree, and/or cognition of human contact during procedures that require handling is of utmost importance. Handling these animals often requires general anesthesia, which provides loss of consciousness and which relieves distress, anxiety, apprehension, and perception of pain. Even though the animal is under general anesthesia, minimizing auditory, visual, and tactile stimulation will help ensure the most stress-free euthanasia possible. With use of general anesthesia, there are more methods for euthanasia available.

A 2-stage euthanasia process involving general anesthesia, tranquilization, or use of analgesics, followed by intravenous injectable pharmaceuticals, although preferred, is often not practical. Injectable anesthetics are not always legally or readily available to those working in nuisance animal control, and the distress to the animal induced by live capture, transport to a veterinary facility, and confinement in a veterinary hospital prior to euthanasia must be considered in choosing the most humane technique for the situation at hand. Veterinarians providing support to those working with injured or live-trapped, free-ranging animals should take capture, transport, handling distress, and possible carcass consumption into consideration when asked to assist with euthanasia. Alternatives to 2-stage euthanasia using anesthesia include a squeeze cage with intraperitoneal injection of sodium pentobarbital, inhalant agents (CO<sub>2</sub> chamber, CO chamber), and gunshot. In cases where pre-euthanasia anesthetics are not available, intraperitoneal injections of sodium pentobarbital, although slower in producing loss of consciousness, should be considered preferable over intravenous injection, if restraint will cause increased distress to the animal or danger to the operator.

Wildlife species may be encountered under a variety of situations. Euthanasia of the same species under different conditions may require different techniques. Even in a controlled setting, an extremely fractious large animal may threaten the safety of the practitioner, bystanders, and itself. When safety is in question and the fractious large animal, whether wild, feral, or domestic, is in close confinement, neuromuscular blocking agents may be used immediately prior to the use of an acceptable form of euthanasia. For this technique to be humane, the operator must ensure they will gain control over the animal and perform euthanasia before distress develops. Succinylcholine is not acceptable as a method of restraint for use in free-ranging wildlife because animals may not be retrieved rapidly enough to prevent neuromuscular blocking agent-induced respiratory distress or arrest.<sup>39</sup>

**DISEASED, INJURED, OR LIVE-CAPTURED WILDLIFE OR FERAL SPECIES**

Euthanasia of diseased, injured, or live-trapped wildlife should be performed by qualified professionals. Certain cases of wildlife injury (eg, acute, severe trauma from automobiles) may require immediate action, and pain and suffering in the animal may be best relieved most rapidly by physical methods including gunshot or penetrating captive bolt followed by exsanguination.

**BIRDS**

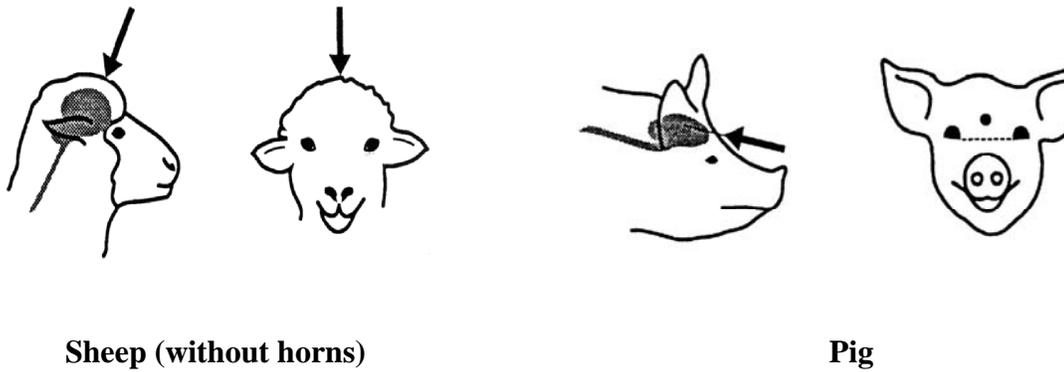
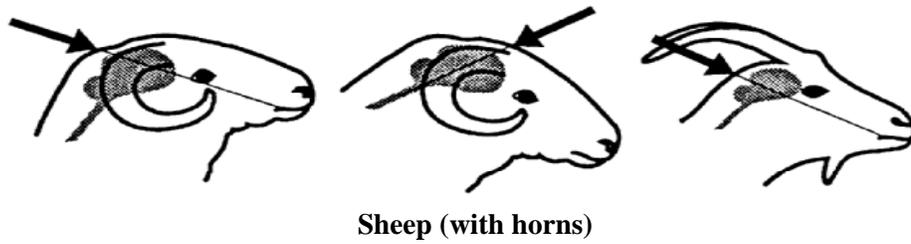
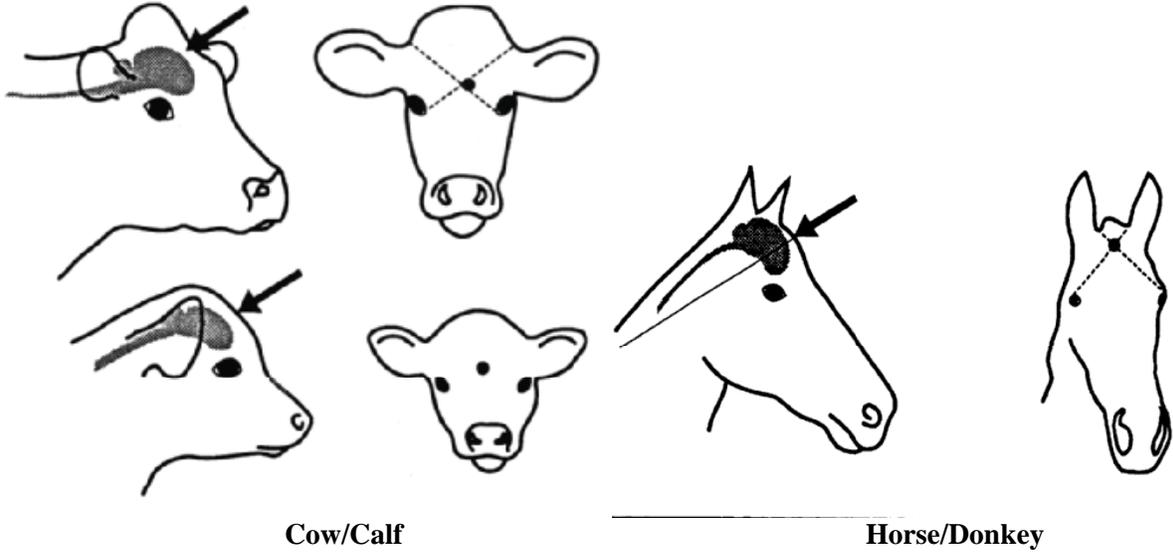
Many techniques discussed previously in this report are suitable for euthanasia of captive birds accustomed to human contact. Free-ranging birds may be collected by a number of methods, including nets and live traps, with subsequent euthanasia. For collection by firearm, shotguns are recommended. The bird should be killed outright by use of ammunition loads appropriate for the species to be collected. Wounded birds should be killed quickly by appropriate techniques previously described. Large birds should be anesthetized prior to euthanasia, using general anesthetics.

**Mass euthanasia**

Under unusual conditions, such as disease eradication and natural disasters, euthanasia options may be limited. In these situations, the most appropriate technique that minimizes human and animal health concerns must be used. These options include, but are not limited to, CO<sub>2</sub> and physical methods such as gunshot, penetrating captive bolt, and cervical dislocation.

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**CORRECT LOCATION FOR EUTHANASIA OF LIVESTOCK WITH A FIREARM OR CAPTIVE BOLT GUN**  
(Figures reprinted from Can Vet J 1991; 32: 724-726 with the permission of the  
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**Appendix 1**

Agents and methods of euthanasia by species

Species	Acceptable*	Conditionally acceptable†
Amphibians	Barbiturates, inhalant anesthetics (in appropriate species), CO <sub>2</sub> , CO, tricaine methane sulfonate (TMS, MS 222), benzocaine hydrochloride, double pithing	Penetrating captive bolt, gunshot, stunning and decapitation, decapitation and pithing.
Birds	Barbiturates, inhalant anesthetics, CO <sub>2</sub> , CO, gunshot (free-ranging only)	N <sub>2</sub> , Ar, cervical dislocation, decapitation, thoracic compression (small, free-ranging only)
Cats	Barbiturates, inhalant anesthetics, CO <sub>2</sub> , CO, potassium chloride in conjunction with general anesthesia	N <sub>2</sub> , Ar
Dogs	Barbiturates, inhalant anesthetics, CO <sub>2</sub> , CO, potassium chloride in conjunction with general anesthesia	N <sub>2</sub> , Ar, penetrating captive bolt, electrocution
Fish	Barbiturates, inhalant anesthetics, CO <sub>2</sub> , tricaine methane sulfonate (TMS, MS 222), benzocaine hydrochloride, 2-phenoxyethanol	Decapitation and pithing, stunning and decapitation/pithing
Horses	Barbiturates, potassium chloride in conjunction with general anesthesia, penetrating captive bolt	Chloral hydrate (IV, after sedation), gunshot, electrocution
Marine mammals	Barbiturates, etorphine hydrochloride	Gunshot (cetaceans < 4 meters long)
Mink, fox, and other mammals produced for fur	Barbiturates, inhalant anesthetics, CO <sub>2</sub> (mink require high concentrations for euthanasia without supplemental agents), CO, potassium chloride in conjunction with general anesthesia	N <sub>2</sub> , Ar, electrocution followed by cervical dislocation
Nonhuman primates	Barbiturates	Inhalant anesthetics, CO <sub>2</sub> , CO, N <sub>2</sub> , Ar
Rabbits	Barbiturates, inhalant anesthetics, CO <sub>2</sub> , CO, potassium chloride in conjunction with general anesthesia	N <sub>2</sub> , Ar, cervical dislocation (< 1 kg), decapitation, penetrating captive bolt
Reptiles	Barbiturates, inhalant anesthetics (in appropriate species), CO <sub>2</sub> (in appropriate species)	Penetrating captive bolt, gunshot, decapitation and pithing, stunning and decapitation
Rodents and other small mammals	Barbiturates, inhalant anesthetics, CO <sub>2</sub> , CO, potassium chloride in conjunction with general anesthesia, microwave irradiation	Methoxyflurane, ether, N <sub>2</sub> , Ar, cervical dislocation (rats < 200 g), decapitation
Ruminants	Barbiturates, potassium chloride in conjunction with general anesthesia, penetrating captive bolt	Chloral hydrate (IV, after sedation), gunshot, electrocution
Swine	Barbiturates, CO <sub>2</sub> , potassium chloride in conjunction with general anesthesia, penetrating captive bolt	Inhalant anesthetics, CO, chloral hydrate (IV, after sedation), gunshot, electrocution, blow to the head (< 3 weeks of age)
Zoo animals	Barbiturates, inhalant anesthetics, CO <sub>2</sub> , CO, potassium chloride in conjunction with general anesthesia	N <sub>2</sub> , Ar, penetrating captive bolt, gunshot
Free-ranging wildlife	Barbiturates IV or IP, inhalant anesthetics, potassium chloride in conjunction with general anesthesia	CO <sub>2</sub> , CO, N <sub>2</sub> , Ar, penetrating captive bolt, gunshot, kill traps (scientifically tested)

\*Acceptable methods are those that consistently produce a humane death when used as the sole means of euthanasia.

†Conditionally acceptable methods are those techniques that by the nature of the technique or because of greater potential for operator error or safety hazards might not consistently produce humane death or are methods not well documented in the scientific literature.

**TAB F SECTION 20**  
**GUIDELINES FOR HUMANE EUTHANASIA OF ANIMALS**

**Appendix 2**  
Some **unacceptable** agents and methods of euthanasia

AGENT OR METHOD	COMMENTS
Air embolism	Air embolism may be accompanied by convulsions, opisthotonos and vocalization. If used, it should be done only in anesthetized animals.
Blow to the head	Unacceptable for most species.
Burning	Chemical or thermal burning of an animal is not an acceptable method of euthanasia.
Chloral hydrate	Unacceptable in dogs, cats, and small mammals.
Chloroform	Chloroform is a known hepatotoxin and suspected carcinogen, and therefore extremely hazardous to personnel.
Cyanide	Cyanide poses an extreme danger to personnel and the manner of death is aesthetically objectionable.
Decompression	Decompression is unacceptable for euthanasia because of numerous disadvantages. (1) Many chambers are designed to produce decompression at a rate 15 to 60 times faster than that recommended as optimum for animals, resulting in pain and distress attributable to expanding gases trapped in body cavities. (2) Immature animals are tolerant of hypoxia, and longer periods of decompression are required before respiration ceases. (3) Accidental recompression, with recovery of injured animals can occur. (4) Bloating, bleeding, vomiting, convulsions, urination, and defecation, which are aesthetically unpleasant, may develop in unconscious animals.
Drowning	Drowning is not a means of euthanasia and is inhumane.
Exsanguination	Because of the anxiety associated with extreme hypovolemia, exsanguination should be done only in sedated, stunned, or anesthetized animals.
Formalin	Direct immersion of an animal into formalin, as a means of euthanasia, is inhumane.
Household Products and Solvents	Acetone, quaternary compounds (including CCl <sub>4</sub> ), laxatives, clove oil, dimethylketone, quaternary ammonium products, <sup>a</sup> acids, and other commercial and household products or solvents are not acceptable agents for euthanasia.
Hypothermia	Hypothermia is not an appropriate method of euthanasia.
Neuromuscular blocking agents (nicotine, magnesium sulfate, potassium chloride, all curariform agents)	When used alone, these drugs all cause respiratory arrest before unconsciousness, so the animal may perceive pain and distress after it is immobilized.
Rapid freezing	Rapid freezing as a sole means of euthanasia is not considered to be humane. If used, animals should be anesthetized prior to freezing.
Strychnine	Strychnine causes violent convulsions and painful muscle contractions.
Stunning	Stunning may render an animal unconscious, but it is not a method of euthanasia (except for neonatal animals with thin craniums). If used, it must be immediately followed by a method that ensures death.
Tricaine methane sulfonate (TMS, MS 222)	Should not be used for euthanasia of animals intended as food.
*Roccal D Plus, Pharmacia & Upjohn, Kalamazoo, Michigan	