Best Practice Guide Pigs
Best Practices for Slaughter



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1 Objectives and structure

What are the objectives of this Best Practice Guide?

The **Best Practice Guides (BPGs)** aim to improve animal welfare by giving recommendations and advice to all stakeholders that are involved in the production of fattening pigs and broiler chickens. They have been developed as part of the **aWISH project (Animal Welfare Indicators at the Slaughterhouse)** and contain numerous measures, the so-called "Best Practices", that can be implemented on farm, during transport and at the slaughterhouse to ameliorate the welfare of pigs and broilers throughout the whole production chain.

This BPG focuses on Best Practices regarding the **slaughter of pigs**.

The process of slaughtering involves many risks to pig welfare. This Best Practice Guide presents recommendations for ensuring animal welfare from the moment of arrival at the slaughterhouse, unloading of the animals, their stay at the slaughterhouse, and subsequent stunning and bleeding. With regard to stunning methods, electrical stunning and CO_2 stunning are addressed, as these are the methods most commonly used for pigs in practice. The Best Practices listed in this guide refer to ensuring animal welfare. Additional measures may apply to occupational safety of slaughterhouse staff; however these are not the main focus of this guide. The following recommendations are based on scientific literature, expert surveys, and experience gained in the EU project aWISH.

Who is this Best Practice Guide intended for?

This Best Practice Guide is intended for slaughterhouse managers and staff, external consultants, scientific experts, policymakers, and anyone involved in animal welfare issues in pig slaughter.

How is this Best Practice Guide structured?

The BPGs are based on AWI that can be measured at different points of the production chain, mainly at the slaughterhouse. The recommendations provided should thus lead to an increase in pig and broiler welfare that is reflected in the automatic welfare monitoring at farm and slaughterhouse level. Concrete Best Practices for important indicators were identified.

The structure of this Best Practice Guide follows the individual steps in the slaughter process, commencing with the arrival of the pigs at the slaughterhouse, the unloading of the animals, and their movement to the slaughterhouse's lairage area. This is followed by the pigs' stay in the lairage area before they are moved on for stunning and slaughter. For each section in this guide, potentially affected animal welfare domains are listed, referring to the five domains model (1 Nutrition, 2 Physical Environment, 3 Health, 4 Behavioural Interactions and 5 Mental State) (Mellor et al., 2020). In addition, the animal welfare indicators (AWI) studied in the aWISH project that are affected in that section are identified. Afterwards, a detailed description of Best Practices is provided that can improve animal welfare in this area.



2 Arrival at the slaughterhouse and unloading from the transport vehicle

Factual background

Pigs arriving at the slaughterhouse have often travelled long distances and spent many hours on the transport vehicle. Long waiting times on the transport vehicle should therefore be avoided, and the animals must be handled gently and examined carefully during unloading (Brandt and Aaslyng, 2015; Cobanovic et al., 2021). When pigs arrive at slaughterhouses, the animals are exposed to several stressors, such as an abrupt unloading process, human-animal contact, exposure to novel surroundings, heat or cold stress as well as mixing with unfamiliar conspecifics (Flores-Peinado et al., 2020). During this phase, it is essential to reduce stress and the risk of injury. The pigs should be moved quickly but carefully from the transport vehicles to the lairage pens. To ensure this, the operating staff must be properly trained (Holmes et al., 2020; Lipovšek et al., 2024). The unloading process must be continuously monitored by the responsible staff (Anonymous, 2017). For this purpose, camera systems and AI technology could be used in future as well (Gronskyte et al., 2015). Injured or sick animals must be identified during unloading and treated accordingly. Severely injured animals must be killed or slaughtered immediately right where they are (Anonymous, 2017), which may mean on the transport vehicle or in the unloading area. Sick animals that are still able to be transported to the slaughterhouse should be separated immediately and given appropriate care. If recovery is not possible, they must be killed, or where appropriate, slaughtered without delay (Anonymous, 2017).

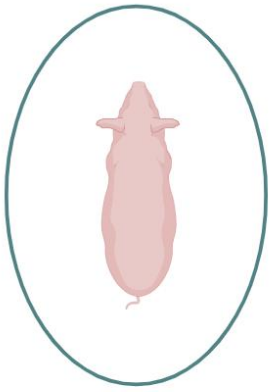
Affected welfare domains[1]:	Physical Environment, Health, Behavioural Interactions, Mental state
Affected AWI (related to the aWISH project):	Skin lesions, Vocalisation

Best Practices

- Both unloading as well as the stay in the lairage area should be as safe and quiet as possible in order to reduce stress.
- Arrival of trucks should be scheduled in such a way that lairage areas are always available to **minimize waiting times**.
- **Feed withdrawal times should be considered** (no longer than 24 hours and prolonged hunger must be avoided.

[1] Referring to the Five Domains Model of Animal Welfare (Mellor et al., 2020), a science-based framework to assess animal welfare. The model includes 5 domains that are assessed: 1 – Nutrition, 2 – Physical environment, 3 – Health, 4 – Behavioural interactions, 5 – Mental state.

- Pigs should be **unloaded without delay**, especially in extreme weather conditions.
- **Training** should be provided to operating staff on **non-aversive animal welfare handling methods** for pigs (e.g. through webinars, lectures or guides) using suitable training materials.
- Pigs must be **checked for health and severe injuries** (such as large open wounds, severe lameness) on the transporter and during unloading → do not unload severely injured or sick animals, consider **emergency** killing on the vehicle (as soon as possible and done by staff trained in emergency killing); For more information on **fitness for transport** check out the **Best Practice Guide "Pigs: Transport"**.
- Animals must be handled **calmly and gently**, **without violence** and with **quiet voice.**
- Pigs should be unloaded from transporter **one compartment at a time** and mixing of unacquainted pigs should be avoided.
- The pigs should be given time to exit the transport vehicle **slowly**, and they should not be rushed. To this end, the **pigs' curiosity** can be used: they normally leave the truck by themselves.
- The ramps must be adequately secured so that animals cannot fall and be injured during unloading. **Railings and a non-slip surface** are essential.
- Ramps should not be steeper than 20°, gaps between vehicle and ramp should be covered.
- Pigs should be moved in **small groups** (optimum: 6; maximum: 9).
- For moving the pigs forward, **paddles, boards or flags** should be used instead of electric prods (do not hit animals, use boards to create a barrier); **Gentle voice and sounds** can be utilized to move the pigs forward, however, there should be no sudden, loud noises that might frighten the pigs.
- Use the animals **flight zone** to move them. The flight zone is the animal's "personal space" and differs for each individual (see graphic). Pigs that are used to being handled can have a smaller flight zone than pigs that rarely come into contact with people. Stepping into the flight zone at a 45° angle behind the shoulder motivates the pigs to move forward. Walking deep into the flight zone towards the animal from one side leads the pig to move into the opposite direction. However, stepping into the flight zone of an animal should always be done slowly and deliberately, as sudden movements can lead to panic. Several resources offer more in-depth information about



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the flight zone and how to move animals (e.g. Broom, 2005; Center for Food Security and Public Health Iowa State University, 2012; Consortium of the Animal Transport Guides Project, 2017; WOAH, 2011).

- **Moving distances** of the animals should be kept **as short as possible.**
- **Monitor handling regularly and give feedback.**



3 Lairage and handling before stunning

Factual background

Mixing pigs in the lairage area of the slaughterhouse is often unavoidable. However, any regrouping of pigs can lead to injuries due to fighting. Fighting activity increases in the lairage, and when moving pigs from the lairage pens to the stunning chamber (Schrøder-Petersen et al., 2026). To minimize the negative effects of fighting, mixing pigs that are unfamiliar with each other should be avoided or reduced to the essential minimum. Whenever possible, groups of pigs that are already familiar with each other from the farm — or at least from transport — should remain together. Lairage times should also be reduced to the necessary minimum; however, they should be long enough to allow the animals to recover from the transport. The movement of pigs into the lairage area and later out of the pens for stunning must be as stress-free as possible. Inadequate pre-slaughter handling procedures are stressful for the animals and can elevate the blood levels of catecholamines and other stress hormones (Hambrecht et al., 2004). Also, the reaction towards CO_2 is affected by the pre-stunning handling and animals with high stress levels show more aversive reactions in the CO_2 atmosphere than low stress handled pigs (Jongman et al., 2021; Terlouw et al., 2008). Whenever possible, pigs should be handled and moved in groups, as this is less stressful for these social animals. Handling in groups is easier to achieve with CO_2 stunning systems than with individual manual electrical stunning. However, even with automatic electrical stunning systems, pigs can be herded in groups prior to stunning (Schrøder-Petersen et al., 2026). One innovative approach to improving animal welfare could be the use of AI-based real-time monitoring methods. These can be based on image analysis or may utilize the pigs' vocalisations associated with stress (Schrøder-Petersen et al., 2026). Development and evaluations of such systems are highly encouraged.

Affected welfare domains:	Nutrition, Physical Environment, Health, Behavioural Interactions, Mental state
Affected AWI (related to the aWISH project):	Skin lesions, vocalisation

Best Practices for lairage and handling before stunning

- **Mixing of pigs in the lairage area should be avoided or reduced to the essential minimum.**
- **Small groups** (approx. 10 animals) should be preferred.
- Different animal species must not be mixed in the same lairage area.
- **Partitions** should be used to prevent contact with other groups.
- **Enough space** must be provided. There must be space for each pig to lie down, stand and move around.
- **Waiting time must be as short as possible**, but pigs should have sufficient time to rest after transport (preferably between 1 and 3 hours).



- **Water** must be provided and available for each animal (irrespective of inside or outside lairage area) → ad libitum, at least two drinkers per pen, drinker:animal ratio min. 1:20, preferably open surface drinkers.
- Noise should be kept to a minimum (< 85 dB(A)), and sudden loud noises should be avoided.
- **Animal monitoring** by responsible staff or camera-based technologies should be implemented to quickly identify potential animal welfare issues.
- There must be a sufficient number of **qualified staff** available at the slaughterhouse to carry out animal monitoring and care.
- Whenever possible, **automated monitoring systems** should be used as a support tool to ensure animal welfare.
- If welfare issues are identified during monitoring (e.g. severely injured or sick animals), appropriate measures must be taken immediately (e.g. notify the veterinarian, remove the animal from the group, emergency killing).
- **Training** of staff in non-violent animal welfare handling methods and in identifying health conditions and injuries (e.g. through lectures, webinars or guidelines) must be ensured.
- It is essential to **handle the pigs calmly and gently**, without using force and speaking in a soft voice.
- Methods should be implemented to minimise heat and cold stress:
    - In outside lairage areas, there should be **shaded areas** available.
    - In outside lairage areas, **shelters** should be provided to protect pigs from adverse weather conditions (such as sun, wind and rain).
    - Space allowance should be increased in hot weather.
    - At temperatures > 23° C, **water sprinkling** for 5min after unloading is recommended.
    - In extreme heat, **ventilation** as well as sprinkling or nebulising water should be provided, preferably right before moving pigs to stunning.
    - If necessary, at low temperatures: **heating systems** in lairage area should be implemented and used.

Best Practices for driving to stunner

- Pigs should preferably be moved forward in **groups** (minimum 2 animals).
- The pigs should be **handled calmly and gently**; they should be moved forward without excessive pressure or force. **Electric prods should not be used**.



- **The animals must not be beaten**. **Driving boards and paddles** may be used for driving without applying force against the animals. These aids are used solely to guide the pigs in the right direction and gently urge them forward.
- Pigs can also be moved forward using **voice commands and soft sounds** (e.g., tapping the driving board), however loud and sudden noises must be avoided as they cause fear
- The animal's **flight zone** (= personal space) should be considered (see section **3 "Lairage and handling before stunning**").
- The drive corridor must not contain any sharp turns, steep slopes, or slippery surfaces; steps should not exceed 15cm.
- An **improved raceway design** should be implemented: curved drive corridors can ensure a steady flow of animals to the stunning area.
- **Distractions must be minimised**: no light reflections, no dark entrances or dead ends, no loose objects and air currents.
- Facilities should be optimised, adapted and improved if problems occur.
- Pigs must be given time to get used to walking in single file when they are separated for automatic electrical stunning; it can also help to put two stunners next to each other in order for pigs to walk into the individual corridors simultaneously.
- **Continuous animal monitoring** should be implemented to quickly identify potential animal welfare issues. This can be done by responsible staff and supported by camera-systems.
- Investing in **personnel's training and skills** is highly encouraged; **regular feedback** regarding handling and interactions with pigs can further motivate staff to adhere to animal welfare friendly handling methods.



4 Stunning

Affected welfare domains: Physical Environment, Health, Mental state

Affected AWI (related to the aWISH project): Skin lesions, Vocalisation, Corneal and eyelid reflex

4.1 Electrical stunning

Factual background

Electrical stunning stimulates the entire brain through prolonged depolarization of nerve cells. Neurologically, the electrical current causes also a release of neurotransmitters. If this occurs in many neurons in both hemispheres of the brain, it results in a generalised epileptic attack (Schroder-Petersen et al., 2026). For animal welfare reasons, electrical stunning should lead to immediate loss of sensibility and consciousness and not merely cause electrical immobilization through muscle stiffening while the animal remains conscious. An epileptic attack goes through two phases, first the tonic phase and then the clonic phase. First, the animal stiffens, breathing stops, and the eyes become fixed. The head is thrown back and the hind limbs are pulled under the body. The front limbs are often stretched out. The tonic phase usually lasts 10 to 20 seconds. This is followed by the clonic phase, which lasts about 15 to 45 seconds and is characterized by paddling movements. Studies with a known electric current of 1.3 amps showed that a generalized cerebral attack can be achieved after a current flow time of just 300 ms. Shorter durations (100 ms and 200 ms) led to clear expressions of pain, allowing the conclusion that the induction phase of any electrical stunning is associated with a brief but intense sensation of pain (Troeger, 2020). Since optimal conditions cannot be assumed for every animal in the slaughterhouse, the minimum electrical currents must be reached within one second. Then the electric current must be maintained for at least 4 seconds (German Animal Welfare Slaughter Regulation). For fattening pigs of regular size, a flow rate of 1.3 amps is required when using rectangular and sinusoidal alternating streams of 50 to 100 Hz. For heavy pigs (old sows, boars), these current strengths may not be sufficient. For the electrical stunning of heavy pigs, higher electrical currents (at least 2 amps within 1 second) and stunning tongs with an extra-wide opening angle are therefore required. For correct electrode positioning during manual electrical stunning, the animal must be securely restrained. The tongs must not slip; particular care must be taken to ensure this when the animal collapses. Only persons with sufficient expertise and experience should perform manual electrical stunning. To ensure that the current required for stunning is achieved, the electrical contact resistance between the animal and the electrodes can be reduced by moistening the skin. However, distress during moistening of the pigs' skin should be minimised. Daily cleaning and maintenance of the stunning equipment is extremely important. Dirt deposits on the electrodes have an insulating effect and reduce the flow of current. The electrodes must be cleaned of deposits with a brush at least once a day, or several times a day if slaughter numbers are high and contamination is severe.



The devices must also be checked regularly by an electrician. This can be done using a resistor connected between the electrodes, which has a resistance similar to that of a pig's head (150-200 ohms). Broken cables or damaged insulation can lead to shunt circuits. It is essential to check this, as although the device displays the correct current levels, only part of the current flows through the animal's body and the current level required for stunning may therefore not reached (Schütt-Abraham, 2002).

Best Practices for electrical stunning

- **Approved stunning devices** must be used which display and record the key electrical parameters for each stunned animal. The key parameters are: minimum current (in A or mA), minimum voltage (in V), maximum frequency (in Hz), minimum exposure time. The display must be within the direct field of vision of the person performing the stunning. The devices must emit clearly visible and audible warning signals if the duration of the electrical current is below the required time.
- Only persons with **professional knowledge and sufficient experience** are permitted to perform electrical stunning.
- Use a **minimum current of 1.3A.**
- For pigs that are heavier than normal fattening pigs (sows, boars > 130 kg), **sufficient current strengths** must be ensured (at least 260 volts (50 Hz) and currents of 1.8–2.0 amps). This must be checked. In addition, sufficiently large stunning tongs must be used for manual stunning.
- **The required current must be reached within one second**.
- Use **low frequencies** (100Hz for the head, 50Hz for the heart).
- The electrical contact resistance between the animal and the electrodes should be reduced by **moistening the skin**. Only the areas of the pig's body should be moistened where the electrodes of the stunning tongs will be applied. Warm water at a temperature of around 40–42 °C should be used.
- The **stunning area** must be kept **dry** to prevent stray currents. **Non-slip flooring and good drainage** are necessary.
- The electrodes must be **cleaned at least once a day**, or several times a day if slaughter numbers are high and contamination is severe.
- The devices must also be **checked for functioning every day and regularly by an electrician**. The output current must be controlled. In addition, the devices must be checked for damage that could cause disruptions in the flow of current.
- **Automatic monitoring systems** (e.g. AI-monitoring) for stunning efficacy are recommended to ensure a standardised procedure for each pig.



4.1.1 Head-only electrical stunning

Factual background

Head-only electrical stunning is a reversible procedure and the duration of unconsciousness after stunning is short. The pigs must therefore be bled immediately after the end of the stunning procedure, unless an additional electrical current is applied to the heart to induce ventricular fibrillation. Head-only electrical stunning is not recommended as the optimal method. The head/heart method is a better option, as it is irreversible and the animal does not regain consciousness. To ensure that the animal does not regain consciousness during bleeding when applying the head- only stunning, it is recommended that the animal is bled within 15 seconds (Vogel et al., 2011). The following specific time periods are required based on EU Regulation 1099/2009 to prevent regaining consciousness:

- Hanging bleeding: The bleeding cut must take place within a maximum of 20 seconds after the end of stunning.
- Recumbent bleeding: Bleeding must take place within a maximum of 10 seconds.

To achieve an effective electrical stunning, it is important to place the electrical tongs in such a way that the brain lies at the shortest connecting line between the electrodes (Anil and McKinstry, 1998). It is of crucial importance to monitor correct placement of the electrodes. The most suitable location for the electrodes is on both sides of the temples between the eye and ear. Placement on both sides at the base of the ear is also acceptable, but placement on the animal's neck or throat is strictly prohibited.

Best Practices for head-only electrical stunning

- The animal must be **securely restrained**. However, fear, struggling and pressure should be minimised as much as possible. Escape possibilities can be minimised by locating the animal in a small pen.
- To ensure that the tongs can be applied safely, the pig's movement should be restricted, e.g. by means of a driving board or an assisting person.
- The person performing the stunning should stand behind the pig so that it cannot escape backwards.
- Use **certified stunning devices** for head-only electrical stunning.
- The **electrodes** should be placed on both sides of the temples **between the eye and base of the ear**. Never place them behind the ears.
- **The tongs must be held firmly** in the hands, and the person executing the stunning must be in a secure, stable position. They must be prepared for the animal to collapse and the tongs to slip. The tongs must be held firmly in position, even if the animal changes position or falls over - however, the pressure should not be so high that it causes pain to the animal.



- Care must be taken to ensure that the **current is applied for at least 4 seconds** and that the tongs do not slip out of the optimal position during this time.
- Carefully **check whether the stunning is effective** and the animal has lost consciousness. Use the criteria listed below for this purpose.
- The process must proceed swiftly to the next step of bleeding. Maximum time between stunning and bleeding: bleeding lying down: 10s, bleeding hoisted on rail: 20s
- **Give feedback to staff** that is responsible for stunning, especially positive feedback when stunning has been correctly executed.

4.1.2 Head/heart electrical stunning

Factual background

The head/heart method with ventricular fibrillation is an irreversible stunning method. It leads to the death of the animal even without exsanguination and is therefore also approved as a method of killing animals. The effect of electricity on the brain leads to unconsciousness and insensibility, while its effect on the heart leads to ventricular fibrillation. Since exposure to electric current that does not immediately cause unconsciousness is very painful, the flow of current through the heart may only occur immediately after the flow through the brain, or at least simultaneously (German Animal Welfare Slaughter Regulation).
The head/heart method is the preferred method for animal welfare. It should always be used (also with automatic anaesthesia systems) and whenever high-frequency alternating currents (300 to >1000 Hz) are applied. Head stunning with high-frequency currents can lead to a shortened stunning effect; therefore, subsequent triggering of ventricular fibrillation is necessary. The cardiac current should have a frequency of 50 to a maximum of 100 Hz. The heart must be exposed to the electrical current for at least 3 seconds.

Best Practices for head/heart electrical stunning

- **Head/heart electrical stunning is preferable to head-only electrical stunning.**
- The brain must always receive the electrical stimulus first, or at least simultaneously with the heart. Consciousness must be lost due to the effect of the current on the brain so that no pain is felt when the current is applied to the heart. **Never use heart stunning when pigs are still conscious.**
- The **required current strengths** must be ensured, be **reached within one second** and should **maintained for 4 seconds at the head and preferably longer at the heart**. The tongs must be large enough to reach the brain and heart.



- Immediately after the head has been stunned (while the animal is unconscious), **one electrode is left on the head,** and the **second electrode is placed behind the elbow** on the chest (at heart level).
- Use **certified stunning devices** for head/heart stunning. These emit an **audible signal** when the duration of head exposure has been sufficient and electrical stimulation of the heart can begin. They also signal when the electrical stimulation of the heart has been sufficiently long.
- **Automatic stunning devices** are preferable to manual methods, as they allow for a standardised stunning procedure.
- Carefully **check whether the stunning is effective** and the animal has lost consciousness. Use the criteria listed below for this purpose.
- **Give feedback to staff** that is responsible for stunning, especially positive feedback when stunning has been correctly executed.



4.1.3 Signs of effective electrical stunning

Monitoring stunning efficacy is a crucial factor for animal welfare. Effective electrical stunning is indicated by the following signs:

- Collapse of the animal
- Rigid posture (tonic phase): front legs stretched out, hind legs drawn up and fixed in place
- Tonic phase (approx. 10-20 seconds), followed by clonic phase with uncoordinated paddling movements of the legs (applies to alternating currents of 50-100 Hz)
- Respiratory arrest
- No vocalisation
- Upward rotation of the eyes, no directed eye movements, dilated pupils
- No attempts to stand up or directed body movements
- No corneal reflex (testing eye blink from touch with a tong)
- No pain reflex (nose twitching after stimulus with a tong)
- Pupils are not reactive to light
- Complete relaxation of the animal's body and absence of pulse (only for head/heart electrical stunning)

A pig is ineffectively stunned in case of at least one of the following observations: vocalisation, positive righting reflex, natural blinking, regular breathing or resumption of breathing with four or more breaths, atypical convulsive behaviour, directed eye movements, constricted pupils. **Pigs that show these signs need to be re-stunned immediately!**



4.2 CO_2-Stunning

Factual background

Carbon dioxide stunning is comparable to inhalation anaesthesia using pharmaceutical anaesthetics. The duration of anaesthesia depends on the CO_2 concentration and the time spent in the CO_2 atmosphere. Exposure of pigs to a CO_2 atmosphere leads to an increase in the concentration of H+ ions in the blood ($CO_2 + H_2O \Rightarrow H_2CO_3 \Rightarrow H+ + HCO_3-$), which results in increased ventilation. The decrease in intracellular pH also affects nerve cell function. The increased ventilation as a result of a feeling of breathlessness is hardly caused by a lack of oxygen, but more by high concentration of CO_2 in the blood and its effect on the respiratory centre. The anaesthetic effect of CO_2 does not set in immediately, meaning that the animals are exposed to stress, particularly respiratory distress, for a period of approximately 10 to 20 seconds. Muscle cramps often occur during CO_2 exposure. Whether the animals are already insensitive at the onset of these excitements has long been debated and remains uncertain to date. Systems for CO_2 stunning use the higher specific weight of CO_2 compared to air. The pigs are lowered in lift-like gondolas into a pit filled with a mixture of CO_2 (> 80%) and air. In so-called backloader systems, the pigs are driven into a gondola in groups of 4 to 5 animals. Stunning pigs in groups is intended to reduce stress levels in the animals as it eliminates the need of restraining pigs. While CO_2 stunning addresses key welfare issues related to restraint and group handling, a high stress potential remains due to the feeling of breathlessness and the slow onset of anaesthesia. In addition, it must be ensured that even the last animal in the gondola is bled quickly enough before it regains consciousness. Therefore, there must be no delays in the process and accurate, continuous monitoring is essential. The stunning of pigs with CO_2 is reversible, meaning that the animals can regain consciousness, if they are not bled within 20 seconds. **Due to the potential stress associated with CO_2 stunning, head/heart electrical stunning is, when appropriately applied, preferable to CO_2 stunning.**

Best Practices for CO_2 stunning

- **The pigs must be driven into the gondolas in groups**. Each gondola must be loaded with at least two pigs, but overcrowding should also be avoided. A pig must never be placed alone in a gondola.
- **Enough space** must be provided in the gondola. Pigs must be able to **stand upright on solid ground** without their thorax being constricted. All pigs in the gondola should be **able to lie down** (at least 0.5m^2 per pig).
- **Pigs having lung problems** (signs: coughing, sitting dog-like, breathing with difficulty) **should not be stunned with CO_2**; emergency killing with electric tongs or captive bolt stunner instead.
- A **minimum CO_2 concentration of 80%** must be used, however a **CO_2 concentration of 90-95% is recommended.**



- The **required CO_2 concentration must be reached no later than 30 seconds** after the pigs are introduced into the stunning system (the gondola must reach its first stop with the required CO_2 concentration within a maximum of 30 seconds).
- The gas mixture should be **body-warm and humidified**, reducing discomfort and fear.
- Each pig must remain in the required CO_2 concentration for **at least 100 seconds.**
- The CO_2 concentration must be **continuously measured and recorded**.
- The **duration of the animals' exposure to the CO_2 atmosphere must be monitored**, at least on a random basis every 2 hours, or preferably continuously using **automated monitoring systems.**
- It must be ensured that the **maximum time interval between stunning and bleeding is strictly adhered to**, even for the pig that leaves the gondola last.

4.2.1 Signs of effective CO_2 stunning

Effective CO_2 stunning is indicated by the following signs:

- Collapse of the animal
- No body movement, relaxed muscles
- Animal does not breathe
- No vocalisation
- Eyes are fixed, no direct eye movement
- Pupils are dilated
- No blink, corneal or pupillary reflex
- No pain reflex (nose twitching after stimulus with a tong)

A pig is ineffectively stunned in case of at least one of the following observations: rhythmic breathing, blinking (spontaneous or through palpebral reflex), deliberate or rhythmic eye movements, narrow pupils or movement of pupils, vocalisation, attempts to stand up, movements of the head and body or directed movements of the legs or angling of the legs.
Pigs that show these signs need to be re-stunned immediately!



5 Sticking and exsanguination

Factual background

Exsanguination is an important part of the slaughter process, as it leads to the death of the previously stunned animal. Immediate and effective blood withdrawal is crucial for animal welfare. It is essential to prevent pigs from regaining consciousness. Rapid blood loss leads to a sharp drop in blood pressure and, as a result, to a failure of brain functions due to cerebral ischemia. The amount of blood loss per unit of time influences the time until brain death occurs due to ischemia. The speed of blood loss depends primarily on the correct execution of the bleeding cut (Meiler, 2006). Under optimal conditions, a bleeding time of 25 seconds is required until the animal dies (EFSA Scientific Panel on Animal Health and Welfare, 2004). In pigs, bleeding is usually carried out manually, so that responsibility lies with the person performing this procedure, who must have the necessary expertise and experience. To ensure animal welfare, monitoring of the bleeding process is essential. The effectiveness of blood loss can be monitored by measuring the amount of blood drawn. Automated systems can also be used for this purpose. To prevent the animal from regaining consciousness, 3 to 4 litres of blood must be drawn from a pig weighing 100 kg within 20 seconds. For pigs weighing 25 kg or more, a heart puncture should be performed. Correct execution of the heart puncture results in severing of the brachiocephalic trunk and the left subclavian artery just above their branch from the aortic arch (Meiler, 2006). It is essential that the large blood vessels near the heart are severed safely. The blood must flow out in a gush, and the bleeding must be controllable (DLG, 2018).

The examination of sensory and perceptual abilities after exsanguination is carried out in the same way as the assessment of the effectiveness of stunning, preferably based on the absence of reflexes. Brain death is characterized by the loss of all brain stem reflexes and a loss of muscle tone. The cessation of cardiac activity and lack of response to painful stimuli alone are not reliable signs of death (Meiler, 2006).

Death should be determined based on the following characteristics:

- Pupils are permanently dilated
- Absence of corneal and eyelid reflexes
- Permanent absence of respiratory movements
- Relaxation of skeletal muscles
- Cessation of cardiac activity

Affected welfare domains: Health, Mental state

Affected AWI (related to the aWISH project): Vocalisation, Corneal and eyelid reflex



Best Practices for sticking and exsanguination

- **Before bleeding, it must be checked that the animals are properly stunned and unconscious.**
- There must be no delays after stunning (risk of recovery) → **execute bleeding immediately after stunning.**
- **Max. time between stunning and bleeding:**
  electrical stunning, bleeding lying down: 10s
  electrical stunning, bleeding hoisted on rail: 20s
  CO_2 stunning: 20s (after leaving gondola) or 30s (after last stop in CO_2 atmosphere) or according to exceptional authorisation
- The bleeding process should be **continuously monitored**; Slaughterhouses should use a **bleeding measurement device** for amount of blood and immediate gush of blood.
- Stick pigs on a **horizontal conveyor belt** to keep time between stunning and bleeding short.
- Stay as close to the stunning area as possible.
- Use **sharp knives** that are long enough to reach the brachiocephalic trunk.
- Stick pigs **at the base of the neck**, 2 – 3 fingers head wards from the breastbone **in the direction of the opposite shoulder blade** or towards the tail or aim towards the heart.
- After inserting the knife, **move it diagonally to cut blood vessels** close to the heart; do not do this when using a hollow knife!
- **Stick swiftly and accurately.**
- When sticking animals while they are lying down, take their upper front limb and move it upwards.
- **Incision should be large enough to have blood profusely leaving the body**; when done correctly, a lot of blood should gush out.
- If blood is not gushing out, **restick immediately** → same way as before, thrusting knife into chest, possibly enlarging the opening.
- **Look for signs of death before moving animals to scalding**: permanent absence of breathing, no muscle tone, ceased bleeding, dilated pupils.
- **Give feedback to staff** that is responsible for bleeding, especially positive feedback when bleeding has been correctly executed.

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