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Question raised by requestor

Is there a guide or procedure for on-farm emergency killing, due to an emergency (e.g., bone fracture) of bovine or small ruminants of all ages by the farmer, when the veterinarian is not available?

Answer

EURCAW *Ruminants & Equines* received the question 22 March 2024. The answer regarding emergency killing of ruminants was sent 17 July 2024.

This answer describes legislation, guidelines and research on emergency killing or euthanasia.

Regulation surrounding Emergency Killing

Article 3 of COUNCIL DIRECTIVE 98/58/EC (1) states that Member States shall make provision to ensure that the owners or keepers take all reasonable steps to ensure the welfare of animals under their care and to ensure that those animals are not caused any unnecessary pain, suffering or injury. Emergency killing is defined as the *"killing of animals which are injured or have a disease associated with severe pain or suffering and where there is no other practical possibility to alleviate this pain or suffering"* (EU Regulation 1099/2009; 2) Emergency killing is appropriate when an acutely sick or injured animal that cannot be treated successfully and/or economically (3), is unfit for transport (EU Regulation 1/2005; 4), and/or unfit for human consumption (Regulation 853/2004; 5), dangerous or transmitting deadly diseases (Art 13, EU Regulation 1099/2009). Article 12 states that *"It is an ethical duty to kill productive animals which are in severe pain where there is no economically viable way to alleviate such pain. In most cases, animals can be killed respecting proper welfare conditions."* It also refers to exceptional circumstances such as an accident in a remote area, where it may be unfeasible to adhere to 'optimal welfare rules'.

Furthermore Article 19 of EU Regulation 1099/2009 (2) states, *"In the case of emergency killing, the keeper of the animals concerned shall take all the necessary measures to kill the animal as soon as possible."*

Generally, following emergency killing, animals do not enter the human food chain. However, where the animal is injured and otherwise healthy, On-Farm Emergency Slaughter (OFES) may be permitted depending on national or local regulations in the Member State. An official veterinarian must be present to conduct an official ante-mortem inspection and there has to be an agreement with a nearby Food Business Operator that is willing to receive the animal for a post-mortem inspection and further processing, in accordance with EU Regulation 853/2004 (5).

Recommended Procedures

The European Commission has published a 'How to' guide for the stunning/killing of sheep and goats on-farm. Two other guidelines of relevance are 'How to stun sheep' and 'How to stun cattle (penetrative captive bolt)' (6, 7). Furthermore, a Final Report on Preparation of best practices on the protection of animals at the time of killing describes 'Elements of Practice - On-farm Killing' (3). This report refers to the regulatory prerequisite that *"the person carrying out the killing shall have the appropriate level of competence to kill animals without causing them any avoidable pain, distress or suffering"* (p137). A Certificate of Competence is not legally required for emergency killing by Regulation 1099/2009 (2); however, a best practice approach would require such a certificate to assure the knowledge and skills of the person performing the procedure. In some Member States emergency killing of a farm animal by the farmer or farm worker may not be the norm, and instead performed by a veterinarian or by trained personnel from an Animal By-Products Collection Service.

Veterinarians should consider discussing and writing protocols with their clients on emergency killing, to help them make swift decisions (8). Examples of decision trees that can be adapted to individual farms are available from the Care4Dairy End of Career Cow Best Practice Guide (9), Farm Animal Welfare Advisory Council (FAWAC) of Ireland 'Animal Welfare Guidelines for Managing Acutely Injured Livestock on Farm' (10), and NFACC 'Code of Practice for the Care and Handling of Dairy Cattle' (8).

Where emergency killing is to be performed by the farmer or their designate, it is important that the procedures involved minimise the further suffering of the animal. In the context of animal welfare, consideration should be given to the competence and training of the persons responsible for emergency killing. This includes:

- Low stress handling and restraint, to ensure that the animal is appropriately restrained to carry out the stun/kill.
- Prior experience of the procedures and knowledge of accurate application of the stun/kill device to ensure that it is effective and humane. For example, the positioning of a penetrative captive bolt stunner varies with species, and in the case of sheep and goats, the presence/absence and position of the horns.
- Knowing the signs of unconsciousness and death.

Methods of Handling and Restraint

In some circumstances, except in the case of acute or severe injuries, the animal may need to be moved to an area where they can be appropriately restrained, to ensure the accurate positioning of the stun/kill device. The Commission's report on the preparation of best practices on the protection of animals at the time of killing (3) recommends acceptable, good, and best practice approaches to handling and restraint for emergency killing (***Table 1***).

Table 1: European Commission's (3) Good practice recommendations for the restraint of cattle, calves, sheep, and goats, outlining the advantages and disadvantages with additional notes on the advantages and disadvantages (denoted).*

Species category	Restraint	Advantage	Disadvantage
Cattle (adult)	Crush or narrow pen to give easy access to the head	Animal is confined with minimal discomfort	Some animals will also need their head restrained
	Head halter (with a quick release mechanism) can be used to restrict head movement	Stabilises the head for stunning, including cattle that are recumbent and cannot be moved. Minimal discomfort for the animal	None
Calves	Manual restraint against a wall or fence	Stabilises young animals	May cause discomfort to the calf. Safety considerations for the handler
Sheep and goats	Group pen – the size may need to be adjusted using a swing gate	Animal is confined, but not actively restrained Animals are not alone, which reduces stress	Disturbance by other animals*
	Crush or narrow pen can be used to give easy access to the head	Animal is confined, and it may provide sufficient restraint to stun the animal Minimal discomfort for the animal	Some animals, especially goats may be too active Separation stress in sheep*
	Adjustable head collar and lead rope or halter or bridle to restrict head movement	Stabilises the head for stunning Effective for more active animals Minimal discomfort for animals	None

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Methods of Stunning and Killing

If the circumstances allow, and depending on the size of the animal, the competence of the person, equipment available, and location, consideration should be given to stunning the animal prior to emergency killing. Regulation 1099/2009 (2) provides a list of approved stunning procedures. ***Table 2*** outlines methods for emergency killing based on approved methods of stunning listed in Regulation 1099/2009 (2). In the context of the Q2E, veterinary-only procedures have been excluded from the table. Furthermore, while EFSA (2024; 11) suggests non-penetrative captive bolts are effective in rendering neonatal sheep and goats unconscious, Regulation 1099/2009 (2) only allows non-penetrative captive bolts at slaughter.

Head-to-body electrical stunning causes death of the animal. However, most stunning methods require a procedure to ensure death (i.e., pithing or bleeding). Pithing is the insertion of a wire or rod into the hole made by the bolt and repeatedly thrust toward the spinal cord causing maximum damage (9). Bleeding requires the severing of both carotid arteries and jugular veins (9).

Table 2: Methods for Emergency Killing based on approved Stunning Methods and Related Specifications in EU Regulation 1099/2009 (Annex 1, Chapters 1 and 2). Amended to only include methods approved for ruminants.

Name	Description	Conditions of Use	Key Parameters	Specific requirements
Penetrative captive bolt device	Severe and irreversible damage of the brain provoked by the shock and the penetration of a captive bolt. Simple stunning.	Slaughter, depopulation and other situations.	Position and direction of the shot differs between polled and horned breeds (see ***Figure 1A-E***). Appropriate velocity, exit length and diameter of bolt according to animal size and species. Maximum stun to stick/kill interval(s).	N/A
Firearm with free projectile	Severe and irreversible damage of the brain provoked by the shock and the penetration of one or more projectiles.	Slaughter, depopulation and other situations.	Position of the shot. (see ***Figure 2 A-C***) Power and caliber of the cartridge. Type of projectile.	N/A
Percussive blow to the head	Firm and accurate blow to the back of the head provoking severe damage to the brain.	Lambs and kids up to 5 kg live weight	Force and location of the blow.	These methods shall not be used as routine methods but only where there are no other methods available for stunning. No person shall kill by percussive blow to the head more than seventy animals per day.

Name	Description	Conditions of Use	Key Parameters	Specific requirements
Electrical head-only stunning	Exposure of the brain to a current generating a generalised epileptic form on the electro-encephalogram (EEG). Simple stunning.	All species. Slaughter, depopulation and other situations.	Minimum current (A or mA). Minimum voltage (V). Maximum frequency (Hz). Minimum time of exposure. Maximum stun-to-stick/kill interval(s). Frequency of calibration of the equipment. Optimisation of the current flow. Prevention of electrical shocks before stunning. Position and contact surface area of electrodes	When using head-only electrical stunning, electrodes shall span the brain of the animal and be adapted to its size. Head-only electrical stunning shall be carried out in accordance with the minimum currents set out in Table 1, Annex 1, Chapter II of 1099/2009.
Head-to-body electrical stunning		All species. Slaughter, depopulation and other situations.	Minimum current (A or mA). Minimum voltage (V). Maximum frequency (Hz). Minimum time of exposure. Frequency of calibration of the equipment. Optimisation of the current flow. Prevention of electrical shocks before stunning. Position and contact surface area of electrodes. Maximum stun-to-stick interval(s), in case of simple stunning(s).	Animals of the ovine, caprine and porcine species. The minimum currents for head-to-body electrical stunning shall be 1 ampere for sheep and goats. There is no provision for calves in 1099/2009

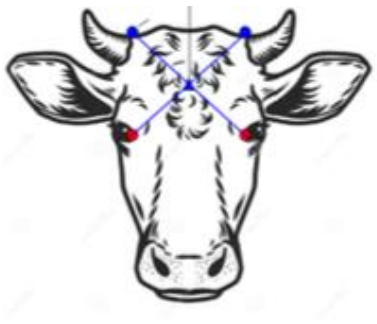
The key parameters can be considered as control points, which are further described in the Commission's 2017 report (3). In the latter, there are control points for pre- and post-stunning each divided into four questions:

- What should you check?
- What does good look like?
- What might go wrong?
- How can it be fixed?

In addition to the above, the European Commission has created 'how to' factsheets outlining stunning and killing methods for sheep and goats and using the captive bolt to stun cattle (6, 7). Practical guidelines on the emergency killing of cattle and small ruminants are also provided by the Humane Slaughter Association (12, 13).

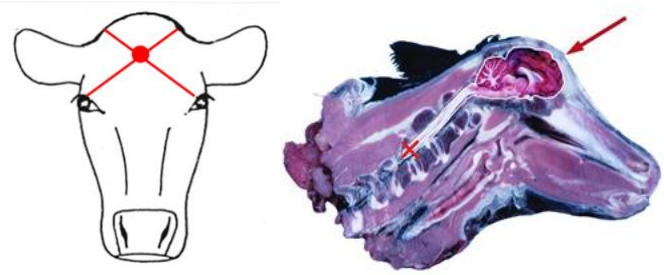
Positioning of the Captive Bolt Device

This section provides an outline of positioning of the captive bolt for cattle, sheep and goats. For further information refer to the Humane Slaughter Association's (HSA) online guide on Captive Bolt Stunning for Livestock (12) and other cited research (14, 15, 16, 17).



Credit: Demota et al 2024 (14)

A) Cattle: the muzzle of the stunner should be placed at a right angle, 2 to 3 cm above the intersection of the lines between the inner angle of the eye to the upper base of the contralateral horn (or equivalent location if hornless) (14). A study comparing positioning of the stunner identified ways of improving the positioning and orientation of shots (15). The shape of the animal's head can affect the effectiveness of the stun position and thus checking for signs of unconsciousness is essential (12).



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B) Calves: the muzzle of the stunner should be placed in the middle of the forehead at the intersection of two imaginary lines from the outside corner of each eye to the opposite horn or equivalent site in hornless animals. The projectile should be directed towards the base of the skull as the forebrain is underdeveloped compared to adult cattle (8).

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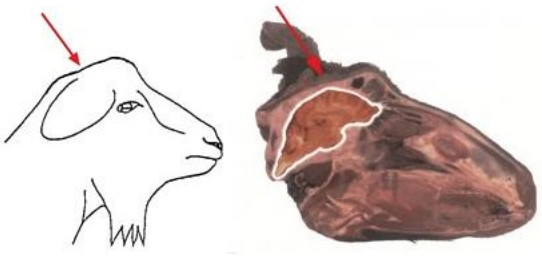
C) Polled sheep: the muzzle of the stunner should be placed on the highest point of the head, and on the mid-line, and aimed straight down (12).



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D) Goats: the muzzle of the stunner should be placed behind the bony mass on the mid-line and aimed towards the base of the tongue, irrespective of whether they have horns or not (12).

*Figure 1: Correct position and direction for penetrative captive bolt stunning **A)** Cattle, **B)** Calves, **C)** Polled sheep, **D)** Goats*

Sheep with horns on the top of the skull: the muzzle of the stunner should be positioned on the mid-line, behind the ridge between the horns (same as for horned goats) and aimed towards the base of the tongue (12). In contrast for sheep with lateral horns: the muzzle of the stunner should be positioned on the mid-line above the line between the eyes and aimed almost horizontally (16).

Positioning of Firearms

This section provides an outline of positioning of firearms for cattle, sheep and goats. For further information refer to the HSA's online guide on Human Killing of Livestock Using Firearms (13).

Cattle: The positioning used for captive bolt stunning applies to the use of a firearm, with the shot aimed at a right-angle to the skull (13). However, for mature bulls (9 years +) that have a hard, thick frontal bone, covered by thick matted hair, a shotgun may be more appropriate to effectively penetrate the skull than small calibre projectiles.

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A) Calves: The brain of the calf is relatively larger than in adult cattle, and the upper part of the skull not as well developed. The shot should be aimed at the angle indicated in the figure, in order to destroy the brain stem (13).

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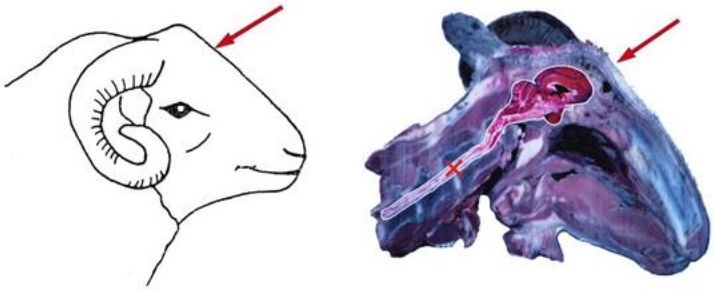

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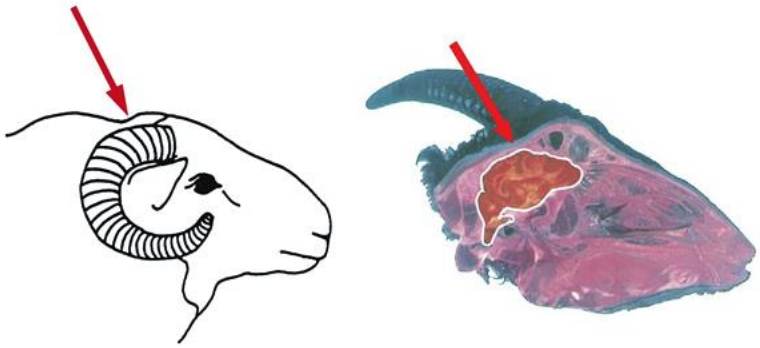
B) Killing sheep and goats: the firearm should be placed on the mid-line, just above the eyes, directed down the line of the spine (13). There can be practical difficulties with using a free bullet due to, for example, minor movement by the animal. The head must be in the normal position (13).



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C) Heavily horned sheep and goats. Due to the horn mass over the forehead, the recommended shooting position is behind the poll as indicated in the image. There are risks involved with using a free bullet described in the HSA Guide (13)

Figure 2: The correct positioning and direction for use of a firearm to kill (13) ***A)*** *Calves (13),* ***B)*** *Sheep and Goats without heavy horns (13),* ***C)*** *Sheep and Goats with heavy horns (13).*

Notes on positioning of the penetrative captive bolt and firearms for other ruminant species

Deer: the muzzle of the stunner should be placed in the middle line of the forehead, at the intersection of two imaginary lines from the eyes to the top of the base of the opposite ears, or slightly above this point (12, 13).

Water Buffalo: According to research published by Gregory et al (17), *"poll shooting can be effective in water buffalo, but it produces a shallow depth of concussion compared with frontal shooting in cattle. It requires accurate placement of the gun to ensure that buffalo are not shot through the spinal cord instead of the brain."* Due to the horn mass over the forehead and the associated risk of effectiveness of the stun in the frontal position, only the highest-powered captive-bolt devices should be used.

Notes on positioning of a non-penetrative captive bolt in kids and lambs

When stunning kids or lambs using a non-penetrative captive bolt, must have the stunner behind the poll, between the ears, with the neck bent and the chin touching chest. See ***Figure 3*** below.

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Figure 3: Correct positioning of non-penetrative captive bolt in neonatal lambs and kids (18). Please note, while EFSA (11) states that non-penetrative captive bolts are effective in rendering a neonatal animal unconscious, Regulation 1099/2009 (2) only permits the use of these devices at slaughter for animals weighing less than 10 kg.

Carcass disposal

In many EU Member States, an authorised Animal Collector must be notified as soon as a dead animal is present on farm. Burial of fallen cattle, sheep and goats is commonly only permitted with a license issued by the competent authority in exceptional circumstances, but the details may differ between different Member States.

According to Regulation 1069/2009 (19), *"Burial and burning of [...] dead animals may be justified in specific situations, in particular in remote areas, or in disease control situations requiring emergency disposal of the animals killed as a measure to control an outbreak of a serious transmissible disease. In particular, disposal on site should be allowed under special circumstances, since the available rendering or incinerator capacity within a region or a Member State could otherwise be a limiting factor in the control of a disease."*

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