# Guidance notes for the on-farm emergency killing of broilers.

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These guidelines provide information on the humane methods to stun and kill broiler chickens on-farm for reasons other than slaughter. Humane methods either kill the animal instantly, render the animal unconscious until death or are non-aversive.

## I. Definitions and legal framework

On-farm euthanasia is the killing of birds with a goal other than for consumption. The most frequent circumstances<sup>1</sup> in which killing birds on-farm may be necessary are:

- 1. To avoid unnecessary suffering of injured or sick animals that cannot be treated.
- 2. Emergency reasons associated with stock management.
- 3. Depopulation of the entire flock to avoid the spread of diseases.
- 4. Disaster management or other emergency circumstances.

The efficacy of a humane killing method depends on how fast the animals lose sensibility and how fast they die<sup>2</sup>. According to the EU Council Regulation (EC) No. 1099/2009<sup>3</sup>, when killed on-farm, birds must always be stunned before or at the same time as they are killed.

The <u>EC Regulation 1099/2009</u> on the <u>Protection of Animals at the Time of Killing (EU)</u> and <u>The Welfare of Animals at the Time of Killing Regulations 2015 (WATOK)</u>\* are the main pieces of legislation which regulate welfare at slaughter in the EU and the UK. (\**Different versions for England, Scotland, Wales and Northern Island*)

Methods		Large-scale killing	Individual and small groups killing	
Electrical	Head only	Stunning	Yes	Yes
Liectrical	Head to body	Stunning	Yes	Yes
	Whole house gassing	Stunning + Killing	Yes	No
Modified	Whole house gassing with high-expansion gasfilled foama	Stunning + Killing	Yes	No
atmospheres	Containerised Gassing Units (CGUs)	Stunning + Killing	Yes	No
	Gas mixtures in containers	Stunning + Killing	Yes	Yes
	Captive bolt	Stunning	Yes	Yes
	Percussive blow to the head <sup>b</sup>	Killing	Yes	Yes
Mechanical	Firearm with free projectile	Killing	No	Yes
	Cervical dislocation b,c	Killing	Yes	Yes
	Neck cutting	Killing	No	Yes
	Lethal injection	Stunning + Killing	Yes	Yes

**Table 2:** Humane stunning/killing methods used on-farm approved for poultry under the EU Council Regulation (EC) No. 1099/2009<sup>3</sup>

a Currently under review to be included in the EU Council Regulation (EC) No. 1099/2009; b: Maximum 70 birds per person and day;

c: Manual dislocation: birds up to 3 kgs, Mechanical dislocation: Birds up to 5 kgs

## II. On-farm humane slaughter: action plan

We encourage broiler producers to set up and implement a robust action plan in order to ensure that the on-farm killing of birds is done appropriately and as humanely as possible, using best available onfarm killing methods and applying those methods correctly and in a standardized way. Such action plan should cover the following aspects:

#### 1. Establish the roles and responsibilities of staff.

In case of on-farm, large-scale killing (large groups of birds), the roles and responsibilities of the staff involved needs to be clearly established<sup>1</sup>.

## 2. Training on general animal welfare principles and techniques for humane on-farm killing.

On-farm killing should be conducted by trained and skilled personnel and must include protocols for the proper maintenance and use of stunning/killing equipment<sup>2</sup>. Basic training should preferably involve technical aspects (how to carry out the different procedures), practical aspects (backup, logistics, etc.), animal welfare aspects, and psychological aspects.

#### 3. Monitoring of mortality and culling rates at company and farm level.

Monitoring mortality is essential to quickly identify and resolve potential problems during the rearing.

- Check for sick or injured animals needing culling in all sheds every day, twice a day, and immediately proceed to on-farm euthanasia.
- Record number of deaths and culls and distribution over time.
- Record the reasons for culling.

#### 4. Standard procedures for on-farm killing.

- Use the best methods available (see figure 1)
  - o Head-only electrical stunning followed by bleeding or cervical dislocation.
  - o Captive bolt stunning followed by bleeding or cervical dislocation.
- Correct application of the chosen method to ensure rapid and effective death.
- Check the effectiveness of stunning and confirm death.
- Clean and maintain the equipment in good condition.

## CHOOSING A KILLING METHOD

## PREFERRED METHODS

## STEP 1: Stunning

- Electrical Head only
- · Captive Bolt



## STEP 2: Killing

- Neck Cutting
- Cervical Dislocation (stretching and twisting method)

#### Stun/Kill

- Lethal injection
- Whole house gassing<sup>1</sup>
- Containerised Gassing Units<sup>1</sup>
- High-expansion, gas-filled foam<sup>1,2</sup>

1: Method to kill large groups

2: Only approved to use in the UK

## **DISCOURAGED METHODS** (Only if no alternatives)

#### Stun/Kill

- Cervical Dislocation (stretching and twisting method)
- Electrical head-body
- · Percussive blow to the head
- Gassing in containers
- Firearm

### **ILLEGAL METHODS**

- Neck cutting without prior stunning
- Cervical dislocation by crushing the neck or other inappropriate methods
- Suffocation
- Ventilation shutdown
- · Low expansion foam or fire extinguishing foam

Figure 1: How to choose the best method for on-farm emergency killing.

## III. Catching, handling, and restraining

Correct catching and handling techniques will minimize stress and suffering for the birds and ensure the handler's safety.

Guidelines on the correct catching and handling of poultry<sup>4,5</sup>:

- Approach the birds quietly and calmly. Catching under dim lighting conditions may reduce the stress associated with catching.
- To pick up the birds:
  - o Catch the chickens individually or maximum two at the time.
  - o Place both hands over the wings to prevent flapping.
  - With one hand, firmly clench the legs between your outstretched fingers (positioning one or two fingers between the legs) and support the bird's breast on the palm of the same hand (Figure 2, A).
  - The wings can then be controlled by your opposite hand or by holding the bird against your body, under your arm.
  - o If the chicken is in a place difficult to reach, such as underneath a rack or a platform, grab both legs with one hand and support the chest with the other hand (Figure 1, D)<sup>5</sup>.
  - o Catching and holding the chickens only by the legs must be avoided.
  - o The chickens should not be inverted.



**Figure 2**. Examples of adequate handling of birds. Method to hold and secure the bird, securing the legs and minimising flapping. A, B, C: The Humane Slaughter Association, 2021; D: Eyes on Animals, 2016

## IV. On-farm euthanasia for individual or small groups of broilers

In commercial large-scale poultry production, birds that become sick of injured are often not treated and must be killed to avoid further suffering. We strongly encourage producers to ensure that culling rate remains low and to treat sick or injured animals whenever possible. When birds need to be euthanized, it is crucial that killing occurs immediately and using the best available method.

#### 1. Stunning

The Council Regulation (EC) No. 1099/2009, defines "stunning" as "an intentionally induced process that causes loss of consciousness and sensibility without pain, including any process resulting in instantaneous death". The following stunning methods may be reversible and should be immediately followed by another killing method (such as neck cutting or cervical dislocation)<sup>1,3</sup>.

#### 1.1. Electrical stunning

Electrical stunning consists in passing sufficient electrical current through the brain to disrupt the normal electrical activity, resulting in immediate unconsciousness and insensibility to pain. The duration of the insensibility depends on the amount of current that passes through the brain and the length of time for which the current is applied.

#### Head only stunning

Head only electrical stunning is a reversible stunning method using a device normally consisting in a pair of attachable electrodes that are placed on either side of the bird's head (Figure 3). This can be applied when the chicken is manually restricted and without inverting the animal. This is a stun only method and needs to be followed by a killing procedure such as neck cutting or cervical dislocation.

According to EU Council Regulation, a minimum current 240 mA is needed to cause loss of consciousness (see Annex 1), but the HSA recommends a minimum of 300-400 mA. Electrical stunning should be performed using a constant current with a voltage above 110V applied for at least 7 seconds<sup>1</sup>. The signs of unconsciousness after using a head only electrical stun can be found in Annex 1.

For a more detailed description of the procedure and equipment, please consult HSA's <u>Practical Slaughter of Poultry</u> guidelines<sup>4</sup>.



Figure 3: Handheld electrical stunner. HSA, 2021

Since head-only stunning doesn't require live inversion, this method should be prioritized over other electrical stunning methods.

Head to body stunning

It is also possible to use electricity to both stun and kill the birds, by using dry electrodes that span the brain and the heart to induce immediate unconsciousness followed by cardiac fibrillation resulting in death<sup>1</sup>. When using this method, a restraint device such as the cone can be used (Figure 4). Restraint devices can cause discomfort or pain to the birds and should be used only briefly<sup>4</sup>. In the cone, the birds are inverted into the device with the head lowered through a hole, but their body is supported by the cone, which also stops the flapping. The stunning/killing must then be carried out immediately.

Head to body electrical stunning requires live inversion, and therefore is more stressful and painful for the birds than head only stunning, which should be preferred.



**Figure 4**: Cone used to restrict a chicken (HSA, 2021

#### 1.2. Mechanical methods

Captive bolt

Captive bolts are defined by the Council Regulation (EC) No. 1099/2009 as a reversible stunning method. It has been shown that when operated correctly, it can also result in the death of the animal<sup>1</sup>. However, by law it still needs to be followed by a killing process such as neck-cutting or cervical dislocation.

Non-penetrating captive bolt devices (Figure 5) can be powered by cartridge or compressed air. When correctly administrated, loss of consciousness occurs very fast (in less than 2 seconds<sup>1</sup>).

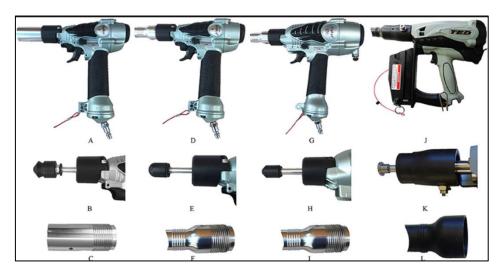
The devices apply a fast blow to the skull, causing the brain to collide against the skull resulting in a disruption of the electrical activity in the brain and a sudden increase of the intra cranial pressure, followed by a sudden drop. Additionally, it leads to severe skull damage and may cause damage to the brainstem, leading to irreversible loss of consciousness and death<sup>6</sup>.

For a detailed description of the procedure, and information about the available devices and its correct use, please consult the <u>HSA poster for mechanical percussive devices</u><sup>7</sup>.

Penetrative captive bolts, which are fired through the skull into the brain, are less frequently used in poultry. Penetrative captive bolt stunning of broiler chickens needs a minimum of 6 mm bolt diameter driven at an air pressure of 827 kPa (120 psi) to a penetration depth of 10 mm<sup>8</sup>.

Repeated use of a captive bolt gun to kill birds in rapid succession can lead to overheating of the barrel and failure of the gun. If a large number of birds need to be killed, several guns should be made available so they can be used alternately and have time to cool off<sup>1</sup>.

The signs of unconsciousness after using a captive bolt can be found in Annex 1.



**Figure 5:** Examples of non-penetrating captive bolt devices (Bandara et al, 2019<sup>9</sup>)

#### 2. Killing

#### 2.1. Percussive blow to the head (blunt force trauma)

This method is described as a stunning and killing method in the Council Regulation (EC) No. 1099/2009. It provokes the death of the animal by hitting the back of the head with a hard blunt object, causing brain concussion and death. The signs of unconsciousness after using a percussive blow to the head can be found in Annex 1.

The EU Council Regulation restrict its use to birds under 5 kg, and no more of 70 birds per person and day can be killed using this method, to avoid errors due to operator's fatigue<sup>1</sup>.

The EU Council Regulation (EC) No. 1099/2009 states that percussive blow to the head should not be used as a routine method but only when other stunning options are not available<sup>3</sup>.

#### 2.2. Cervical dislocation

Cervical dislocation is still by far the most used method<sup>10,11</sup> for killing chickens on-farm. It can be performed manually or with the help of a mechanical device.

The EU Council Regulation (EC) No. 1099/2009 states that cervical dislocation should not be used as a routine method but only when other stunning options are not available<sup>3</sup>.

Manual cervical dislocation

Manual cervical dislocation is performed by holding the legs of the chicken in one hand while the other hand stretches and twists the neck. This provokes death by dislocating the cervical vertebrae and rupturing the spinal cord and the jugular blood vessels <sup>12</sup>. When correctly applied, this method is more reliable in provoking death at the first application than other methods like the mechanical dislocation or the captive bolt<sup>2</sup>. However, it has been shown that the birds remain conscious after the application<sup>13</sup>. Furthermore, it requires skill, experience, and physical strength, and it's subjected to human fatigue.

In the EU and the UK, it is, by law, restricted to chickens with a maximum weight of 3 kg and a maximum of 70 birds per person and day. For a more detailed description of the procedure, please check HSA's <u>Practical Slaughter of Poultry</u> guidelines<sup>4</sup>.

Manual cervical dislocation by other methods than stretching and twisting the neck (such as crushing the vertebrae or by "spinning" the bird) should never be used<sup>1,3</sup>.

Mechanical cervical dislocation

Mechanical cervical dislocation implies the use of a device to obtain the same effect. Some examples of those devices are the killing cone, the <u>Koechner euthanasing device</u> or the <u>Livetec Nex</u>®. EU Council Regulation allows the use of mechanical cervical dislocation to kill birds up to 5 kg.

Mechanical cervical dislocation with devices that crush the first cervical vertebra should never be used as they don't induce loss of consciousness and may result in death from suffocation <sup>1,3</sup>.

The signs of unconsciousness after applying cervical dislocation can be found in Annex 1.

#### 2.3. Neck cutting

Neck cutting is a killing method that causes the death of the bird by severing either both carotid arteries or the vessels from which they arise. The birds should always be unconscious prior to neck cutting, and they should be bled without delay, and always within 15 seconds of stunning to ensure death occurs before consciousness can be regained<sup>3</sup>.

When there is suspicion of infectious disease, the EFSA recommends that other killing methods, such as cervical dislocation, are preferred<sup>1</sup> for biosecurity reasons.

For a detailed description of the procedure please see the HSA guide on "Effective neck-cutting of Poultry"14

#### 2.4. Lethal injection

Barbiturates or their derivatives are most commonly used alone or in combination with other euthanasic drugs to induce loss of consciousness and death. In the EU, a lethal injection of veterinary drugs (e.g., sodium pentobarbital) can only be applied by a veterinarian<sup>3</sup>.

Lethal injection of anaesthetic drugs should be administered strictly following the manufacturer's instructions on dose, route, and rate of administration. Administration of euthanasic drugs without anesthetics properties can only be allowed if the bird has been rendered unconscious by other methods.

## V. On-farm euthanasia for large groups of broilers

Euthanasia for large groups of broilers, including the killing of entire flocks, may be necessary in case of infectious disease outbreaks, natural disasters, or other emergencies. Several methods are currently available for large scale euthanasia.

#### 1. Whole house gassing

Whole house killing of poultry by gas follows the same principles as the Controlled Atmosphere Stunning (CAS) systems in slaughterhouses but occurs in the shed where the animals have been raised, with the building being previously sealed. This method is a stun-kill procedure.

The most frequently used gas is CO<sub>2</sub>, which induces the death of the birds by hypercapnic hypoxia. Other gases such as carbon monoxide and nitrogen are not recommended for whole house gassing. Carbon monoxide is potentially dangerous when applied to on-farm killing, as absolute sealing is difficult to achieve<sup>15</sup>. The use of nitrogen to create an anoxic situation is also not suitable as it dissolves in the air very rapidly<sup>1</sup>.

In a sealed shed, the concentration of  $CO_2$  is increased gradually, so that the animals become unconscious before they are exposed to concentrations that become aversive for the birds<sup>16</sup>. However, there are other welfare concerns such as the low temperature at which liquid  $CO_2$  is injected (e.g. -80C°) which can cause severe hypothermia, and the long duration of the period in which the birds experience disturbed breathing<sup>17</sup>.

Instead of injecting CO<sub>2</sub> in liquid form, CO<sub>2</sub> can be injected under pressure at multiple injection points in the shed. In this case, the temperature drop would not exceed 10-15°C at the injection points<sup>1</sup>. This method leads to a gradual increase of the carbon dioxide concentration in the whole building and ensures a more homogeneous distribution of the gas than when it's injected in liquid form. This, in turn, decreases the risk of exposure of conscious birds to high carbon dioxide concentrations.

This method is only permitted under the supervision of a veterinary surgeon<sup>4</sup>.

The advantage of this procedure is that it does not require manipulation or handling of the birds, avoiding stress for the animals and improving biosecurity by minimizing the contact between humans and birds.

Whole house gassing is the preferred method recommended by the EFSA when euthanasia of all the birds of a shed is necessary<sup>1</sup>.

#### 2. Containerised Gassing Units (CGUs)

A commercially available mixture of gases can be used to stun and kill large numbers of poultry on-farm using containerised gassing units (CGUs)<sup>18</sup> (Figure 6). This method involves loading transport containers, crates or modules full of birds into a gas-tight metal container. When the container is closed, it delivers the gas mixture until the desired concentrations are attained, maintaining the gas concentrations until all the birds are dead<sup>1</sup>. For example, a maximum residual oxygen volume of 5% created by using a mixture of 80% argon and 20% carbon dioxide will kill chickens in 2 minutes<sup>18</sup>.

#### 3. Gassing in containers

This method is the exposure of batches of birds to high concentrations of  $CO_2$  or a mixture of inert gases and  $CO_2$ . Smaller containers for routine culling by farm staff are available for this method. In this case, birds need to be manually caught in small batches and introduced one by one in a container connected to gas cylinders (Figure 7).

These containers can be sealed and therefore require a smaller quantity of gas and offer more flexibility with gas mixtures than whole shed gassing. However, birds must be handled and killed in batches. This is more stressful for the birds and more labor intensive than CGUs or whole house gassing Birds are normally introduced in the containers through a small hole, which can compromise their welfare and some animals may suffer and/or die as a result of the compression and suffocation before the container is filled with birds<sup>1</sup>.



**Figure 6**: Containerised Gassing Unit (EFSA, 2019<sup>1</sup>)



**Figure 7**: Equipment for gassing in containers, (EFSA, 2019¹)

#### 4. High-expansion gas-filled foam

High expansion nitrogen-filled foam is a stun-kill method consisting in administrating gas-filled foam which acts as a delivery mechanism for the gas, most commonly nitrogen. As the foam envelopes the animal, the bubbles burst releasing the gas, and the oxygen is effectively eliminated/displaced, leading to the death of the birds by anoxia. This method is currently under review by the EFSA to be included in the EU Council Regulation 1099/2009 but is already approved for use in the UK.

Where approved, gas-filled foam can be used in open buildings that are not suitable for whole house gassing.

This method should not be confused with air filled high-density foam with high water content (also known as low-expansion foam or firefighting foam) which kills birds by occluding the airways and is often used in the United States.

Low-expansion foam is not approved for use in the UK or EU as it causes dead by suffocation, which is not accepted as a humane method for killing birds<sup>1</sup>.

## VI. Confirmation of death

Death should always be confirmed at the end of the killing process, before disposing of carcasses.

Signs of insensibility or brain death<sup>2</sup> include:

- Lack of response to:
  - o Palpebral link
  - o Pupillary light
  - o Nictitating membrane reflexes
- Absence of rhythmic breathing. Please note that barbiturates, often used alone or combined with other drugs as lethal injection, can suppress breathing, and the breathing interval can become considerably longer than normal in birds that are still alive<sup>1</sup>.
- Cessation of convulsions
- Cessation of cloacal movement. Cloacal movement is often the last involuntary behaviour to cease and therefore is the most conservative sign of death in chickens.

## VII. References

- 1. EFSA Panel on Animal Health and Welfare (AHAW), Nielsen, S. S., Alvarez, J., Bicout, D. J., Calistri, P., Depner, K., ... & Michel, V. (2019). Killing for purposes other than slaughter: poultry. EFSA Journal, 17(11), e05850.
- 2. Baker-Cook, B., Torrey, S., Widowski, T. M., Turner, P. V., Knezacek, T., Nicholds, J., & Schwean-Lardner, K. (2021). The efficacy of three on-farm euthanasia methods for broiler chickens throughout the production cycle. British Poultry Science, 62(5), 638-649.
- 3. Council Regulation (EC) No 1099/2009 of 24 September 2009 on the protection of animals at the time of killing. https://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:303:0001:0030:EN:PDF
- 4. Humane Slaughter Association (2021). Practical Slaughter of Poultry. https://www.hsa.org.uk/downloads/publications/practicalslaughterofpoultrydownload-cm-updated.pdf
- 5. Eyes on Animals (2018). Instruction EonA Dutch caching method. https://www.eyesonanimals.com/wp-content/uploads/2019/06/Instruction-EonA-Dutch-caching-method.pdf
- 6. Gibson, T. J., Rebelo, C. B., Gowers, T. A., & Chancellor, N. M. (2018). Electroencephalographic assessment of concussive non-penetrative captive bolt stunning of turkeys. British poultry science, 59(1), 13-20.
- 7. Humane Slaughter Association, (2016), Stunning poultry: mechanical percussive devices. https://www.hsa.org.uk/downloads/hsatippoultrypercussapril2016pdfoptimiser.pdf
- 8. Raj, A. M., & O'Callaghan, M. (2001). Evaluation of a pneumatically operated captive bolt for stunning/killing broiler chickens. British Poultry Science, 42(3), 295-299.
- 9. Widowski, T. M. (2019). Anatomical Pathology, Behavioral, and Physiological Responses Induced by Application of Non-penetrating Captive Bolt Devices in Layer Chickens. Front. Vet. Sci. 6,
- 10. Clarkson, J. M., Paraskevopoulou, A., & Martin, J. E. (2023). A decade on: Where is the UK poultry industry for emergency on-farm killing? Poultry Science, 102604.

- 11. Watters, J. V., Krebs, B. L. & Eschmann, C. L. Assessing Animal Welfare with Behavior: Onward with Caution. J. Zool. Bot. Gard. 2, 75–87 (2021).
- 12. Watteyn, A., Jacobs, L., Ampe, B., Moons, C. P., Garmyn, A., & Tuyttens, F. A. (2020). Killing individual poultry on-farm—a survey among veterinarians and farmers. Poultry science, 99(9), 4132-4140.
- 13. Erasmus, M. A., Lawlis, P., Duncan, I. J. H., & Widowski, T. M. (2010). Using time to insensibility and estimated time of death to evaluate a nonpenetrating captive bolt, cervical dislocation, and blunt trauma for onfarm killing of turkeys. Poultry Science, 89(7), 1345-1354.
- 14. Humane Slaughter Association, (2016) Effective neck-cutting of poultry, https://www.hsa.org.uk/downloads/neck-cutting-poster-final-version.pdf
- 15. Gerritzen, M. A., Lambooij, E., Stegeman, J. A., & Spruijt, B. M. (2006). Slaughter of poultry during the epidemic of avian influenza in the Netherlands in 2003. Veterinary Record, 159(2), 39-42.15.
- Gerritzen, M., Lambooij, B., Reimert, H., Stegeman, A., & Spruijt, B. (2007). A note on behaviour of poultry exposed to increasing carbon dioxide concentrations. Applied Animal Behaviour Science, 108(1-2), 179-185.
- 17. McKeegan, D. E. F., Sparks, N. H. C., Sandilands, V., Demmers, T. G. M., Boulcott, P., & Wathes, C. M. (2011). Physiological responses of laying hens during whole-house killing with carbon dioxide. British poultry science, 52(6), 645-657.
- Raj, M., O'callaghan, M., Thompson, K., Beckett, D., Morrish, I., Love, A., ... & Howson, S. (2008). Large scale killing of poultry species on-farm during outbreaks of diseases: evaluation and development of a humane containerised gas killing system. World's Poultry Science Journal, 64(2), 227-244.

## **Annex 1: European Commission guidelines on stunning/killing poultry**

