



SOP 10.2 Euthanasia of livestock (horses, cattle, goats, sheep and pigs)

Version and Date of Issue: Ver 2, May 2024
School reviewer: Allan Gunn
Review due date: April 2027

Purpose

- (1) The objective of this standard operating procedure is to provide guidance to the Charles Sturt University staff on:
 - a) Euthanasia of livestock

Scope

- (2) This procedure applies to any person who is involved in AEC approved projects involving the euthanasia of livestock.
- (3) All researchers and teaching staff using animals for scientific purposes must be competent. For definition of competency refer to Charles Sturt University's Policy on 'Animal Care Competency Training and Assessment'

Details of procedure

Euthanasia:

- (4) Euthanasia is carried out using one of three main methods:
 - a) Captive bolt euthanasia using either the frontal or poll method
 - b) Lethal gunshot wound to the head using either the frontal or poll location
 - c) Lethal dose of barbiturates by intravenous administration
 - d) (Euthanasia, or subjecting to euthanasia, for the purposes of this SOP, is defined as: the humane killing of animals.)
- (5) The preferred methods are:
 - Captive-bolt euthanasia using the frontal or poll method
 - Lethal dose of barbiturates by intravenous administration
- (6) **Captive bolt euthanasia**
Where large numbers of livestock are to be euthanised, two operators are required to facilitate speed of the process.

To undertake captive bolt euthanasia the animal must be well restrained, operators must know the correct anatomical landmarks for placing of the device, and how to confidently handle and operate the captive bolt device.

Captive bolt devices must be well maintained (which includes cleaning after each session of use) so that the velocity of the bolt is not slowed by corrosion or carbon build up in the barrel. The correct strength blanks must be used appropriate to the size of the animal (the blanks for each model of captive bolt are colour-coded according to the amount of propellant in them).



SOP 10.2 Euthanasia of livestock (horses, cattle, goats, sheep and pigs)

The manufacturers' recommendations on the colour-code for the size of the animal must be followed.) The blanks must be stored properly so the propellant doesn't deteriorate. Devices should be kept stored in dry, secure conditions and checked to be in working order intermittently when not in use.

The device is placed directly on the head of the animal and the bolt discharged using depression of the device trigger. This releases the retractable bolt which results in a direct injury to the skull and then percussive injury to the brain resulting in stunning, and if effectively applied, death by destruction of the autonomous control centres for consciousness, breathing and heart rate in the brain stem and/or thalamus.

Effective euthanasia using captive bolt devices is determined by the correct identification of critical anatomical landmarks. In addition, two placement methods can be used, a) the frontal method where the device is placed on the front of the skull (the forehead), or b) the poll method where the device is placed at the poll of the skull.

Most critical is the placement of a well-directed shot appropriate for the species and its size if a second bolt placement, or secondary method, is to be avoided. The most consistently effective killing shots are those directed at the brainstem which in most species lies in the midline between the ears. This applies to frontal shots, poll shots and behind the ear shots – they should be directed at the brainstem. In livestock the brainstem consistently lies between the ears, or more specifically, between the ear canals which are usually at the base of the ears. It is important that the operator is aware that for the frontal method the target area is the brainstem of the animal, so the bolt should be placed at an angle facing towards the base of the skull not horizontally towards the horns or ears. Likewise, the target of the poll method is the thalamus and dorsal brainstem, which are located dorsoventrally from the poll, therefore the angle of the device is pointing to the jawline not directly downwards or backwards to the base of the neck.

Livestock culled using a captive-bolt device must have death confirmed, as described in section 10. The operator should always have an additional charge at the ready to use if death is not confirmed and a repeat shot is required. If the frontal method was used and death did not occur, then the poll method should be used for the second shot and death confirmed. The operator should always be prepared with a secondary method e.g., a knife or pithing device.

Livestock can be pithed (insertion of a wire or long handled rod into the bolt hole for destruction of brain stem tissue) or exsanguinated by severing any major artery (e.g., subclavian, aorta, carotid, brachial) using a suitable sharp knife as soon as it collapses to the ground. To avoid injury due to the animal's involuntary leg movements, the operator should stand behind the neck to carry out these procedures. Death must be confirmed in all cases.

(7) Euthanasia by gunshot

Euthanasia by gunshot should only be considered where euthanasia by other methods is not possible for inability to capture or contain the animal for the purposes of carrying out the procedure, animal welfare and/or operator safety considerations.



SOP 10.2 Euthanasia of livestock (horses, cattle, goats, sheep and pigs)

The same conditions and methods apply for euthanasia by gunshot as are described in Section 6) for captive bolt euthanasia. The frontal method is the preferred unless animal position or operator safety implications preclude. In the case of euthanasia by gunshot wound, the muzzle of the weapon should never be placed directly against the head of the animal although the shot should be fired from as close range as possible.

The major considerations for the use of a live firearm as the method of euthanasia compared to the preferred method of captive bolt euthanasia are:

- a) lack of availability of a captive bolt device
- b) suitability of the firearm for the size and species to be euthanised
- c) appropriate licencing, training, and experience of the operator
- d) safety of the operator(s) and other people.

The size of the animal dictates the required size of the rifle, e.g. 0.22 calibre rifles are appropriate for use in sheep but cattle and horses require larger calibre weapons, particularly if they are to be used at distance. Hollow point or soft nosed ammunition is recommended. Use of shotguns is not recommended for euthanasia..

(8) Euthanasia by lethal dose of barbiturates

Euthanasia by lethal dose of barbiturates (pentobarbitone) can be used where suitable trained or qualified staff are available, only a small number of animals are to be euthanised, and time is not a limiting factor. Euthanasia using lethal dose requires competency in intra-venous injection or catheterisation, access to Schedule 4 controlled substances via veterinary prescription. Veterinary oversight is a legal requirement because of the classification of the drug (S4D). The laws within each jurisdiction need to be adhered to as appropriate. Euthanasia by lethal dose of barbiturate should be rapid and painless. Collapse should be rapid, occurring within 10 seconds of administration at the correct dose rate for the species.

Pentobarbitone is the preferred barbiturate for use for euthanasia and should be administered by injection into the jugular vein. **Intramuscular, intrathoracic, or intraperitoneal administration should not be used for euthanasia of livestock.** Rapid injection of the dose should be achieved to ensure fast progression from consciousness to unconsciousness, and to avoid the potential of induction excitement (a state of agitation prior to unconsciousness).

Sedation can be used prior to delivery of barbiturate injection to minimise or eliminate pain, anxiety and distress and mitigate against early induction excitement. This can be applied if euthanasia is occurring under controlled conditions (e.g., not in a field setting).

If death is not confirmed two minutes post injection, then a second dose at the same rate can be applied. Death must be confirmed by checking all possible measures of consciousness (section 9) but the only reliable confirmation of death using this method would be absence of heart rate due to the nature of anaesthetics.

Confirmation of death post euthanasia:

- (9) Death occurs following a specific series of events:



SOP 10.2 Euthanasia of livestock (horses, cattle, goats, sheep and pigs)

- a) Collapse
- b) rigidity (induction excitation)
- c) relaxation and
- d) cessation of vital signs (heart rate, breathing)

Death should be confirmed immediately by checking the following signs:

- a) Absent corneal reflex
- b) Fixed, fully dilated pupils
- c) Relaxation of the jaw
- d) Flaccidity of the tongue
- e) Absence of rhythmic breathing

Only when all vital signs are confirmed absent should death be confirmed to have occurred.

Drugs, chemicals, or biological agents

- (10) Pentobarbitone is a Schedule 4 drug and **available by prescription**. It can only be administered by a registered veterinarian as an act of veterinary science (or an authorised person under their direction) or, under certain circumstances, by an investigator under a valid research authority. There is variation in dose rates, so the manufacturers label should be followed at all times to ensure the correct dose as well as statutory requirements of the relevant state referred to before use.

Impact of procedure on wellbeing of animals

- (11) Where euthanasia is carried out by a competent operator using the methods described, the process is fast and effective, leading to unconsciousness or death in a rapid manner. As such the welfare impacts of the procedure are usually minimal and frequently are for a higher welfare outcome for the animal. Low stress handling, and safety of the animal and operator, should be of paramount importance in every case.
- (12) Euthanasia by gunshot wound is not a recommended procedure unless capture and containment of the livestock is impossible due to the pertaining circumstances, will result in injury or significant danger to the animal or operator, or where no other option is available and there is an immediate and pressing welfare need.
- (13) To minimise the suffering of animals which are penned or homed together in groups, it is expected that animals will be separated from the presence of other animals when being euthanised.

Animal care

- (14) Animals should be handled using safe and low stress stock handling practices prior to euthanasia. If euthanasia is required due to disease, injury, or other emergency (misadventure, starvation, trauma), then the welfare and safety of the operator(s) must also be carefully considered prior to any procedure being undertaken to ensure both the animal and the operator are not compromised by the intervention.



SOP 10.2 Euthanasia of livestock (horses, cattle, goats, sheep and pigs)

Pain relief

- (15) Where euthanasia is carried out by a competent operator using the methods described the process is fast and effective, leading to unconsciousness and death in a rapid manner. As such additional pain relief is not required.

Reuse and repeated use

- (16) Not applicable.

Qualifications, experience or training necessary to perform this procedure

- (17) Euthanasia should only be carried out by trained and experienced operators, or operators under the supervision and guidance of a trained and experienced operator. Use of barbiturate lethal dose with or without muscle relaxants to be used under veterinary supervision only.
- (18) Use of captive bolt devices do not require a firearms certificate except in WA and Tasmania. However, training in the use of captive bolt euthanasia can be undertaken under the supervision of an experienced operator and without the use of live animals in the first instance. The use of firearms should only occur after appropriate training, with the necessary licences in place and in line with State or Territory laws.

Recording requirements

- (19) All animals that undergo humane slaughter will have their individual IDs recorded and animal numbers reported to the AEC through current annual reporting processes. Where euthanasia was the result of an unexpected illness/injury, this should also be reported using current adverse event reporting processes.

Associated documentation (including pictures if available)

- (20) Not applicable.

Glossary

- (21) Euthanasia – to kill an animal humanely

References and relevant links

- (22) The Australian Animal Welfare Standards and Guidelines for Cattle
<https://animalwelfarestandards.net.au/welfare-standards-and-guidelines/cattle/>
- (23) Reference information and diagrams may be accessed in the AVMA Guidelines for the Euthanasia of Animals: 2020 Edition, pp 115-120. <https://www.avma.org/resources-tools/avma-policies/avma-guidelines-euthanasia-animals>