

Effective Euthanasia of Cattle under Field Conditions

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Abstract

Euthanasia of cattle under field conditions may be accomplished in a variety of ways. However, few of these methods are as humane as gunshot or penetrating captive bolt combined with either exsanguination, the rapid intravenous injection of a concentrated solution of potassium chloride or pithing of the brain and upper spinal cord. The proper application of either method meets the objectives of inducing immediate loss of consciousness and rapid death without pain or distress to the animal. Persons who perform this task must be technically proficient and have a basic understanding of the most appropriate anatomical landmarks and equipment (firearms or captive bolt) used for humane euthanasia of animals.

In the following are some comments relative to indications, application and moral responsibility for conducting humane euthanasia of sick and/or debilitated animals in farm, ranch or other situations where veterinary supervision may, or may not be, available.

Résumé

L'euthanasie des bovins sur le terrain peut s'accomplir de plusieurs façons. Toutefois, peu de ces méthodes sont aussi humanitaires que l'abattage par balle ou la pénétration par cheville percutante suivi soit d'une exsanguination, soit d'une administration intraveineuse rapide d'une solution concentrée de chlorure de potassium ou soit de la destruction du cerveau et de l'épine dorsale supérieure. L'utilisation adéquate des deux méthodes permet d'atteindre les objectifs d'une perte de conscience immédiate suivie d'une mort rapide sans douleur et sans détresse. Les personnes qui euthanasient les animaux doivent être techniquement compétentes et avoir une connaissance de base des points de repères anatomiques les plus appropriés et de l'équipement (arme à feu ou pistolet à cheville percutante) utilisé pour l'euthanasie humanitaire des animaux.

On présente ici certains commentaires à l'égard de la pertinence, de l'application et de la responsabilité morale de faire l'euthanasie humanitaire des animaux malades et/ou débilisés à la ferme, au ranch ou dans d'autres situations où le vétérinaire peut ou ne peut pas être disponible pour superviser les opérations.

Indications for Euthanasia

Cattlemen, dairymen, and others who derive all or a portion of their livelihood from animal agriculture share a moral obligation to ensure the welfare of animals in their keeping. Therefore, when disease or injury conditions arise that diminish quality of life or create pain and suffering that cannot be effectively relieved by medical means, euthanasia is indicated. Examples may include the following:

- Fractures of the legs, hip or spine that are not repairable and result in immobility or inability to stand
- Paralysis from traumatic or calving-related injuries that result in immobility
- Diseases that result in a significant loss of production (e.g., severe mastitis in dairy cattle)
- Advanced eye disease (e.g., cancer eye in cattle)
- Disease conditions where cost of treatment is prohibitive
- Disease conditions where prognosis is poor or time to expected recovery is unusually prolonged
- Rabies suspect animals - where there is significant threat to human health (these animals should be attended to or seen by a veterinarian)

Although the rate of occurrence of rabies is low, potential for human exposure is often quite high when it does occur. Veterinary practitioners are well aware of the dangers when dealing with animals exhibiting symptoms suggestive of a central nervous system disorder, and normally limit their exposure. However, farm and ranch employees need continual reminders of the potential dangers and the importance of confirmation of rabies whenever it is recognized that there may have been significant human contact with the animal in question. Retrieval of brain tissue for diagnostic confirmation should be conducted by, or via close supervision of, a veterinarian.

Important Considerations

The loss of productive function as a result of disease or injury in cattle presents at least two options: slaughter or euthanasia. Generally speaking, slaughter

should be considered for animals that are not in severe pain, freely able to stand and walk, capable of being transported, and without disease or treatment that might constitute a public health risk. Euthanasia is the appropriate choice whenever the above conditions cannot be met.

When conditions warrant euthanasia, the next consideration is method. The intravenous injection of a labeled euthanasia agent may be considered, particularly when dealing with those more sensitive situations where a bovine animal fits the classification of a "pet" or "companion animal." This approach to euthanasia requires the veterinarian, is more costly and may create significant challenges relative to carcass disposal. In the commercial cattle and dairy industry settings there are essentially two methods for conducting humane euthanasia:

- **gunshot** with the appropriate caliber of firearm and a solid-point bullet delivered to the correct anatomical site, and
- **penetrating captive bolt** to induce immediate loss of consciousness followed by one or more of the following procedures to ensure death including: a) exsanguination which causes death through blood loss, b) use of a pithing device (through the projectile entry site) to increase destruction of brain and spinal cord tissue and/or c) the intravenous injection of approximately 120 ml of potassium chloride (KCl) which results in cardiac arrest.

These methods do not require the presence of a veterinarian, but there are important opportunities for veterinarians to provide training on how to properly conduct these procedures.

Persons conducting euthanasia procedures should attempt to minimize animal distress. Cattle should be approached quietly and restrained only if necessary to properly conduct the procedure. If the animal to be euthanized is ambulatory and able to be moved without causing distress, discomfort or pain, it may be moved to an area where the carcass may be more easily reached by removal equipment. Dragging of non-ambulatory animals is unacceptable. In cases where movement may increase distress or animal suffering, the animal should be euthanized first, and moved following confirmation of death.

A final consideration is the person who must perform the task of humane euthanasia. It is important to recognize that this is not a procedure that all persons are mentally or emotionally able to perform repetitively. In fact, observation has shown that constant exposure to, or participation in, euthanasia procedures may result in psychological damage leading to work-related dissatisfaction and a tendency toward careless or callous handling of animals. One strategy for managing this

problem includes providing adequate training so that euthanasia procedures may be competently applied. Another might be to change work duties as needed to provide relief when it becomes apparent that such duties are causing excessive stress. Euthanasia, regardless of the circumstances, impacts a person's emotional state. Sensitivity to this issue should not be overlooked.

Humane Euthanasia by Gunshot or Penetrating Captive Bolt

Properly applied, euthanasia by either gunshot or penetrating captive bolt (combined with supplemental procedures to ensure death), causes less fear and anxiety and induces a more rapid, painless, and humane death than can be achieved by most other methods. However, both methods involve human risk, and therefore, require skill and experience. Neither method should be attempted by untrained or inexperienced persons.

Gunshot

In most circumstances on the farm or ranch, gunshot is the most practical method of euthanasia. Most people have some type of firearm and are familiar with its use. The key is selection of an appropriate firearm and bullet with sufficient energy and size to traverse the skull, enter the brain, and cause massive brain destruction. A 22 long rifle solid-point bullet fired from either a pistol or rifle is sufficient for use on most young animals. This same firearm and bullet is used on many adult cows, however experience has shown that the results with a 22 long rifle bullet in adult cows is inconsistent. Hollow or soft-point bullets are not recommended since they may fail to penetrate the skull thus resulting in a temporary state of unconsciousness. Euthanasia of bulls by gunshot requires larger calibers (9 mm) because of thickness of the skull. Proper placement of the bullet is essential, and best achieved by holding the firearm within two to 12 inches (when possible) of the intended target.

Use of a shotgun (20, 16, and 12 gauges) at close range (within 1 to 2 yards) is also a very acceptable firearm choice. Some suggest that small-gauge shotguns such as the .410 or 28-gauge should not be used on heavy bulls. One may use either slugs or number 4, 5, or 6 birdshot. **Firearms should never be held flush with the skull, since this may result in explosion of the barrel.**

Advantages: When properly positioned, the bullet causes massive brain destruction and immediate unconsciousness. Assuming one owns the firearm, gunshot is inexpensive and does not require close contact with the animal.

Disadvantages: Gunshot is dangerous. Ricochet of the bullet is possible and therefore, the operator and by-standers must use extreme care in positioning of themselves and others when the procedure is performed. Another disadvantage is that in cases involving fractious animals, it may be difficult to hit the vital target area.

Whereas most animals for which euthanasia by gunshot is indicated are either debilitated or down, opportunity for proper placement of the bullet is less difficult. On the other hand, for animals on their feet and mobile or potentially dangerous, it may be necessary to shoot from a distance. In such cases, the preferred target areas are the head or neck.

Penetrating Captive Bolt

Penetrating captive bolt followed by immediate exsanguination (bleeding out) is the preferred method for euthanasia of cattle in abattoirs (slaughter facilities). The mode of action of a penetrating captive bolt gun is concussion and trauma to the brain. This requires that it be held firmly against the surface of the head over the intended site. This constitutes a major difference between the placement of a firearm and the placement of a penetrating captive bolt. Because placement and positioning of the projectile is critical, some degree of restraint is generally required for proper use of this device.

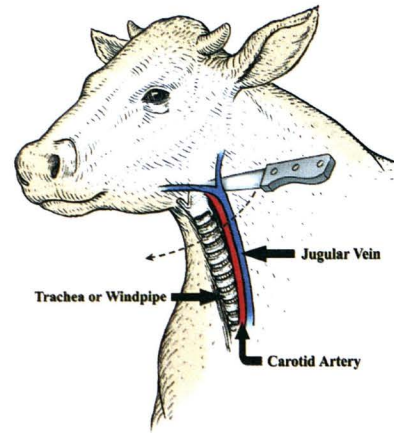
Ensuring Death by Exsanguination, Pithing or the Injection of Potassium Chloride (KCl)

There are two types of captive bolt: penetrating and non-penetrating. Both are discharged by gunpowder or compressed air. A penetrating captive bolt works by concussion and trauma to the brain. It causes immediate unconsciousness and destruction of brain tissue as a result of penetration of the discharged bolt. While the destruction of brain tissue with the penetrating captive bolt may be sufficient to result in death, operators are strongly advised to ensure death by exsanguination, pithing or the injection of a saturated solution of KCl (potassium chloride) to ensure death. The non-penetrating captive bolt device works by concussion and only stuns the animal. Since the destruction of brain tissue is minimal and level of consciousness more variable, it should not be used alone for euthanasia of livestock in field situations.

Advantages: Although not without risk, penetrating captive bolt is generally safer for the operator and bystanders. Beyond the initial investment of a captive bolt, continued use is inexpensive.

Disadvantages: Death may not occur unless followed by exsanguination, pithing or the intravenous injection of a saturated solution of approximately 120 ml of KCl. The operator must be close to the animal and have it adequately restrained in order to get proper placement of the captive bolt. The penetrating captive bolt should not be fired when the animal is moving its head.

Exsanguination may be initiated once the animal has been rendered unconscious. This procedure should be performed using a pointed, very sharp knife with a rigid blade at least six inches in length. The knife should be fully inserted through the skin just behind the point of the jaw and below the neck bones. From this position, the knife is drawn forward severing the jugular veins, carotid arteries, and windpipe. Properly performed, blood should flow freely with death occurring within a period of several minutes.



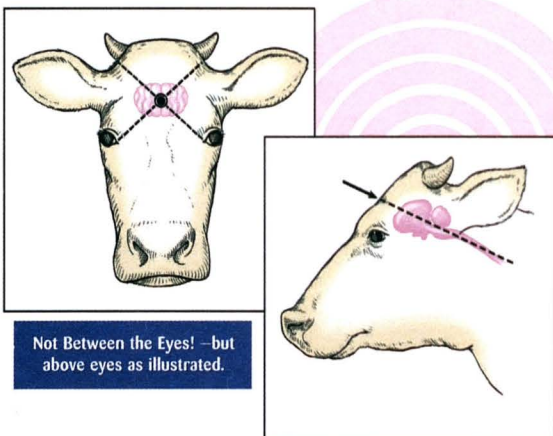
Pithing is a technique designed to cause death by increasing the destruction of brain tissue. It is performed by inserting a pithing rod or tool through the entry site produced in the skull by the captive bolt stunner. The operator manipulates the pithing tool to destroy both brainstem and spinal cord tissue, which ensures death. This procedure is sometimes used in advance of exsanguination procedures to reduce involuntary movement in stunned animals.

Rapid injection of a concentrated solution of potassium chloride (KCl) is another option for ensuring death once the animal has been rendered unconscious. Potassium chloride (KCl) is a salt solution which, when delivered by rapid intravenous injection, induces cardiac arrest. Normally, the injection of 120

ml of a saturated solution of KCl is sufficient to cause death. It is advised that when conducting euthanasia that may require KCl, the operator prepare two to three 60 ml syringes with KCl solution equipped with 14 or 16-gauge, 1-½ inch needles prior to rendering the animal unconscious. In this way, the injection may be made as soon as possible once the animal is rendered insensible. Any available vein may be used for the injection, however it is important to position oneself out of the reach of feet and legs which may cause injury during periods of involuntary movement. In most cases, it is safest to kneel close to the animal's head and neck (on the dorsal side out of the range of feet and legs) and reach over the neck to deliver the intravenous injection into the jugular vein. Once the needle is in the vein, the KCl should be delivered by rapid intravenous injection. Death will usually occur within a few minutes. **Please note that KCl should never be used in conscious animals. Potassium chloride (KCl) causes death by inducing cardiac arrest.**

Anatomical Landmarks

Proper positioning of the firearm or captive bolt is necessary to achieve the desired results. When euthanasia is performed by gunshot, the firearm should be held approximately six to 24 inches from the intended target. Ricochet may be prevented if the barrel of the firearm is positioned perpendicular to the skull. The projectile's point of entry should be at the intersection of two imaginary lines, each drawn from the inside corner of the eye to the base of the opposite horn (or to a point somewhat above the opposite ear in a cow without horns). As seen in the diagram below, this places the recommended point of entry in the center of the forehead somewhat above a line drawn between the eyes.



Not Between the Eyes! –but
above eyes as illustrated.

Confirmation of Death

Regardless of the method of euthanasia used, death must be confirmed before disposal of the animal. The following should be used to evaluate consciousness or confirm death.

- Lack of a heartbeat
- Lack of respiration
- Lack of a corneal reflex
- Presence of rigor mortis
- Lack of movement over an extended period of time (two to three hours).

The presence of a heart beat can best be determined with a stethoscope placed under the left elbow. Please note that a pulse is usually not palpable under such circumstances and should not be used to confirm death. Movement of the chest indicates respiration but respiration rates may be very erratic and slow in unconscious animals. Therefore, one must be cautious in the interpretation of respiration for confirmation of death. One may test for evidence of a corneal reflex by touching the surface of the eyeball. Normal or conscious animals will blink when the eyeball is touched. Absence of a corneal reflex, failure to detect respiration, and absence of a heart beat for a period of more than five minutes may be used to confirm death. An alternative is to observe the animal over a period of several hours. Lack of movement and absence of a heartbeat, respiration or corneal reflex over an extended period of time provides further confirmation of death.

Unacceptable Methods of Euthanasia

Although laws vary by state, the following methods are generally considered unacceptable for euthanasia of cattle:

- Manually applied blunt trauma to the head
- Injection of any chemical substance not labeled for use as a euthanasia agent
- Injection of air into a vein
- Electrocution, as with a 120 or 220-volt electrical cord.

Personnel Training

Skill and experience of personnel are important when gunshot or penetrating captive bolt in combination with exsanguination, pithing or chemically-assisted euthanasia are used for euthanasia of sick and debilitated animals. Therefore, training of individuals who may be required to perform these procedures is essential. Experience has shown that many people (even those experienced in handling livestock) are not aware of the anatomical landmarks for proper execution of these

techniques. Furthermore, persons should be aware that there is significant danger for the operator (or for bystanders with gunshot) whenever these methods of euthanasia are used. On large operations, most, if not all, persons should be familiar with these procedures and several should be specifically trained to perform this task. However, only those who can demonstrate a working knowledge of the techniques should be permitted to perform these procedures. When these methods are not properly performed, animals may become injured, have varying degrees of consciousness, and experience undue pain and distress.

Experienced persons should assist in the training of inexperienced persons. Skulls from deceased animals may be used to demonstrate anatomical landmarks and application of the various techniques. It is important that trainees develop proficiency with the procedures before being given the responsibility for conducting these procedures in actual situations. People must also be aware of how to confirm death. Thus, trainees should be required to assist experienced persons when conducting these procedures to learn the techniques as well as methods for confirming death.

A Moral Responsibility

Euthanasia may be characterized as the “kindest act”; that is, one of the easiest to perform, but often one of the hardest to do. There is little question in the minds of most that when excruciating pain and suffering are uncontrollable by medical means, euthanasia is indicated. Nonetheless, many producers, managers, farm employees or others find it difficult to perform this task, not because the procedures are difficult, but because it is hard to kill an animal under any circumstances, and particularly so when it is their animal or one under their care. This is normal and understood. Few enter the livestock business thinking that this is one of the tasks they must be prepared to do. However, once a person accepts the moral responsibility implicit in owning and working with livestock, they must also accept that one

day they may be in a position where they are required to conduct this procedure.

Conclusions

The objective of humane euthanasia is to induce rapid death without causing pain or distress to the animal. When veterinary options are unavailable, the physical methods of gunshot and penetrating captive bolt coupled with either exsanguination, pithing or the rapid intravenous injection of KCl are acceptable methods for conducting these procedures. Both have advantages and disadvantages, and both require training for safe and effective use. Cadavers may be used to perfect techniques and train personnel. Euthanasia is an unpleasant task, but knowing how to perform it competently not only prevents needless suffering, but avoids those even more unpleasant conditions where improper technique may create pain or distress in animals requiring euthanasia.

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