

Methods for Bovine Euthanasia

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.

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Method	Human Safety Risk	Skill Required	Aesthetic Concern
Gunshot	High	Moderate*	Moderate: Some blood/motion
Captive Bolt	Moderate	Moderate*	Moderate: Some blood/motion
Barbituate Overdose	Low	Moderate*	Low
Exsanguination	Moderate	Moderate*	High
Electrocution	High	Moderate*	High

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Exsanguination	Moderate	Moderate*	High
Electrocution ⁺	High	Moderate*	High

* Moderate means operator training required.

⁺ Requires special equipment. Not appropriate on the farm.

Gunshot to the Brain

This method is inexpensive and does not require close contact with the animal. Done skillfully, it induces instantaneous unconsciousness. The bullet should be directed perpendicular to the front of the skull to prevent ricochet and to provide optimum destruction of central nervous tissue. The point of entry is illustrated in the diagram on the back of this insert. A .22 caliber long rifle bullet is sufficient for most cattle but a larger caliber should be used on large bulls.

Disadvantages to this method include local regulations against the use of firearms, the need for firearms permits, the need for security of the firearm, safety concerns (especially in enclosed or busy environments), and the destruction of brain tissue when samples are needed for analysis.

Penetrating Captive Bolt

This method can induce euthanasia similar to a gunshot but has the advantage of safety when used in certain environments. The same entry point in the skull is used as described above. The captive bolt gun must be placed firmly against the skull prior to actuation of the bolt by discharge of a blank cartridge. In large animals the penetrating bolt will not reach the mid- or hindbrain. Such animals will be "brain-dead" but maintain heart and respiratory function for a variable time period. Death in these animals should be assured by using an additional procedure such as

exsanguination, or chemical injection. These animals will also show involuntary, often violent, reflex muscular activity, of which owners should be forewarned, and necessitating care in further handling of the animal.

Maintenance and cleaning of the gun as described by the manufacturer must be followed exactly to maintain consistent performance and optimum hitting power of the gun. Captive bolt guns are available from several sources including Koch Supplies in Kansas City (800-456-5624), Hantover in Kansas City (800-821-2227), and Packers Engineering Equipment Company in Omaha (800-279-7326).

Concerns about the security of the captive bolt instrument are very real, however, as this remains a lethal weapon. This method carries the disadvantage that it requires the operator to be very close to the animal and to physically hold the gun against the skull. With aggressive or wild animals, this will require physical or chemical restraint. Similar to gunshot, this method will destroy brain tissue that might be desired for further analysis. Safety, low cost and lack of permit requirements can make this method more desirable than gunshot.

The point of entry of the captive bolt or bullet should be at the intersection of 2 lines drawn from the inside border of the eye to the base of the opposite horn.

Exsanguination should be done using a pointed, very sharp knife, with at least a 6 inch rigid blade. The knife is thrust into the neck just below the neck bones and drawn downward to sever the jugular vein (1), carotid artery (2) and trachea (3).

Barbiturate Overdose

Intravenous administration of a barbiturate overdose is an ideal method for euthanasia. Properly administered, unconsciousness and anesthesia are rapidly induced followed by respiratory center depression, apnea, hypoxia and cardiac arrest. Unfortunately, this method of euthanasia has two primary disadvantages. These controlled substances may only be administered by a veterinarian and animals euthanized with barbiturates contain potentially harmful residues that can complicate carcass disposal.

Exsanguination

This method can be used to ensure death subsequent to stunning, sedation or anesthesia. Extreme hypovolemia induces anxiety so exsanguination must not be used as the sole means of euthanasia. A pool of blood on the ground is generally very undesirable. This mess can be avoided by cutting the caudal aorta through the rectum causing blood to pool in the abdominal cavity. Following unconsciousness induced chemically or by mechanical means, this method requires the least amount of financial investment and can be a good method when brain evaluation is required following euthanasia.

Additional Comments

Agents that produce muscle paralysis without unconsciousness are absolutely condemned as sole agents for euthanasia (e.g., curare, succinylcholine, gallamine, strychnine, nicotine, magnesium or potassium salts, pancuronium). However, once unconsciousness is achieved by another method, these agents can be employed to cause the death of the animal. Chemicals commonly used for other purposes can cause death when administered to animals intravenously. Such agents (e.g., chlorhexidine and other chemical disinfectants, formalin, certain antibiotic preparations) should not be used as sole agents for euthanasia unless research

demonstrates that they fulfill the requirement of unconsciousness prior to cessation of respiration or cardiac arrest. It would be acceptable to use these agents following induction of unconsciousness by other means.

A nonpenetrating blow to the head when properly applied can render an animal unconscious. For neonates, this method can produce acceptable euthanasia when the blow provides sufficient force to cause a depressed fracture of the skull and physical damage to the brain. These requirements are difficult to accomplish in cattle. Some commercially available instruments are available for nonpenetrating physical stunning of cattle prior to slaughter. Nonpenetrating stunning tools must be viewed as providing unconsciousness but not euthanasia and must be accompanied by exsanguination or other method of inducing death of the animal in order to provide adequate euthanasia.