

Chapter 7.5 – ANIMAL WELFARE DURING SLAUGHTER

Restraint, stunning and bleeding

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Content

- Free moving animals (ruminants, camelids, equids and pigs)
- Animals in containers (most poultry species and rabbits)
 - ✓ Animal welfare concerns
 - ✓ Animal-based and other measures
 - ✓ Recommendations
 - ✓ Species-specific recommendations

Restraint for stunning or bleeding

➤ To facilitate the correct application of the stunning or bleeding equipment.

1. Animal welfare concerns

- ✓ Incorrect restraint leads to ineffective stunning or bleeding, but also cause distress, fear and pain.
- ✓ **Hazards include:**
 - a) slippery restraining area;
 - b) insecure restraint;
 - c) excessive force of restraint;
 - d) Not appropriate to the size of the animal;
 - e) prolonged restraint



Slaughter without stunning increases the risk of *pain* and fear due to the need for robust *restraint* of conscious animals for neck cutting, especially if animals are turned on their sides or backs.

Restraint for stunning or bleeding

2. Animal-based and other measures

- a) Animal slipping or falling;
- b) Struggling;
- c) Escape attempts;
- d) Animal vocalisation;
- e) Reluctance to enter the restrainer;
- f) Use of electric goads.



Restraint for stunning or bleeding

3. Recommendations

- ✓ **Narrow enough** that the animals cannot move backward, forward or turn around.
- ✓ **Not sharp edges** and well maintained to minimise risk of injury.
- ✓ Avoid flooring design and handling methods that cause loss of balance, slipping or falling.
- ✓ Improve ease of entry and minimize distractions.
- ✓ No animal should enter the restrainer until equipment and personnel are ready to stun and slaughter that animal.
- ✓ No animal should be released from the restrainer until the operator has confirmed loss of consciousness.
- ✓ Animals should not be left in single file races or restrainers during work breaks, and in the event of a breakdown animals should be removed from the restrainer promptly.



General principles for stunning

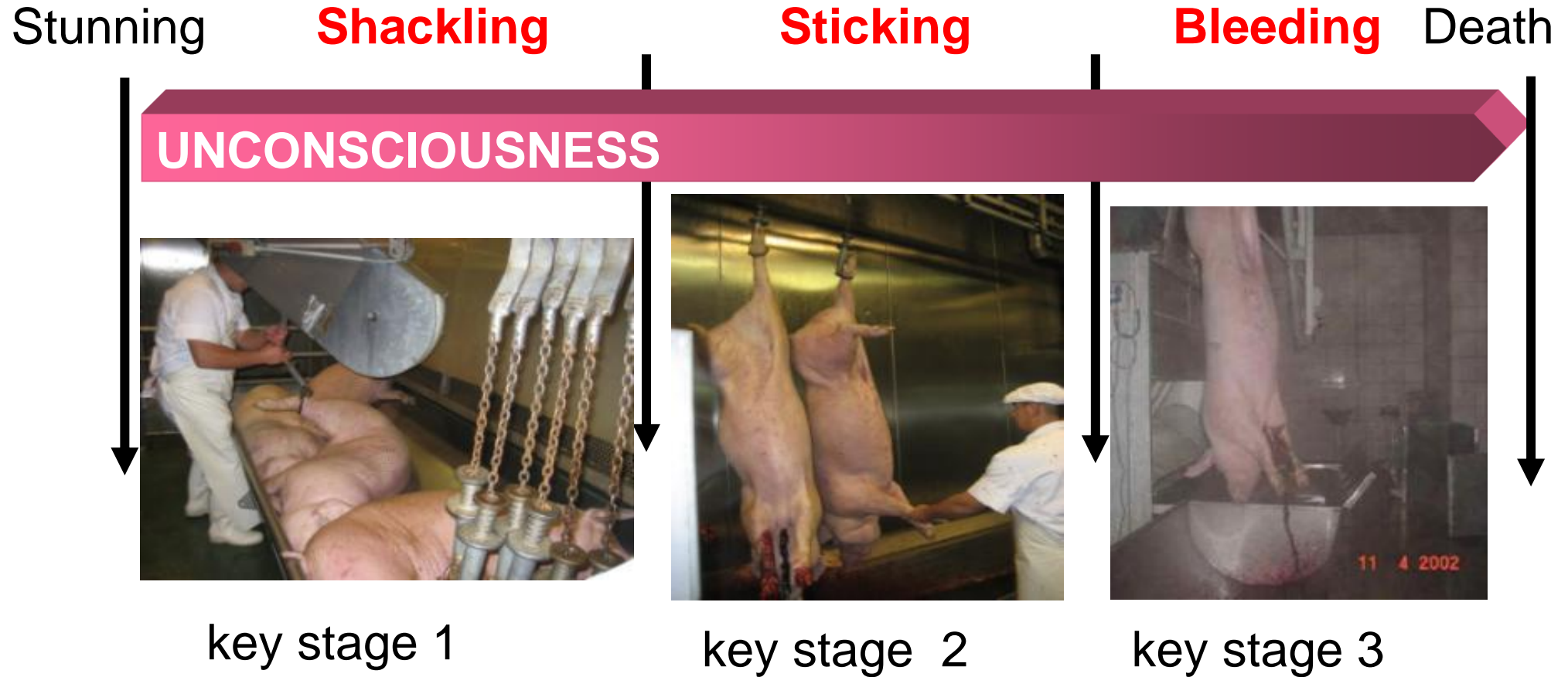
- Prevents distress, fear and pain to animals during neck cutting and bleeding
- The most common methods are mechanical, electrical and exposure to controlled atmosphere.

1. Animal welfare concerns

- ✓ 'Ineffective stunning' results in distress, fear and pain, during induction of unconsciousness and possible recovery before death.
- ✓ Animals should only be stunned using stunning methods that have been scientifically validated as effective for stunning that species.

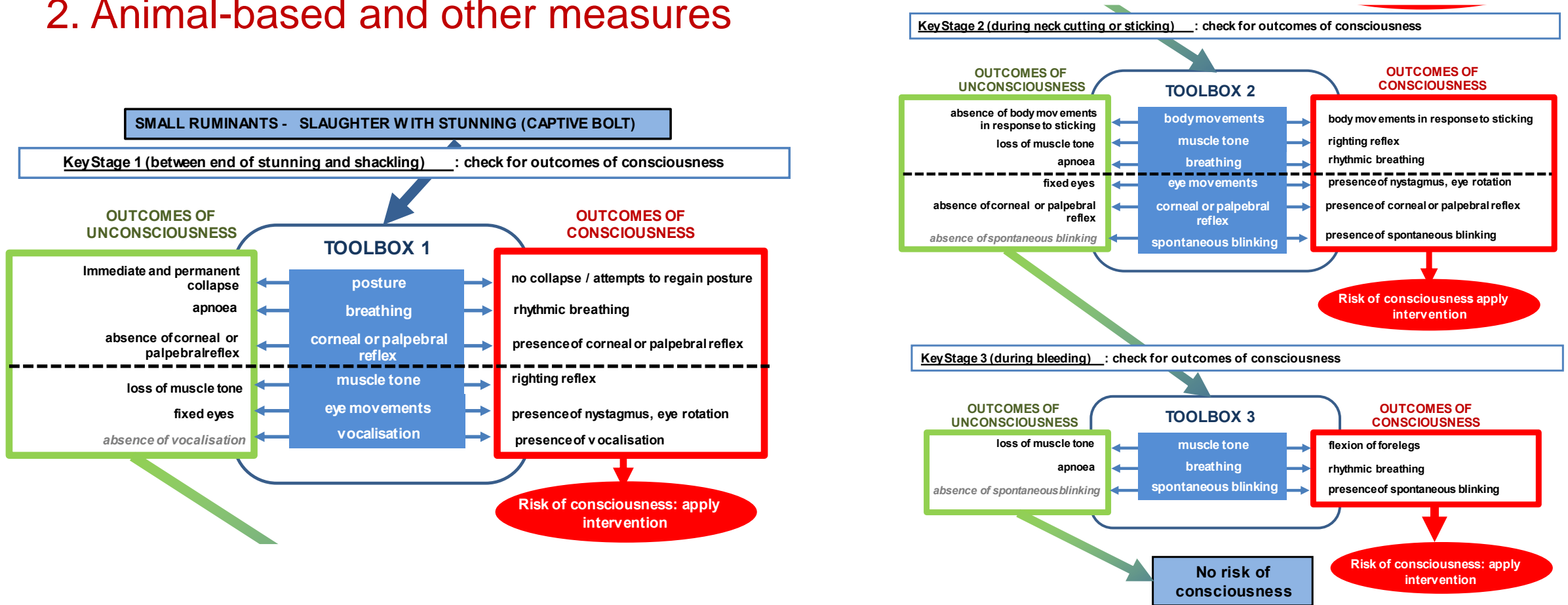


Assessment of the state of consciousness



General principles for stunning

2. Animal-based and other measures



General principles for stunning

3. Recommendations

- ✓ Be stunned as soon as they are restrained.
- ✓ Ineffective stunning or recovery:
 - Re-stun immediately using a backup method
 - Systematically recorded and the cause of the failure identified and rectified
- ✓ Stunning equipment should be used, cleaned, maintained and stored following manufacturer's recommendations.
- ✓ Regular calibration
- ✓ Standard operating procedures

Mechanical stunning

1. Animal welfare concerns

- ✓ Ineffective stunning or short-lasting unconsciousness.
- ✓ Main hazards are incorrect shooting position and incorrect direction of the impact.
 - Absence of or incorrect restraint
 - Poor maintenance of the equipment or inadequate cartridge power or air line pressure
 - Inappropriate use of cartridge, narrow bolt diameter or short length of bolt
 - Animals with thicker skull
 - Fracture of the skull

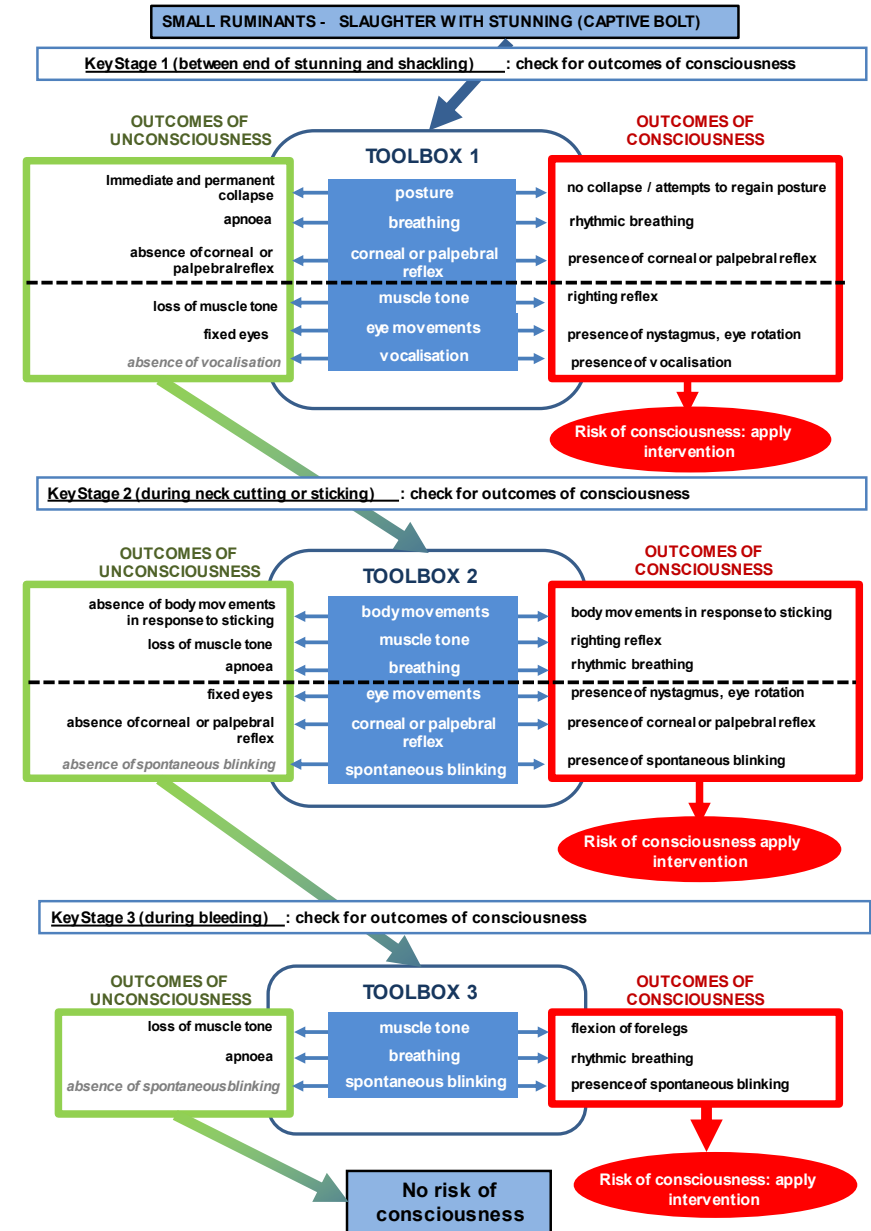


Mechanical stunning

2. Animal-based and other measures

✓ **Effective stun:** immediate collapse; apnoea; tonic-clonic seizure; absence of corneal or palpebral reflex; absence of eye movements.

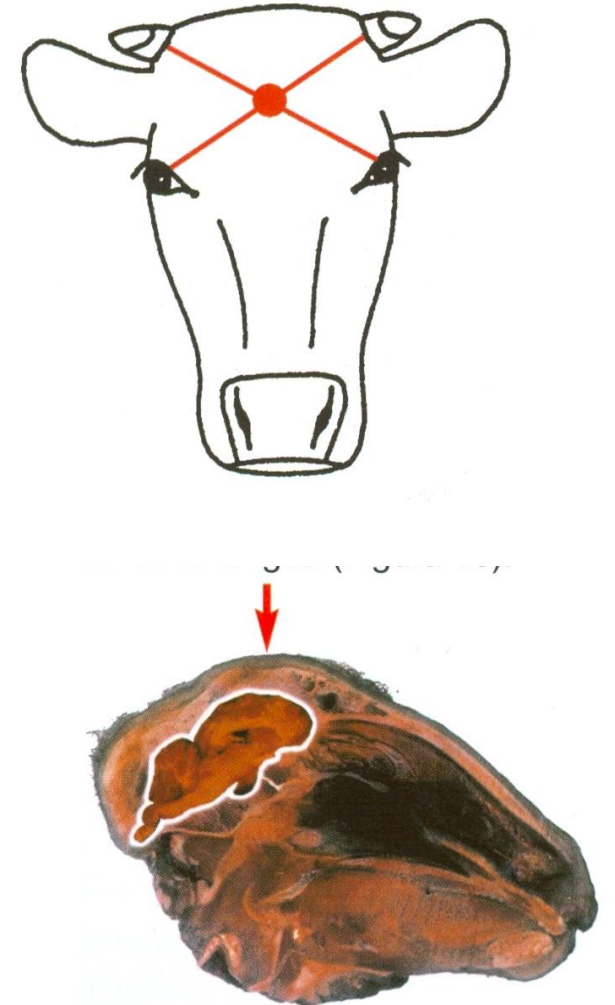
✓ **Ineffective stun or recovery of consciousness:** absence of collapse or attempts to regain posture; rapid eye movement or nystagmus; vocalisation; spontaneous blinking; righting reflex; presence of corneal or palpebral reflex; rhythmic breathing.



Mechanical stunning

3. Recommendations

- ✓ SOP with key operating parameters for the species and age group:
 - grain of the cartridge or air pressure (captive bolt);
 - calibre and type of gun and ammunition (free bullet);
 - length and diameter of the penetrating bolt;
 - shape and diameter of the non-penetrating bolt;
 - position and direction of the shot.



Electrical stunning

- Electric current across the brain of sufficient magnitude to induce immediate unconsciousness.

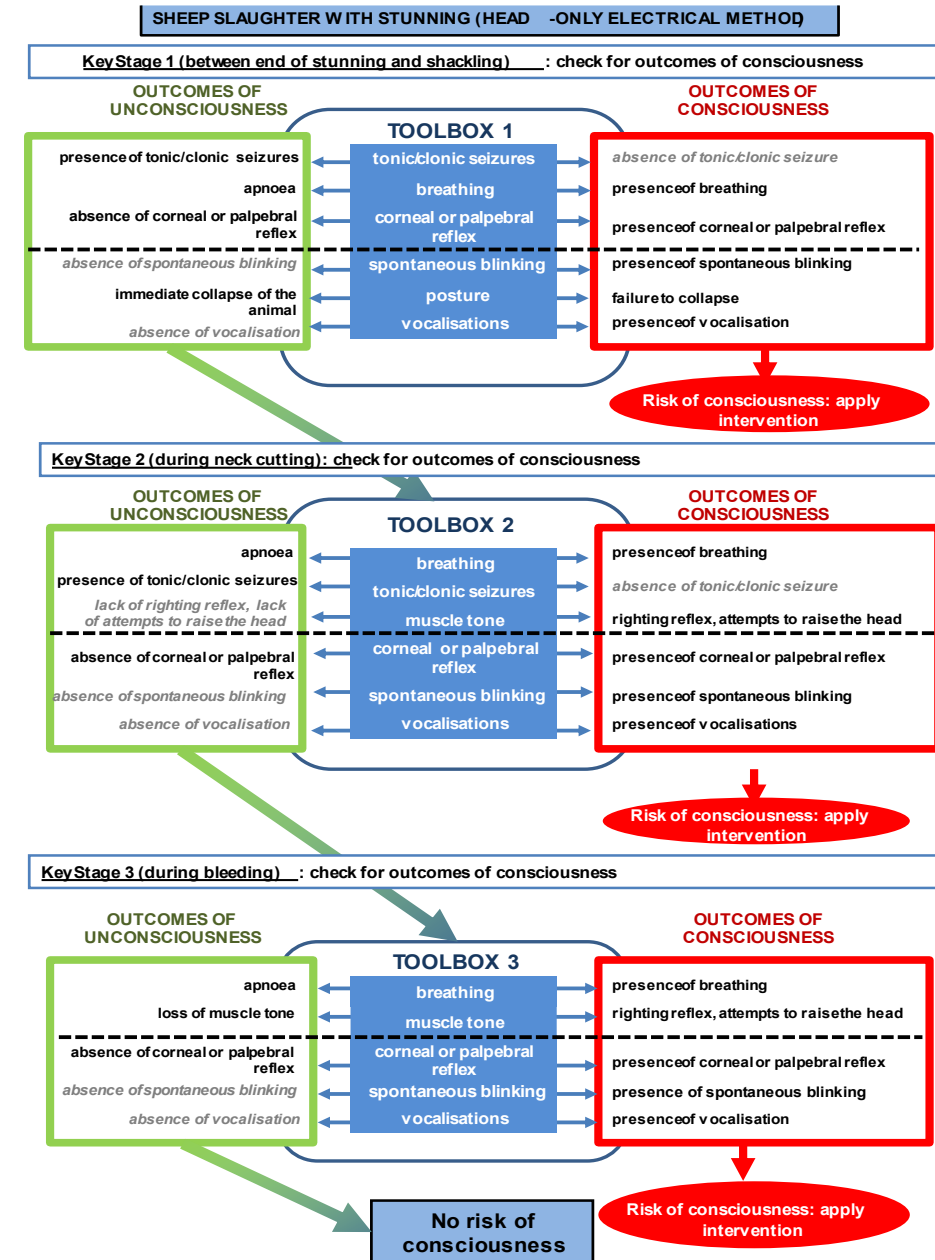
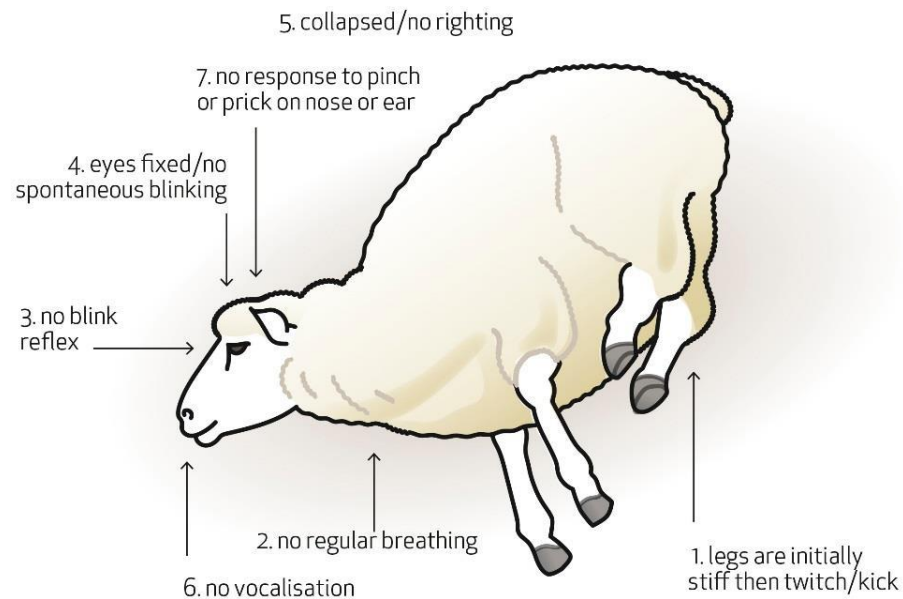
1. Animal welfare concerns

- ✓ Main hazards are:
 - Incorrect electrode placement
 - Poor contact
 - High contact resistance (e.g wool or dirt)
 - Dirty or corroded electrode
 - Low voltage/current or high electrical frequency.



Electrical stunning

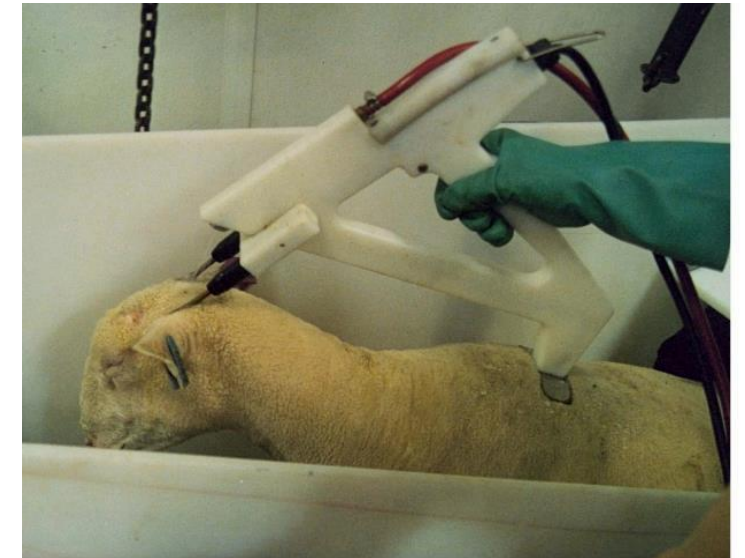
2. Animal-based and other measures



Electrical stunning

3. Recommendations

- ✓ In **head to body electrical stun-kill method**, electrical current to the brain before it reaches the heart.
- ✓ shape, size and placement of the electrodes;
- ✓ contact between electrode and head;
- ✓ moisten point of contact;
- ✓ minimum exposure time;
- ✓ maximum stun to stick interval;
- ✓ visual or auditory warning system
- ✓ electrical parameters (current intensity [A], waveform type [AC and DC], voltage [V] and frequency [Hz]);
 - 1.15 to 1.28 A for bovines,
 - 1.25 A for finished pigs,
 - 1.8 A for sows and boars,
 - 1 A for small ruminants.

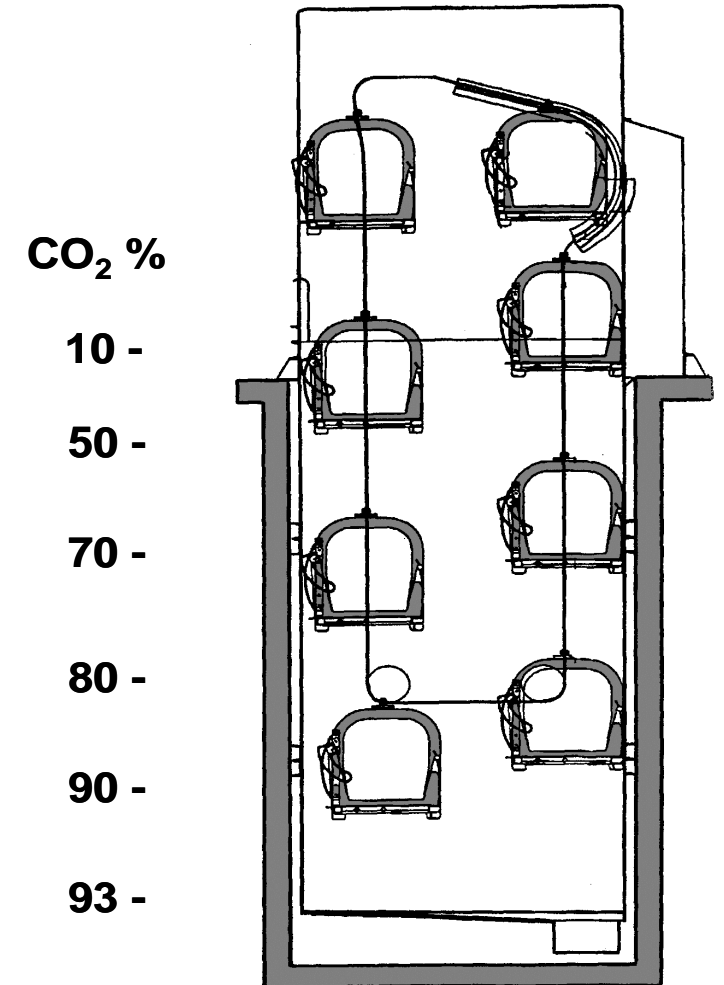


Controlled atmosphere stunning

- High concentrations of CO₂ (hypercapnia)
- Low concentration of oxygen (hypoxia)
- Combination of the two (hypercapnic hypoxia).

1. Animal welfare concerns

- ✓ Loss of consciousness not immediate
- ✓ The main hazards:
 - ✓ Irritant or aversive gas mixtures
 - ✓ Low gas temperature and humidity
 - ✓ Overloading of the gondola.
 - ✓ Incorrect gas concentration
 - ✓ Too short gas exposure time.



Controlled atmosphere stunning

2. Animal-based and other measures

- **Effective stun:** loss of posture; apnoea; absence of corneal or palpebral reflex; absence of muscle tone.
- **Ineffective stun or recovery of consciousness:** vocalisation; spontaneous blinking; righting reflex; presence of corneal or palpebral reflex; rhythmic breathing.

Controlled atmosphere stunning

3. Recommendations

- gas concentrations and exposure time;
- temperature and humidity;
- stocking density of the gondola or restraint for pigs;
- visual or auditory warning system.
- animal-based measures should be monitored during the induction phase



4. Species-specific recommendations

Pigs:

- Gases or gas mixtures that are painful to inhale should not be used.



Bleeding

1. Animal welfare concerns

- Recovery of consciousness.
- Loss of consciousness due to bleeding is not immediate
- Animals experience fear, pain and distress.
- This period will be reduced by applying stunning immediately after neck cutting.
- Absence of or ineffective stunning may result in animals being released from the restraint, shackled, and bled and/or further processed while they are still conscious or have the potential to recover consciousness.



Bleeding

2. Animal-based and other measures

- Blood flow (rate and duration).
- **In cases of bleeding without stunning:** absence of muscle tone; absence of corneal or palpebral reflex; absence of rhythmic breathing.
- Unconsciousness should be reassessed until death is confirmed.
- Cessation of bleeding after a continuous and rapid blood flow can be used as an indicator of death.



Bleeding

3. Recommendations

- a) Sever both carotid arteries or the blood vessels from which they arise should be severed;
- b) Assure continuous and rapid blood flow;
- c) death should be assured before further processing;
- d) bleeding knives should be sharpened for each animal

Slaughter with stunning:

- a) Short stun-to-stick interval
- b) unconsciousness should be confirmed before bleeding;

Slaughter without stunning:

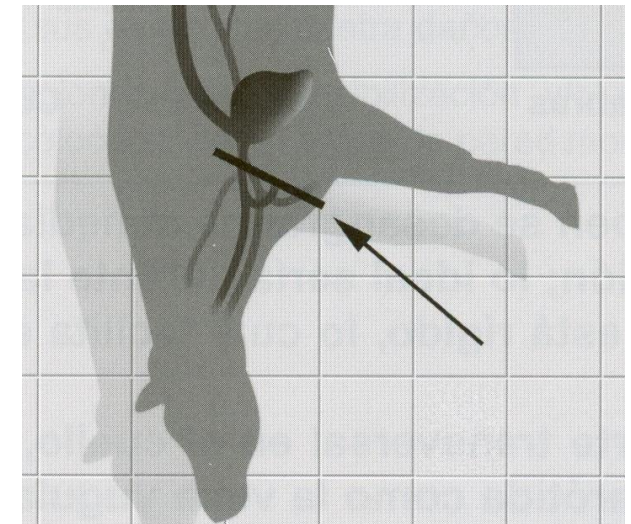
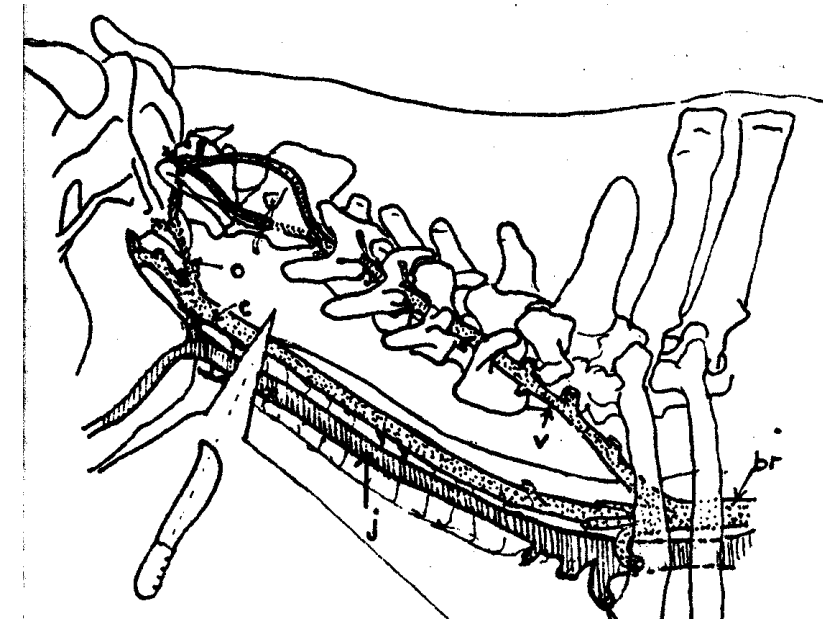
- a) bleeding by a single incision; any second intervention should be recorded and analysed
- b) further processing may only be carried out when the death of the animal has been ascertained.



Bleeding

4. Species-specific recommendations

- ✓ Bovines are at risk of prolonged bleed
- ✓ The vertebral arteries will continue to provide blood to the brain.
- ✓ Furthermore, any occlusion of the cut major arteries will slow exsanguination.
- ✓ Therefore, bleeding with a cut of the brachiocephalic trunk should be preferred in bovines.



Slaughter of pregnant animals

1. Animal welfare concerns

- Fetuses in the uterus are considered not to achieve consciousness.
- However, if removed from the uterus the fetus may perceive pain or other negative effects.

2. Animal-based and other measures

- Signs of consciousness in the neonate after removal from the uterus, such as breathing.

3. Recommendations

- The fetus should be left undisturbed in utero for at least 30 minutes after the death of the dam.
- The uterus could be removed as a whole, clamped and kept intact such that there is no possibility for the fetus to breathe.
- In cases where the fetus is removed before 30 minutes has elapsed euthanasia should be carried out immediately.

Emergency killing

1. Animal welfare concerns

- Animals that arrive with injuries or severe illnesses that can cause distress, pain and suffering.

2. Animal-based and other measures

- Unable to walk independently
- Severe injuries such as fractures, large open wounds, or prolapses.
- Clinical signs of serious illness
- Extreme weakness.
- New-born animals
- Animals that gave birth within the last 48 hours



Emergency killing

3. Recommendations

- Animals should not be moved
- Euthanise the animal as soon as possible.
- Systematically recorded and analysed



Restraint for stunning or bleeding

1. Animal welfare concerns

- a) Inversion provokes compression of the heart and lungs or air sacs by the viscera and compromises breathing and cardiac activity.
- b) During shackling, birds are subjected to compression of their legs and wing flapping by their neighbour
- c) Inappropriate shackling (e.g. shackles are too narrow or too wide, animals are shackled by one leg, or when one animal is shackled on two different adjacent shackles)
- d) Drops, curves and inclination of the shackle line or high speed of the shackle line



Restraint for stunning or bleeding

2. Animal-based and other measures

- a) Wing flapping for birds;
- b) escape attempts;
- c) animal vocalisation indicative of *distress*;
- d) injuries;
- e) respiratory distress.



Restraint for stunning or bleeding

3. Recommendations

- ✓ Avoid handling, shackling and inversion of conscious animals.
- ✓ Handle and restrain to minimise struggling or attempts to escape.
- ✓ Shackle lines should be constructed and maintained so they do not jolt animals
- ✓ Shackle line speeds should be optimised.
- ✓ Shackling duration prior to stunning should be kept to a minimum.
- ✓ Breast support from the shackling point up to the stunner.
- ✓ Inappropriate shackling can be prevented by the appropriate training of relevant staff, by rotating the staff to avoid boredom and fatigue and by using shackles that are appropriate and adjustable for the species and size of the animals.



Restraint for stunning or bleeding

4. Species-specific recommendations

Rabbits:

- ✓ *Restraining* for head-only electrical *stunning* is manual and involves holding the rabbit with one hand supporting its belly, and the other hand guiding the head into the stunning tongs or electrodes.
- ✓ Rabbits should not be lifted or carried by the ears, head, hair or, one leg, or by the skin at the back of the neck without supporting the body.

Poultry:

- ✓ Shackling of heavy birds are more susceptible to fractures
- ✓ Poultry should not be lifted or carried by the head, neck, wings or one leg.



Head-only electrical stunning

- ✓ Electrical stunning involves application of an electric current across the brain of sufficient magnitude to induce immediate unconsciousness.

1. Animal welfare concerns

The main hazards:

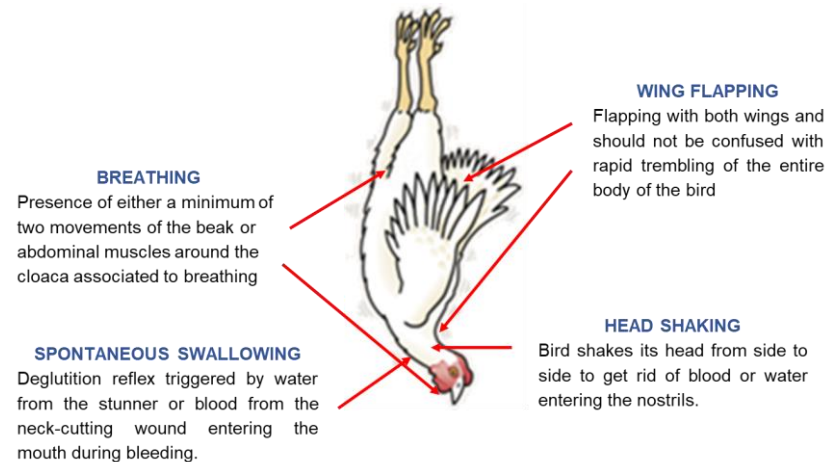
- Incorrect electrode placement,
- poor contact,
- dirty or corroded electrode,
- high contact resistance caused by hair and feathers
- dirt on the animal surface
- inappropriate electrical parameters (low voltage/current or high frequency).



Head-only electrical stunning

2. Animal-based and other measures

- **Effective stun:** tonic-clonic seizures; apnoea; absence of corneal or palpebral reflex.
- **Ineffective stun or recovery are:** vocalisation; spontaneous blinking; righting reflex; presence of corneal or palpebral reflex; rhythmic breathing; spontaneous swallowing and head shaking.



<https://www.eurcaw-poultry-sfa.eu/en/minisite/sfawc/webinar-assessment-consciousness-after-waterbath-stunning-broiler-chicken-0>

Head-only electrical stunning

3. Specie-specific recommendations

- ✓ Effective electrical parameters determined based on scientific data
- ✓ For head-only stunning, minimum parameters are recommended for the following species:
 - ✓ 240 mA for hens and broiler chicken,
 - ✓ 400 mA for turkeys,
 - ✓ 600 mA for geese and ducks,
 - ✓ 140 mA for rabbits (100V of a 50 Hz sine wave AC).

Electrical water-bath stunning

1. Animal welfare concerns

- Inverted and shackled by the legs
- Lack of contact between head and water,
- Differences in individual bird resistance,
- Improper system grounding,
- Pre-stun shocks
- Inappropriate electrical parameters (low voltage/current or high frequency)

2. Animal-based and other measures

- Slipping, falling and piling up
- Animals with broken or injured limbs
- Turning-back, attempting to escape and or reluctant to move



Electrical water-bath stunning

3. Recommendations

- Optimum combination of voltage and frequency
- Contact between water and head, as well as between the legs and the leg shackle
- In the case of ineffective stunning or recovery, birds should be re-stunned immediately using a backup system and be killed immediately.

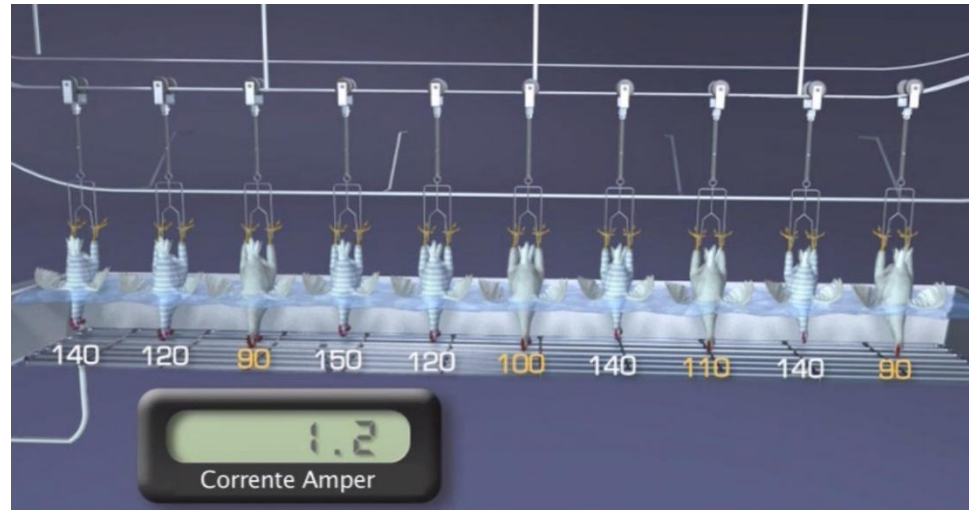
4. Species-specific recommendations

- Effective electrical parameters, should be based on scientific evidence for different types and species of birds.
- Recommended frequency and minimum parameters [EFSA, 2019]
- Ducks, geese and quails should not be stunned at frequencies higher than 200 Hz.
- Chicken and turkeys should not be stunned at frequencies higher than 600 Hz.



Electrical water-bath stunning

Frequency (Hz)	Chickens	Turkeys	Ducks & geese	quail
< 200 Hz	100 mA	250 mA	130 mA	45 mA
200 – 400 Hz	150 mA	400 mA	Not permitted	
400 – 600 Hz	200 mA	400 mA	Not permitted	

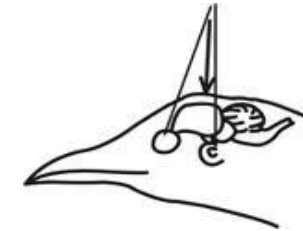


Mechanical stunning

➤ Penetrative and non-penetrative captive bolt:

1. Animal welfare concerns

- ✓ Requires precision and often physical strength to restrain and stun the animals.
- ✓ Common causes of the misapplication are a lack of proper skill and operator fatigue.
- ✓ Incorrect shooting position
- ✓ Incorrect captive bolt parameters (not hitting the skull with sufficient force)



Mechanical stunning

2. Animal-based and other measures

- ✓ Severe convulsions (wing flapping and leg kicking i.e. uncontrolled muscular movements)
- ✓ **Effective stun:** the absence of corneal or palpebral reflex; apnoea; loss of posture; presence of tonic-clonic seizure.
- ✓ **Ineffective stun or recovery:** vocalisation; spontaneous blinking; righting reflex; presence of corneal reflex or palpebral reflex; rhythmic breathing.

Mechanical stunning

3. Recommendations

- ✓ Only as backup, for small- throughput slaughtering or for emergency killing.
- ✓ Used, cleaned, maintained and stored following the manufacturer's recommendations.
- ✓ The power of the cartridge, compressed air line pressure or spring should be appropriate for the species and size of birds.
- ✓ Cartridges should be kept dry and the gun regularly inspected and maintained.
- ✓ Effectiveness of the stunning should be monitored.
- ✓ Proper restraint of the head of the animal.
- ✓ Restrained in a bleeding cone to contain wing flapping.
- ✓ Perpendicularly on the parietal bones of birds.

Mechanical stunning

3. Recommendations

Without comb:

- ✓ The placement of the device should be directly on the midline of the skull and at the highest/widest point of the head with the captive bolt aimed directly down towards the brain.

With comb:

- ✓ The placement of the device should be directly behind the comb and on the midline of the skull with the captive bolt aimed directly down towards the brain of the bird.

Rabbits:

- ✓ The device should be placed in the centre of the forehead, with the barrel in front of the ears and behind the eyes.
- ✓ The device should be discharged twice in rapid succession at the pressure recommended for the age and size of the rabbit.
- ✓ There should be a sufficient number of bolt guns such that they are allowed to cool between operations.

Controlled atmosphere stunning

- Animals are not subject to restraint: Directly in crates or after being unloaded on a conveyor belt.
- CO₂, inert gases, mixtures of carbon dioxide with inert gases or low atmosphere pressure (LAPS).

1. Animal welfare concerns

- Too short exposure time
- Too low concentration of gas
- Too high stocking density
- The duration of unconsciousness needs to be long enough to ensure that animals do not recover consciousness prior to being killed.
- Furthermore, hazards causing increased distress during induction of unconsciousness are irritant or aversive gas
- mixtures, low gas temperature and humidity. In the case of exposure to carbon dioxide, there is a risk that animals
- are exposed to too high a concentration of this gas, leading to pain and distress. Exposure of conscious animals

- to more than 40% carbon dioxide (CO₂) will cause painful stimulation of the nasal mucosa and

Controlled atmosphere stunning

1. Animal welfare concerns

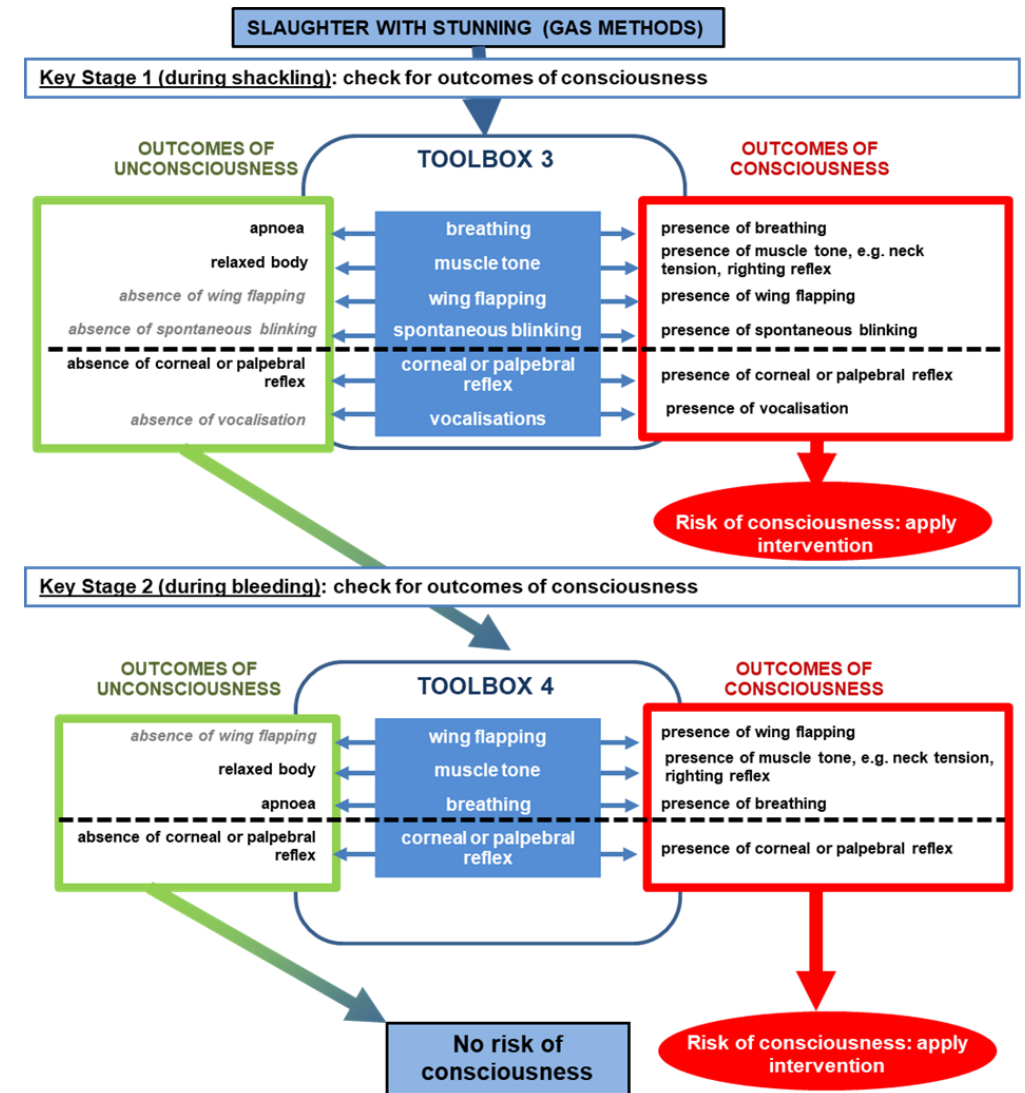
Hazards:

- Irritant or aversive gas mixtures
- Low gas temperature and humidity.
- Exposure of conscious animals to more than 40% CO₂ will cause painful stimulation of the nasal mucosa and aversive reactions.
- Low atmospheric pressure systems (LAPS) should not be confused with decompression:
 - LAPS utilise a slow removal of air here animals exhibit minimal to no aversive behaviours.
 - Decompression is a fast process that is associated with pain and respiratory distress.

Controlled atmosphere stunning

2. Animal-based and other measures

- Difficult to monitor because of limited access to observe animals during the stunning process.
- All chamber-type systems should have either windows or video cameras
- Unconsciousness is confirmed at the end of the exposure.
- Unconsciousness can be confirmed by apnoea, absence of corneal or palpebral reflex, dilated pupils and relaxed carcass.



Controlled atmosphere stunning

3. Recommendations

- Should not be exposed to carbon dioxide concentrations exceeding 40%.
- Compressed gas should also be vaporised prior to administration and humidified at room temperature.
- The duration of exposure and the gas concentration should render unconscious until death.
- Gas concentrations and exposure time, temperature and humidity should be monitored continuously.
- Visual and auditory warning system to alert the operator to improper function, such as inappropriate gas concentration or decompression rate.

Bleeding

3. Specie-specific recommendations

- For chicken, the slaughter line speed should allow a minimum bleeding period of 90 seconds so that there is minimum blood loss of 60% before reaching the scalding tank or other potentially painful operation;
- qualified personnel should check that at the bleeding line, especially before scalding, birds are completely dead.
- Birds that are still alive need to be euthanised immediately and removed from shackle.





World Organisation
for Animal Health
Founded as OIE

**Thank you for
your attention**

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