# Procedures for Humane Euthanasia

## Humane Euthanasia of Sick, Injured and/or Debilitated Livestock

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## Preface

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The topic of euthanasia is unpleasant under any circumstances. It is, however, one of those tasks that veterinarians and others who work with livestock must be prepared to do. In many cases it is the only practical way to provide prompt relief of otherwise uncontrollable animal suffering. To that extent, it is a responsibility of all who own or work with livestock to have the proper equipment and knowledge to conduct this procedure with maximum efficiency and effectiveness.

The purpose of this brochure is to aid those who may be required to perform these procedures in situations where veterinary assistance is not available. Indications for euthanasia along with important human and animal considerations are discussed. Specific anatomical sites for proper placement of penetrating captive bolt or gunshot are described and illustrated for all major livestock species. Certain methods of euthanasia require exsanguination to ensure death therefore, this technique and appropriate methods to confirm death are described. This brochure is intended for use by livestock owners, market operators, law enforcement personnel, persons who transport livestock and others who may need to know proper methods for euthanasia of farm animals. Persons requiring additional information are referred to the web site or J. K. Shearer, Dairy Extension Veterinarian, as listed in this brochure.

Supplementary Materials Available:

- Wall Chart on Euthanasia of Cattle
- Desk Card on Euthanasia of Cattle
- Wallet Card on Euthanasia of Cattle
- Multi-species Index Card

# Procedures for the Humane Euthanasia of Sick, Injured and/or Debilitated Livestock

*Prepared Especially for*

Livestock Owners and Producers,
Livestock Market Operators and Transporters
or Others Who may Need to Know

"Euthanasia" is a Greek term meaning "good death". In this context, its objectives are met when death is induced which causes no pain or distress to an animal. To avoid pain and distress requires that the techniques which are used cause immediate loss of consciousness followed by cardiac and respiratory arrest that ultimately results in loss of brain function and death. Persons who perform this task must be technically proficient and have a basic understanding of the anatomical landmarks and equipment used for humane euthanasia of animals.

The purpose of this brochure is to describe proper procedures for humane euthanasia of sick and/or debilitated animals in farm, ranch or other situations where veterinary supervision may not be available.

## Indications for Euthanasia

Livestock owners and others who derive all or a portion of their livelihood from animal agriculture share a moral obligation to ensure the welfare of animals. 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 include the following:

- Fractures of the legs, hip or spine that are not repairable and result in immobility or inability to stand
- Emergency medical conditions that result in excruciating pain that cannot be relieved by treatment (e.g. terminal colic in horses, or trauma associated with highway accidents)
- Emaciation and/or debilitation from disease or injury that may result in an animal being too weak to be transported
- Paralysis from traumatic injuries or disease that result in immobility
- Advanced eye disease (e.g. lymphoma or cancer eye in cattle)
- Disease conditions for which cost of treatment is prohibitive
- Disease conditions where no effective treatment is known (Johne's Disease in ruminants), 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 not be killed by gunshot or other methods which result in head trauma that might cause excessive damage or loss of brain tissue and increase potential for human exposure to the rabies virus. Instead, rabies suspect animals should be attended to by a veterinarian who can properly euthanize the animal and obtain brain tissue for diagnostic purposes.)

## Important Considerations

The loss of productive function as a result of disease or injury in livestock 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 (drug residue). Euthanasia is the appropriate choice whenever the above conditions cannot be met.

When conditions warrant euthanasia, the next consideration is method. There are essentially 2 methods for humane euthanasia in circumstances where veterinary supervision is unavailable:

1) gunshot with the appropriate caliber of firearm and a solid point bullet delivered to the correct anatomical site.
2) 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.

Choices of one over the other should include concerns for human safety, animal welfare, ability to restrain the animal for proper application of the procedure, skill of the person performing the procedure, cost, rendering and carcass disposal considerations and possibly, potential need for brain tissue (for diagnostic purposes) in the event that the animal is suspected of having rabies.

Persons conducting euthanasia procedures should attempt to minimize animal distress. If animals are accustomed to human contact the presence of a familiar person may be reassuring and reduce anxiety. On the other hand, for wildlife and animals unaccustomed to human contact, gunshot should be delivered with the least amount of human contact necessary. 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 for 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. This is particularly true if a person is in a position where they must perform these procedures 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 may be to change work duties as needed to provide relief when it becomes apparent that such duties are causing emotional distress. Euthanasia, regardless of the circumstances, impacts a person's emotional state.

# Humane Euthanasia by Gunshot or Captive Bolt in Combination with Exsanguination

Properly applied, euthanasia by either gunshot or penetrating captive bolt (combined with 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 may 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 only practical method of euthanasia. This procedure requires the selection of an appropriate firearm and bullet with sufficient velocity, energy and size to pass through the skull (enter the brain), and cause massive brain destruction. A .22 caliber long rifle solid point bullet fired from either a pistol or rifle is sufficient for young animals. Hollow or soft point .22 caliber bullets increase brain tissue destruction, but may not penetrate the skull in adult animals and are therefore not recommended. Euthanasia of bulls, adult cows, horses, or cervids (elk) by gunshot requires larger caliber firearms because of thickness of the skull. Proper placement of the bullet is essential and best achieved by holding the firearm, when possible, within 2 to 3 feet (60 to 90 cm) of the intended target. The muzzle of firearm should not be held or placed against the head.

Shotguns are an excellent alternative to rifles or handguns for conducting euthanasia procedures. As with rifles and handguns, they must be used at close range, preferably within 1 to 2 yards (1 to 2 meters) of the intended target. Options for mature cattle (including bulls), horses and elk include the 12, 16, and 20 gauge shotgun loaded with slugs or No. 2, 4, or 6, size birdshot. The .410 and 28 gauge shotguns should not be used on larger animals, particularly bulls.

*Advantages:* When properly positioned a bullet, birdshot from a shotshell or slug will cause massive brain destruction and immediate loss of consciousness. Gunshot is inexpensive and does not require close contact with the animal.

*Disadvantages:* When using a rifle or handgun, ricochet of the bullet is possible and therefore, the operator and bystanders 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 get close enough to accurately 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, neck, or lower thorax just behind the elbow.

## *Penetrating Captive Bolt/Exsanguination/Pithing/KCl Injection*

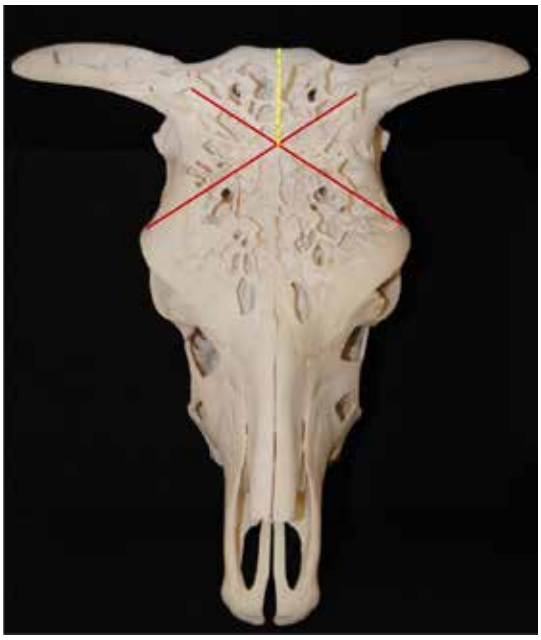
Penetrating captive bolt followed by immediate exsanguination (bleeding out) is the preferred method for euthanasia of cattle in abattoirs (slaughter facilities). The mode of action of a penetrating captive bolt gun is concussion and trauma to the brain. This requires that it be held firmly against the 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 required for proper use of this device. A rope halter is sufficient to restrain the head for ensuring proper placement of the penetrating captive bolt.

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 chemical substance such as KCl 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 penetrating 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 penetrating captive bolt. The penetrating captive bolt should not be fired when the animal is moving its head.

*Penetrating captive bolt and charges*



*Proper placement of penetrating captive bolt*

## *Indications of Unconsciousness*

Indications that an animal has been properly stunned (or rendered unconscious) would include the following observations: 1) immediate collapse of the animal when the penetrating captive bolt is fired, 2) no attempt of the animal to right itself following the stun, 3) body and muscles become immediately rigid after the shot, followed by varying degrees of involuntary movement of the limbs, 4) normal rhythmic breathing stops, and 5) the eyelids remain open with eyeballs facing straight ahead. At no time should one expect to hear vocalization as this would indicate that the animal is returning to sensibility.

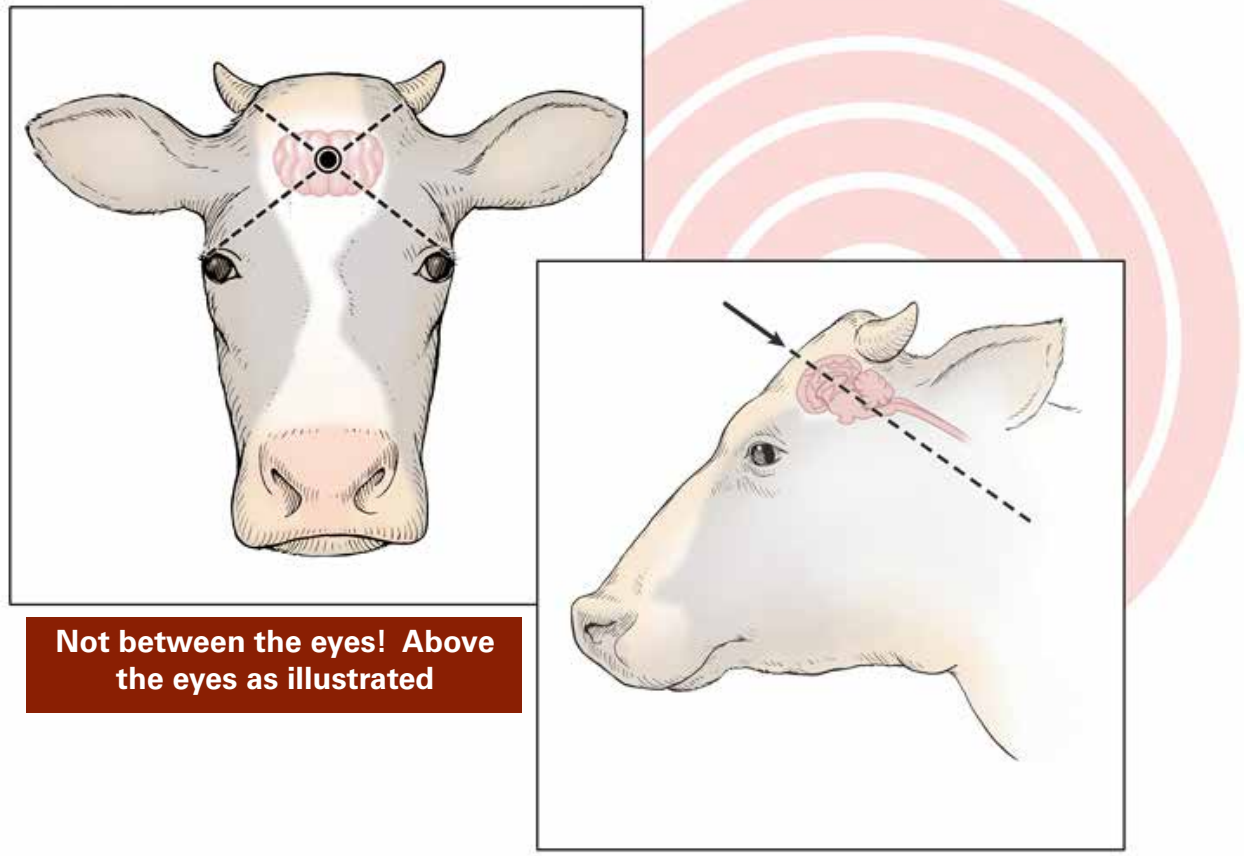
## Aesthetic Concerns

Both gunshot and penetrating captive bolt are aesthetically displeasing procedures. Euthanasia by either technique results in involuntary movements that may be inaccurately interpreted as painful to an inexperienced person. Therefore, when and where possible, it is recommended that such procedures be performed in areas out of the public view.

## Anatomical Landmarks

Proper positioning of the firearm or penetrating captive bolt is necessary to achieve the desired results. When euthanasia is performed by gunshot, the firearm should be held within a few inches or a few feet of the intended target. Ricochet may be prevented if the barrel of the firearm is positioned perpendicular to the skull as shown in the diagram. In cattle, the point of entry of the projectile should be at the intersection of two lines each drawn from the rear corner (outside corner) of the eye to the base of the opposite horn.

Penetrating captive bolt or gunshot followed by immediate exsanguination are the preferred methods of euthanasia in sheep. For hornless sheep, goats and rams the recommended sites for placement of the gun or penetrating captive bolt include the top of the head or slightly behind the poll. Sheep should be exsanguinated, pithed or given KCl by intravenous injection within 10 seconds after stunning by penetrating captive bolt or they may regain consciousness. Exsanguination, pithing and intravenous injection techniques should be performed as described on page 9.

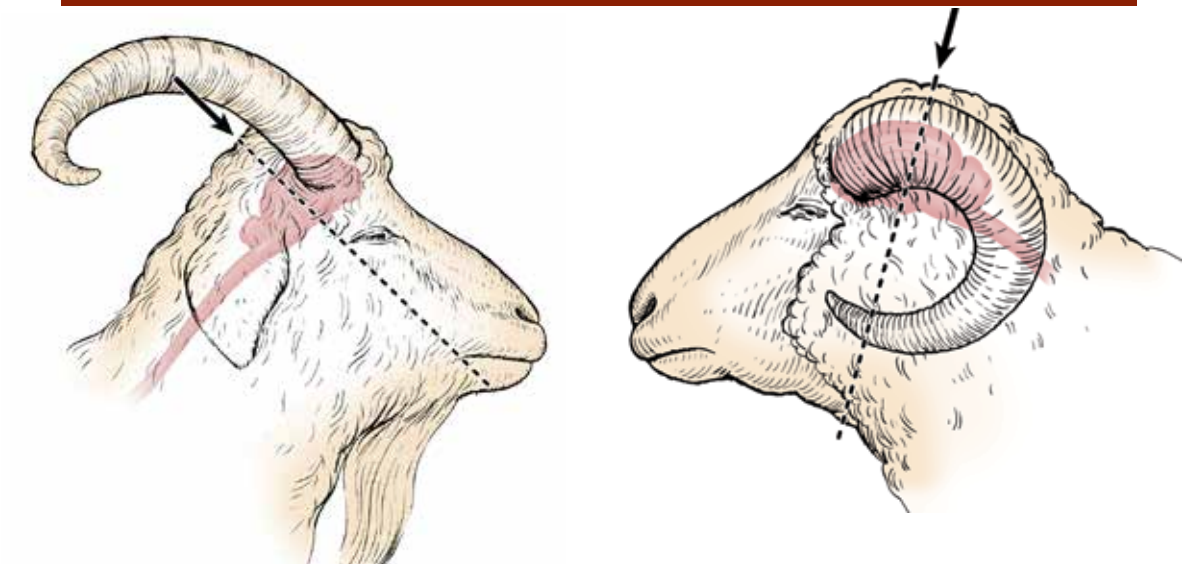


**Not between the eyes! Above the eyes as illustrated**

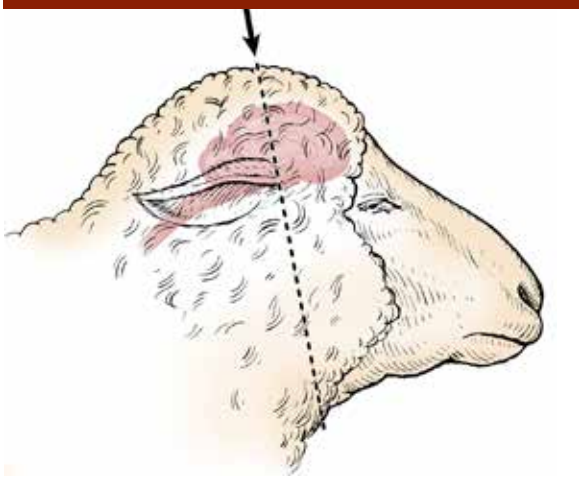
In horned sheep and rams the top of the head may not be the ideal location because of the thickness of the skull in this region. Instead, an alternate position and orientation for penetrating captive bolt or gunshot in horned animals is on a line from the poll and aimed downward toward the back of the throat. An alternative position for placement of the penetrating captive bolt or firearm in horned animals is the front of the skull directing the bolt or bullet toward the spinal cord.

The site for penetrating captive bolt or gunshot placement in horned goats is similar to that described for horned sheep and rams. An alternate site is slightly behind the poll aimed toward the lower part of the chin as shown in the diagram.

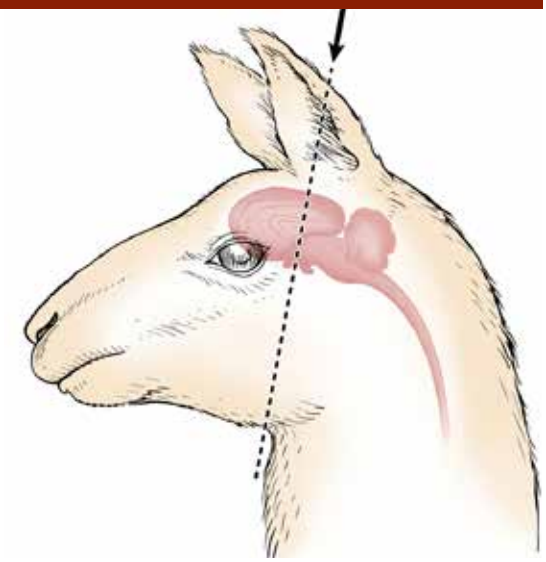
**Proper site in horned goats or sheep is behind the poll as shown**



**Again, Not Between the Eyes! — but slightly behind the poll or on the top of the head**

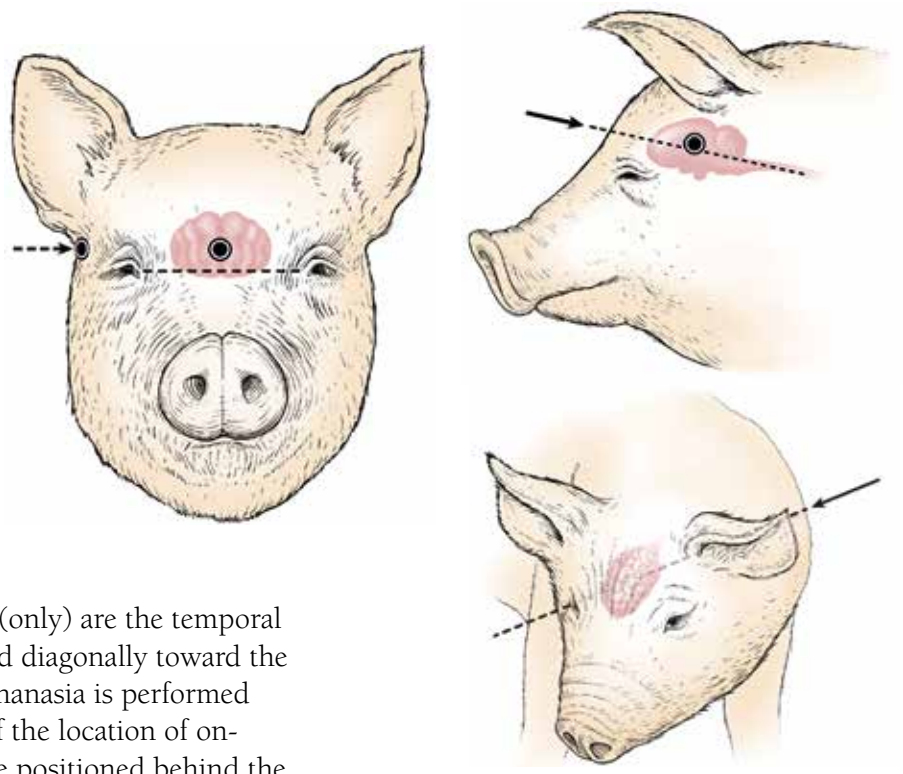


**Proper site in llamas is similar to that for hornless sheep**



**In swine there are 3 possible sites: frontal, temporal or from behind the ear toward the opposite eye**

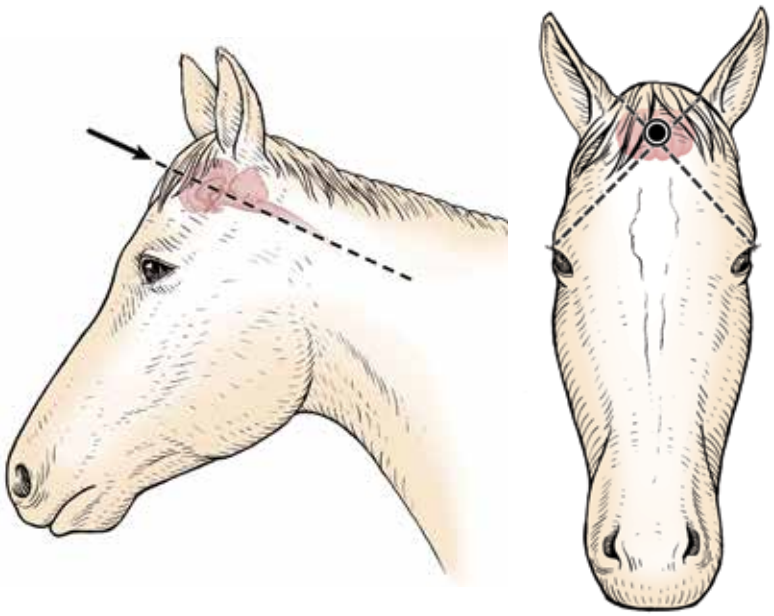
For swine, there are three possible sites: frontal, temporal and from behind the ear toward the opposite eye. Recommended placement of the penetrating captive bolt or gun for use of the frontal site is in the center of the forehead slightly above a line drawn between the eyes. The bolt or free bullet should be directed toward the spinal canal. Proper placement and aim of the euthanasia device is particularly important since the brain is relatively small and well protected by sinuses. Alternative sites for gunshot (only) are the temporal region or from behind the ear directed diagonally toward the opposite eye. As advised anytime euthanasia is performed with a firearm, one must be careful of the location of onlookers. By-standers should always be positioned behind the shooter.



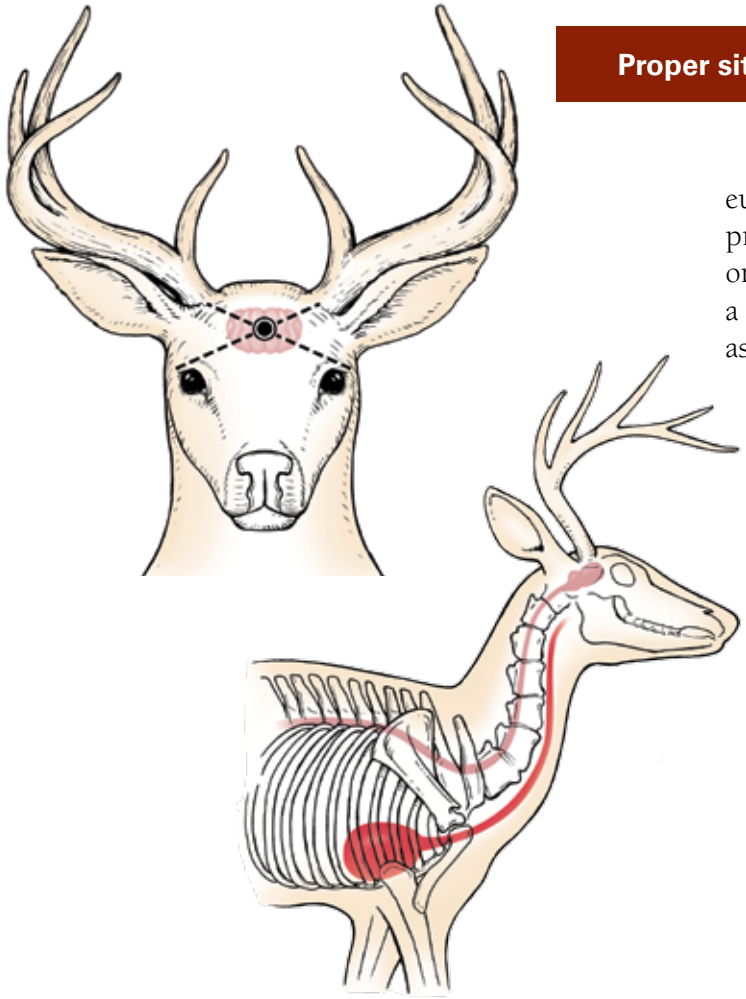
*An alternative site when euthanasia is performed by gunshot is to direct the bullet from behind the ear toward the opposite eye*

**Not between the eyes, but on the intersection of 2 lines each drawn from the outer corner of the eye to the top of the opposite ear**

Horses may be euthanized by gunshot or penetrating captive bolt. As described previously, use of the captive bolt requires good restraint so that the device may be held in close contact with the skull when fired. The site for entry of the projectile is described as being on the intersection of two diagonal lines each running from the outer corner of the eye to the top of the opposite ear (note diagram). An alternative means of finding the appropriate site is to direct the bolt or free bullet 1-2 inches (2.5-5 cm) above the intersection of 2 lines each drawn from the top of the eye to the base of the opposite ear.



*Demonstration/training on the correct use of the penetrating captive bolt*



## Proper site in deer is similar to that in cattle

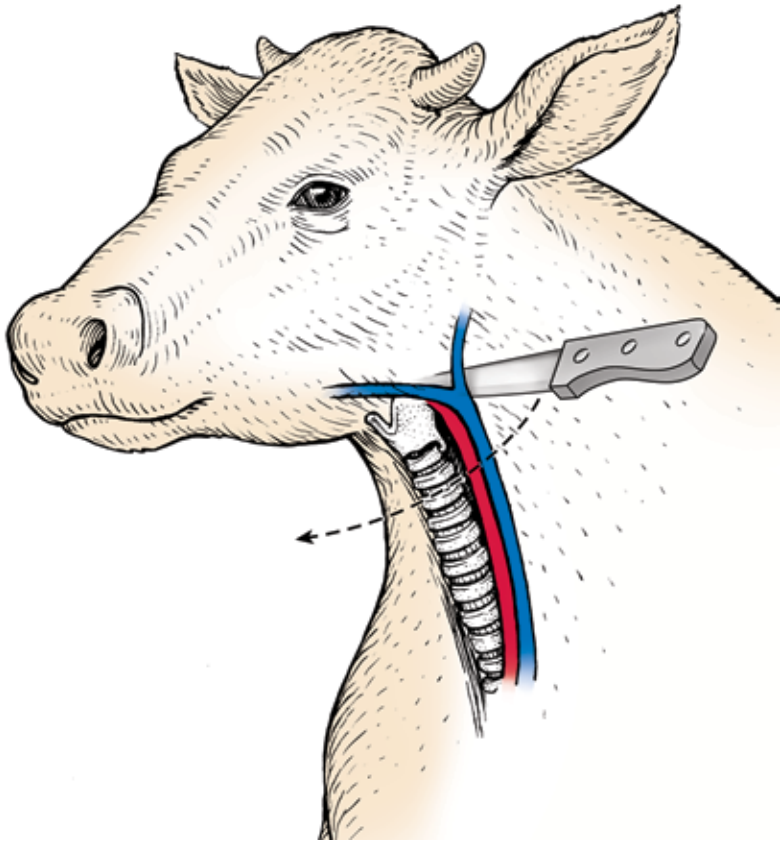
The methods described for emergency euthanasia of deer are similar to those described previously for cattle and small ruminants. Recommended positions and direction for firing of a penetrating captive bolt or gunshot in deer are as shown.

Since deer requiring euthanasia may be encountered on farm or road-side conditions, it is important to consider the natural instincts of fear and anxiety of a farm-raised versus wild animal. Approaching an injured wild deer will likely increase its distress causing it to attempt to flee which may only compound its misery. In general, when-ever wildlife are involved in highway accidents, the best advice is to contact the appropriate state wildlife authorities. Their personnel are properly trained to handle these emergencies.

# Exsanguination/Pithing/Intravenous Injection of KCl

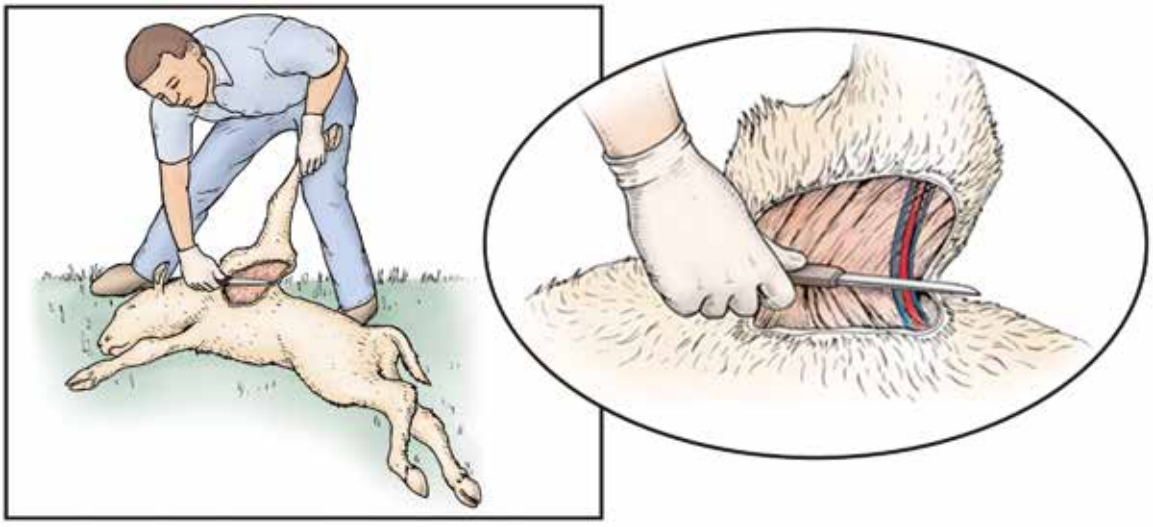
Once the animal has been rendered unconscious, procedures to ensure death should be initiated. Exsanguination should be performed using a pointed, very sharp knife with a rigid blade at least 6 inches (15 cm) in length. The knife should be fully inserted through the skin just behind the point of the jaw and below the neck bones. From this position the knife is drawn forward severing the jugular vein, carotid artery, and windpipe. Properly performed, blood should flow freely with death occurring within a few minutes (See diagram at right).

Alternatively, one may sever the brachial vasculature by lifting a front leg and inserting the knife deeply into the axillary area at the point of the elbow and cutting the skin, blood vessels, and surrounding tissue until the limb can be laid back away from the thorax of the animal. Regardless of the method used, great care should be exercised in performing exsanguination procedures. Although unconscious, animals in this state are capable of violent involuntary movement that may cause personal injury. (See diagram below).



*Exsanguination by severance of major blood vessels in the neck:*

1. *Jugular Vein, (indicated in blue color)*
2. *Carotid Artery, (indicated in red color)*
3. *Trachea or Windpipe (white tube)*



# Exsanguination/Pithing/Intravenous Injection of KCl (con't)

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 penetrating captive bolt stunner. The operator manipulates the pithing tool to destroy both brain stem and spinal cord tissue which ensures death. This procedure is sometimes used in advance of exsanguination procedures to reduce involuntary movement in stunned animals.

Another option for ensuring death once the animal has been rendered unconscious is through the injection of a saturated solution of potassium chloride (KCl). Potassium chloride 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 60 ml syringes with KCl solution and needles (14 or 16 gauge 1 ½ inch or 4 cm) prior to rendering the animal unconscious. In this way, the injection may be made as soon as possible once the animal is rendered unconscious. Any available vein may be used, 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, behind the animal's head and neck (out of 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 injection should be delivered by rapid intravenous injection. Death will usually occur within a couple of minutes. Please note that KCl should never be used in conscious animals. Potassium chloride (KCl) causes death by inducing cardiac arrest.

*Photos of a disposable pithing rod (Pithingrods.com)*

*Pithing rods are used to assure death following the use of penetrating captive bolt or gunshot. The pithing rod is inserted through the hole in the skull created by the penetrating bolt or bullet after which it is pushed to its entire length and locked in place. The rod shown in the photo is intended for one time use eliminating the need for exsanguination to ensure death. http://www.pithingrods.com*

## 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

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 or absent 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 5 minutes should be used to confirm death. An alternative is to observe the animal over a period of several hours. Lack of movement, absence of a heartbeat, respiration, or corneal reflex over an extended period of time provides further confirmation of death.

### *Special Considerations for Euthanasia of Bulls*

Bulls present particular challenges because of size, attitude, and the physical thickness of their skull. Specialized heavy duty penetrating captive bolt guns, higher caliber firearms or heavier gauge shotguns are required for euthanasia of bulls. As described previously, safety is of paramount importance. Since ideal positioning of either device requires close contact with the animal, restraint is usually necessary. Operators should recognize that restraint alone causes significant distress. By preparing the euthanasia device for use prior to restraining the animal, one can limit the restraint-related stress period.

### *Unacceptable Methods of Euthanasia*

The following is a partial list of methods considered as "unacceptable" for euthanasia of livestock:

- Manually applied blunt trauma to the head such as a large hammer
- 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

Laws regarding acceptable methods of euthanasia vary from state to state. Persons are advised to contact local and/or state legal authorities for further information. In some states, a person convicted of violating these laws may be charged with a felony.

### *Personnel Training*

Large farms and ranches are advised to develop personnel training programs for proper instruction of humane euthanasia techniques. As indicated in the previous discussion, the skill and experience of personnel are of paramount importance when gunshot or penetrating captive bolt/exsanguination or pithing and/or the injection of KCl are used for euthanasia of sick and debilitated animals. 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 farms or ranches, 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 and proficiency with the techniques should be permitted to perform euthanasia procedures. When these methods are not properly performed, animals may become injured, have varying degrees of consciousness, and experience needless pain and distress.

Experienced persons should assist in the training of inexperienced persons and utilize carcasses to demonstrate anatomical landmarks and application of the various techniques. Carcasses should be used for practice by trainees until they become competent with euthanasia devices and procedures. People must also be aware of how to confirm death.

## Conclusions

The objective of humane euthanasia is to induce death without causing pain or distress to the animal. When veterinary options are unavailable, the physical methods of gunshot and penetrating captive bolt combined with secondary procedures to ensure death are acceptable. Both have advantages and disadvantages, and both require training for safe and effective use. Cadavers or carcasses 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 increase pain and distress in animals requiring euthanasia.

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