Annex 10

DRAFT CHAPTER 7.5.

ANIMAL WELFARE DURING SLAUGHTER

Introduction

Providing good welfare to animals at *slaughter* is ethically and economically beneficial. The implementation of *animal welfare* measures, in addition to giving value to the product directly for ethical reasons, contributes to the improvement of workers' wellbeing, health and safety. This will also contribute to food safety and product quality, and consequently to the improvement of economic returns [Blokhuis *et al.*, 2008; Lara and Rostagno, 2018].

Article 7.5.2.

Scope

This chapter identifies *hazards* to *animal welfare* during *slaughter* and provides recommendations for arrival and *unloading*, *lairage*, handling, *restraint*, *stunning* and bleeding of animals in *slaughterhouses/abattoirs*. It provides animal-based measures to assess the level of welfare and recommends remedial and corrective actions to be applied, when necessary.

This chapter applies to the *slaughter* in *slaughterhouses/abattoirs* of free-moving animals, such as ruminants, camelids, equids and pigs, and animals in *containers* such as rabbits and most *poultry* species. This chapter should be read in conjunction with the guiding principles for *animal welfare* provided in Chapter 7.1., Chapter 7.14. and with relevant provisions of Chapters 6.2. and 6.3.

Article 7.5.3.

Definition

For the purposes of this chapter:

Bleeding means the act of severing major blood vessels that supply the brain, to ensure death.

Article 7.5.4.

Hazards to animal welfare

*Hazards* to *animal welfare* during each of the pre-slaughter stages have a cumulative effect on the stress of the animals [Moberg and Mench, 2000].

At *slaughterhouses/abattoirs*, animals are exposed to *hazards* to *animal welfare* including *feed* and water deprivation, mixing of unfamiliar *animals*, handling by humans, exposure to a novel environment (e.g. noise, lighting, flooring and smells), forced movement, limited space allowance, adverse weather conditions and ineffective *stunning* and bleeding. These *hazards* can have negative impacts on the welfare of the animals that can be assessed through animal-based measures. In the absence of feasible animal-based measures, resource-based measures and management-based measures may be used as a proxy. *Hazards* to a*nimal welfare* can be minimised by appropriate design of premises and choice of equipment, and through good management, training and competency of personnel.

Article 7.5.5.

Measures

The welfare of animals at *slaughter* should be assessed using animal-based measures. Although consideration should be given to the resources provided as well as the design and management of the system, animal-based measures are preferential. However, key *stunning* parameters should be selected, taking into account animal-based measures.

The routine use of these animal-based measures and the appropriate thresholds should be adapted to the different situations in which animals are managed at a *slaughterhouse/abattoir*. It is recommended that target values or thresholds for animal-based measuresbe based on current scientific evidence and appropriate national, sectorial or regional standards.

Article 7.5.6.

Management

The *slaughterhouse/abattoir* operator is responsible for the development and implementation of an operating plan that should consider the following:

‒ training and competency of personnel;

‒ design of premises and choice of equipment;

‒ standard operating procedure;

‒ recording, reporting adverse incidents and taking corrective actions;

‒ throughput (number of animals slaughtered per hour);

‒ maintenance and cleaning procedures of equipment and premises;

‒ emergency plans.

 Article 7.5.7.

Training and competency of personnel

*Animal handlers* and other personnel have a crucial role to play in ensuring good *animal welfare* conditions from the time of arrival of the animals at the *slaughterhouse/abattoir* through to their *death*. Training for all personnel should emphasise the importance of *animal welfare* and their responsibility in contributing to the welfare of the animals that come through the *slaughterhouse/abattoir*.

*Animal handlers* should understand the species-specific behavioural patterns of the animals they are working with and the underlying principles for carrying out the required tasks whilst ensuring good *animal welfare*. They should be experienced and competent in handling and moving the animals with knowledge that allows them to identify signs of *distress*, fear, and *pain* and take preventive and corrective actions. Personnel in charge of *restraint* (including pre-stun shackling) and of *stunning* and bleeding operations should be familiar with the relevant equipment, and its key working parameters and procedures. Personnel in charge of *stunning*, post-stun shackling and bleeding animals should be able to identify and take corrective actions in case of: [EFSA, 2013a; EFSA 2013b]

a) ineffective *stunning* of the animal;

b) recovery of consciousness;

c) signs of life prior to dressing or scalding.

Competencies may be gained through a combination of formal training and practical experience. These competencies should be assessed by the *Competent Authority* or by an independent body recognised by the *Competent Authority*.

Only the personnel actively working in areas where live animals are handled should be present in these areas. The presence of visitors or other personnel should be limited in these areas in order to prevent unnecessary noise, shouting and movement and to reduce risk of accidents.

Article 7.5.8.

Design of premises and choice of equipment

The design of premises and the choice of equipment used in a *slaughterhouse/abattoir* have important impacts on the welfare of animals. The animals' needs should be considered including:

‒ thermal comfort;

‒ ease of movement;

‒ protection from injury;

‒ protection from visual, auditory and olfactory overstimulation;

‒ minimising fear and avoiding *distress* and *pain*;

‒ ability to perform natural and social behaviours;

‒ water and *feed*;

‒ needs arising from illness or injury;

‒ needs arising from other vulnerabilities (e.g. pregnant, lactating or neonatal animals).

Premises should be designed to eliminate distractions that may cause approaching animals to stop, baulk or turn back.

Flooring should be non-slip to prevent injury and stress due to slipping or falling. There should be adequate quality and quantity of lighting to allow appropriate ante-mortem inspection of animals and to enable the moving of animals utilising low-stress handling techniques.

The design of the *slaughterhouse/abattoir* and choice of equipment should take into consideration the species, categories, quantities, size or weight and age of the animals. *Restraint*, *stunning* and bleeding equipment is critical for the welfare of an animal at the time of *slaughte*r. Appropriate back-up equipment should be available for immediate use in case of failure of the primary *stunning* equipment.

Article 7.5.9.

Throughput

The throughput of the *slaughterhouse/abattoir* is the number of animals slaughtered per hour.It **s**hould never exceed the maximum capacity of the design of the facilities or equipment. The *slaughterhouse/abattoir* operators should continuously monitor throughput and adjust it to any operational changes, such as staff numbers and experience or line breakdowns. Throughput may need to be reduced if welfare is negatively impacted.

Personnel allocation should be adequate for the anticipated throughput and be sufficient to implement the *slaughterhouse/abattoir* operating plan as well as ante- and post-mortem inspections.

Article 7.5.10.

Maintenance and cleaning procedures

All equipment should be clean, well maintained and calibrated, in accordance with the manufacturer’s instructions in order to ensure positive outcomes for *animal welfare*.

Maintenance and cleaning of handling, *unloading*, *lairage* and moving facilities and equipment contribute to ensuring that animals are handled smoothly, minimising *pain* and fear.

Maintenance and cleaning of handling, *restraining*, *stunning* and bleeding equipment are essential to ensure reliable and effective *stunning* and *slaughter*, thereby minimising *pain*, fear and suffering.

Article 7.5.11.

Emergency plans

Emergency plans should be in place at the *slaughterhouse/abattoir* to protect the welfare of the animals in the event of an emergency. The plans should consider the most likely emergency situations given the species slaughtered and the location of the *slaughterhouse/abattoir.*

Emergency plans should be documented and communicated to all responsible parties and these plans should be tested regularly.

Personnel who have a role to play in implementing the plans should be well trained on the tasks they have to perform.

Article 7.5.12.

Arrival of free-moving animals

On arrival at the *slaughterhouse/abattoir*, animals would already have been exposed to *hazards* that may have negative impacts on their welfare. Any previous *hazards* will have a cumulative effect that may affect the welfare of the animals throughout the *slaughter* process. Therefore, animals should be transported to the *slaughterhouse/abattoir* in a manner that minimises adverse animal health and welfare, and in accordance with Chapters 7.2. and 7.3.

1) Animal welfare concerns:

Delay in *unloading* of animals is a major *animal welfare* concern at arrival [NAMI, 2021].

Animals in *vehicles* have smaller space allowances than on farm, undergo water and *feed* deprivation, may have suffered from an injury, and may be exposed to adverse weather conditions and to stress and discomfort from social disturbance, noise, vehicle vibration and motion. In addition, stationary *vehicles* may have insufficient ventilation. Delays in *unloading* animals will prolong or exacerbate the impact of these *hazards*. Under these circumstances, injured or sick animals requiring urgent attention may not be identified or dealt with appropriately and therefore the duration of their suffering will be prolonged.

2) Animal-based and other measures:

It can be difficult to assess animal-based measures while animals are in the *vehicle*. Some measures that may be assessed include animals with injuries, lameness or poor body condition or those that are sick or have died. Panting, shivering and huddling may indicate thermal stress. Drooling and licking may indicate prolonged thirst.

Animals dead or emergency killed (see Article 7.5.19.) on arrival should be recorded and monitored as an indicator of *animal welfare* prior to and during transport.

Time from arrival to *unloading* and the environmental temperature and humidity can be used to establish relevant thresholds for corrective action.

3) Recommendations:

Animals should be unloaded promptly on arrival. This is facilitated by scheduling the arrival of the animals at the *slaughterhouse/abattoir* to ensure that there are sufficient personnel and adequate space in the *unloading* or *lairage* area.

Consignments of animals whose welfare is at greater risk of being compromised should be unloaded first. When no space is immediately available, creating space should be a priority. Provision should be made to provide shelter, shade or additional ventilation during waiting periods, or animals should be transported to an alternative nearby location where such provisions available.

Animals should not be isolated throughout the *slaughter* process, except under specific conditions, such as for aggressive or sick animals.

Animals should be provided with drinking water as soon as possible after *unloading*.

Animals that have undergone long or arduous journeys, are sick or injured, are lactating or pregnant and neonatal animals should be slaughtered as a priority and without delay.

4) Species-specific recommendations:

Some species such as pigs and shorn sheep are especially sensitive to extreme temperatures and therefore special attention should be paid when dealing with delays in *unloading* sensitive animals. This may include careful consideration of transport plans to time arrival and processing, provision of additional means of temperature and humidity control.

Article 7.5.13.

Handling of free-moving animals

This article addresses the handling of animals during *unloading* and *lairage*, and in the *killing* area.

1) Animal welfare concerns:

During *unloading*, animals are exposed to similar *hazards* to those encountered when being loaded (see Chapters 7.2. and 7.3.). Inappropriate equipment in the *vehicle* or the *slaughterhouse/abattoir*, such as a lack of lateral protection when *unloading*, excessively steep ramps, slippery surfaces or an absence of foot battens, may result in animals slipping, falling or being trampled, causing injuries. The absence of ramps, lifts or an *unloading* bay or dock could result in animals being pushed or thrown off the *vehicle*. These *hazards* can also be associated with inappropriate handling and forced physical movement of animals that are unable to move independently as a result of weakness or injuries. Exposure to novel environments (e.g. noise, lighting, flooring, smell) may cause fear and reluctance to move, or turning back. Poorly designed facilities will increase the risk of such fear and injuries.

2) Animal-based and other measures:

a) animals slipping, falling and piling up;

b) animals with broken or otherwise injured limbs;

c) animals turning-back, attempting to escape or reluctant to move;

d) animal vocalisation referring to *distress*;

e) animals that are unable to move by themselves due to reasons other than broken or injured limbs;

f) animals that collide with facility structures;

g) use of force by personnel;

h*)* use of electrical goads.

Animals are safely handled when these measures are below an acceptable threshold.

3) Recommendations:

Ramps or lifts should be provided and used except when the *vehicle* and the *unloading* dock are at the same height. There should be no gap between the *vehicle* and *unloading* dock. Ramps or lifts should be positioned so that the animals can be handled safely. The gradient should not be so steep as to prevent animals from moving voluntarily, and solid side barriers should be in place.

Design of the facilities should promote the natural movements of animals, and, as far as possible, minimise human interaction.

Preventive equipment such as foot battens, rubber mats and deep-groove flooring can help animals to avoid slipping.

The *unloading* area and raceways should be well lit so that animals can see where they are going.

The design of areas and raceways should aim to minimise the potential for distractions that may cause animals to stop, baulk or turn back when being unloaded (e.g. shadows, changes in flooring, moving objects, loud or sudden noises). For details refer to Chapters 7.2. and 7.3.

Animals that are injured, sick or unable to rise require immediate action and, when necessary, emergency *killing* should be performed without moving them and without delay. Refer to Articles 7.5.19. and 7.5.21. Such animals should never be dragged, nor should they be lifted or handled in a way that might cause further *pain* and suffering or exacerbate injuries.

Personnel should be calm and patient, assisting animals to move using a soft voice and slow movements. They should not shout, kick, or use any other means that is likely to cause *distress*, fear or *pain* to the animals. Under no circumstances should *animal handlers* resort to violent acts to move animals (see Article 7.5.20.).

Personnel should not stand between an animal and where they want it to move to as this may cause the animal to baulk. They should keep in mind the flight distance and point of balance of the animal when positioning themselves to encourage movement.

Animals should be moved in small groups as this decreases fear and makes use of their natural tendency to follow other animals.

Mechanical handling aids should be used in a manner to encourage and direct movement of the animals without causing *distress*, fear or *pain*. Preferred mechanical aids include panels, flags, plastic paddles, flappers (a length of cane with a short strap of leather or canvas attached), plastic bags and rattles.

Other handling aids should not be used as a substitute for good facility design and handling. They should not be used repeatedly if an animal fails to respond or move. In such cases it should be determined whether some physical or other impediment is preventing the animal from moving.

Electric goads should not be used on a routine basis to move animals. Electric goads may only be used when other measures have been ineffective, the animal has no injury or other condition that is impeding mobility and there is room for the animal to move forward without obstruction (e.g. obstacles or other animals).

The use of electric goads should be limited to low-voltage goads applied to the hindquarters of adult pigs and large ruminants, and never to sensitive areas such as the eyes, mouth, ears, ano-genital region, udders or belly. Such instruments should not be used on equids, camelids, ratites, sheep and goats, pregnant animals or on calves or piglets. Shocks should not be used repeatedly if the animal fails to respond and should not last longer than one second [Ritter *et al.*, 2008].

The manual lifting of animals should be avoided; if it is necessary, animals should not be grasped or lifted in a manner which causes *pain* or suffering and physical damage (e.g. bruising, fractures, dislocations). (See Article 7.5.20.)

Animals should not be forced to move at a speed greater than their normal walking pace to minimise injury through slipping or falling. Facilities should be designed, constructed and staffed with competent *animal handlers*, so that less than 1% of the animals fall.

Article 7.5.14.

Lairage of free-moving animals

1) Animal welfare concerns:

Animals may be exposed to several *hazards* to *animal welfare* during lairage including:

1. *feed* and water deprivation leading to prolonged hunger and thirst;

b) absence of protection against adverse weather conditions, leading to thermal stress;

c) sudden or excessive noises, including from personnel, facilities, equipment and gates, leading to fear;

d) insufficient space to lie down and move freely leading to fatigue and aggressive behaviour;

e) poor design and maintenance leading to *distress* and injuries;

f) mixing of unfamiliar animals leading to aggressive behaviour or social stress;

g) limited access to resources (e.g. drinkers, bedding) leading to aggressive behaviour;

h) exposure to surfaces leading to injury or lameness (e.g. sharp, abrasive).

2) Animal-based and other measures:

a)thermal stress (e.g. panting, sweating, shivering, huddling behaviour);

b) space allowance;

c) excessive soiling with faeces (e.g. coat cleanliness, dag score for sheep);

d) injuries (e.g. lameness, open wounds, fractures);

e) illness (e.g. diarrhoea, coughing);

f)aggressive behaviours (e.g. mounting, fighting);

g) animal vocalisation referring to *distress*;

h) restlessness (e.g. pacing, walking with continuous ear movements and frequency of snorts – especially in horses) [Micera *et al.*, 2010 and Visser *et al.*, 2008];

i) bruised carcass.

3) Recommendations:

Animals should have constant access to drinking water. Water supply points should be designed according to the species and age of the animal, with environmental conditions that allow for effective consumption. The number and location of the water supply points should minimise competition.

Animals should be provided with *feed* in *lairage* if the duration between their last meal and expected time for *slaughter* exceeds a period appropriate for the species and age of animals. In the absence of information on the transport duration, animals that are not expected to be slaughtered within 12 hours of arrival should be fed as appropriate for the age and species.

The *lairage* should provide animals with protection against adverse weather conditions including shade and shelter.

Animals should be protected from excessive and sudden noise (e.g. ventilation fans, alarms, or other indoor or outdoor equipment).

*Lairage* areas should be free from sharp edges and other *hazards* that may cause injury to animals.

The *lairage* should provide enough space for all animals to lie down at the same time, to move freely and to move away in case of aggressive behaviours.

*Lairage* areas should have adequate lighting levels to allow inspection of the animals.

Animals from different categories (e.g. sexes, sizes, horned or not, species) should not be mixed except if they are already familiar to each other.

Animals that are injured, sick, pregnant or are neonates should be slaughtered with priority or separated to protect them from other animals. Animals that are very ill or down or have severe injuries should be euthanised without delay (see Article 7.5.22.).

4) Species-specific recommendations:

Pigs should be moved in groups up to 15 [Barton-Gade and Christensen,1998].

Bison and cervids need specific design and construction standards for unloading and holding prior to *slaughter*.

Article 7.5.15.

Restraint for stunning or bleeding (free-moving animals)

1) Animal welfare concerns:

The purpose of *restraint* is to facilitate the correct application of the *stunning* or bleeding equipment. Incorrect *restraint* may not only lead to ineffective *stunning* or bleeding, but also cause *distress*, fear and *pain*.

Other *hazards* include:

a) slippery restraining area;

b) insecure *restraint*;

c) excessive force of *restraint*;

d) a restraint box that is not appropriate to the size of the animal;

e) prolonged *restraint*, which may exacerbate insecure or excessive *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 [von Holleben *et al.*, 2010; Pleiter, 2010].

2) Animal-based and other measures:

a) animal slipping or falling;

b) struggling;

c) escape attempts;

d) animal vocalisation referring to *distress*;

e) reluctance to enter the restrainer;

f) use of electric goads.

3) Recommendations:

Where individual restraint is used, the restrainer should be narrow enough that the animals cannot move backward, forward or turn around.

The restrainer being used should be appropriate to the size of the animals and the restrainer should not be loaded beyond its design capacity.

In case of *slaughter* without *stunning*, the restrainer should restrain the head and should support the body of the animal.

The restraint should be maintained until the animal is unconscious.

When restrainers that hold an animal with its feet off the floor are used, the animal should be held in a balanced, comfortable, upright position.

When a restrainer is used to rotate an animal from an upright position, the body and head should be securely held and supported to prevent struggling and slipping within the device.

Restrainers should not have sharp edges and should be well maintained to minimise risk of injury.

Non-slip flooring should be used to prevent animals from slipping or falling.

Flooring design and handling methods that cause loss of balance, slipping or falling, i.e. a box with a floor that rises on one side upon entry to the box, should not be used.

Distractions (e.g. movements of equipment or people, loose chains or objects, shadows, shiny surfaces or floors) should be minimised to prevent baulking and improve ease of entry into the restrainer.

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.

The restrainer should be in a clean and non-slip condition.

Animals should not be able to pile on top of each other in the restrainer, nor receive pre-stun shocks from contact with the animal in front, in the case of electrical *stunning*.

Animals subject to specific methods of *stunning* should be individually restrained to ensure precise positioning of the *stunning* equipment. However, this should not apply when restraining is likely to cause additional *distress* or *pain* as well as excessive and unpredictable movements (e.g. animals that cannot move normally due to injuries or sickness, *wild* animals or horses).

4) Species-specific recommendations:

Gondolas for gas *stunning* of pigs should not be overloaded and should allow pigs to stand without being on top of each other.

Head *restraint* is recommended for bovines.

Specialised restraining equipment and methods are required for bison and cervids.

Article 7.5.16.

General principles for stunning of free-moving animals and animals in containers

1) Animal welfare concerns:

The main *animal welfare* concern associated with *stunning* is ‘ineffective *stunning*’ which 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. The most common methods for *stunning* are mechanical, electrical and exposure to controlled atmosphere. Animals should only be stunned using *stunning* methods that have been scientifically validated as effective for *stunning* that species.

*Stunning* prior to *slaughter* prevents *distress*, fear and *pain* to animals during neck cutting and bleeding.

2) Animal-based and other measures:

Multiple indicators should be used to determine whether a stun is effective and the animal is unconscious. After *stunning*, the state of consciousness is assessed to identify if animals are successfully rendered unconscious or if they are conscious (e.g. *stunning* was ineffective or they recovered consciousness) and therefore at risk of experiencing *distress*, fear and *pain*. For each animal-based measures of state of consciousness, outcomes either suggesting unconsciousness (e.g. presence of tonic seizures) or suggesting consciousness (e.g. absence of tonic seizures) have been identified for each *stunning* method.

3) Recommendations:

Animals should always be stunned as soon as they are restrained.

In the case of ineffective *stunning* or recovery, animals should be re-stunned immediately using a backup method. Ineffective *stunning* or return to consciousness should be systematically recorded and the cause of the failure identified and rectified.

Effectiveness of *stunning* should be monitored using multiple animal-based measures at different stages: immediately after *stunning*, just before and during bleeding until *death* is confirmed [EFSA, 2013a; EFSA, 2013b; AVMA, 2016].

*Stunning* equipment should be used, cleaned, maintained and stored following manufacturer’s recommendations.

Regular calibration of the equipment according to the manufacturer’s procedure is recommended.

*Slaughterhouses/abattoir*s should have standard operating procedures that define key operating parameters and follow the manufacturer’s recommendations for *stunning* the species and age group concerned.

 Article 7.5.17.

Mechanical stunning of free-moving animals

1) Animal welfare concerns:

The main *hazards* preventing effective mechanical *stunning* are incorrect shooting position and incorrect direction of the impact. These may cause ineffective *stunning* or short-lasting unconsciousness. Absence of or incorrect restraint can lead to an incorrect shooting position. Poor maintenance of the equipment or inadequate cartridge power or air line pressure can result in less concussive impact to the skull. Inappropriate use of cartridge, narrow bolt diameter or short length of bolt may also affect the effectiveness of *stunning*. In animals with a thicker skull, there is an increased risk of an ineffective stun, especially with non-penetrative percussive *stunning*. Fracture of the skull which may cause ineffective *stunning* are more likely to occur in young animals such as calves.

For certain extensively reared domestic and *captive* *wild* animals, on-site shooting with a free bullet in the brain can be an alternative to prevent stressful handling and transport. Under such circumstances, the main objective is a shot that kills the animal immediately.

2) Animal-based and other measures:

Animal-based measures of an effective stun are: immediate collapse; apnoea; tonic-clonic seizure; absence of corneal or palpebral reflex; absence of eye movements.

Animal-based measures of ineffective stun or recovery of consciousness are: 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.

3) Recommendations:

*Slaughterhouses/abattoirs* should have standard operating procedures that define key operating parameters and follow the manufacturer’s recommendations for *stunning* the species and age group concerned, such as:

‒ grain of the cartridge or air pressure (captive bolt) [Gibson *et al.*, 2015];

‒ 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 [AVMA, 2016].

4) Species-specific recommendations:

Non-penetrative captive bolt should not be used in animals with thick skull (e.g. bison, water buffalo).

Water buffaloes should be stunned with penetrative captive bolt in the occipital position using a heavy-duty contact-fired captive bolt gun directed at the nose or using large-calibre firearms and deformation ammunition (e.g. 0.357 Magnum).

Article 7.5.18.

Electrical stunning in free-moving animals

1) Animal welfare concerns:

Electrical *stunning* involves application of an electric current across the brain of sufficient magnitude to induce immediate unconsciousness [EFSA, 2004; Grandin, 1980]. The main *hazards* preventing effective electrical *stunning* are: incorrect electrode placement, poor contact, electrical arcing, high contact resistance caused by wool or dirt on the animal surface, dirty or corroded electrode, low voltage/current or high electrical frequency [EFSA, 2004]. Excessively wet hides or fleeces may result in ineffective *stunning* due to electrical current taking the path of least resistance and flowing around the outside of the body rather than through the skull. This may paralyse the animal, or cause pre-stun shocks, rather than *stunning* the animal. If electrodes are energised prior to ensuring they have good contact with the animal, this results in *pain* from the shock.

2) Animal-based and other measures:

Animal-based measures of an effective stun are: tonic-clonic seizures; loss of posture; apnoea; and absence of corneal or palpebral reflex.

Animal-based measures of ineffective stun or recovery of consciousness are: absence of tonic-clonic seizures; vocalisation; spontaneous blinking; righting reflex; presence of corneal or palpebral reflex; rhythmic breathing.

3) Recommendations:

When a head to body electrical stun-kill method is used, the electrical current should be applied to the brain before it reaches the heart otherwise the animal will experience cardiac arrest while still conscious.

*Slaughterhouses/abattoirs* should have standard operating procedures that define key operating parameters and follow the manufacturer’s recommendations for *stunning* the species and age group concerned, such as:

‒ shape, size and placement of the electrodes [AVMA, 2016];

‒ contact between electrode and head;

‒ moisten point of contact;

‒ minimum exposure time;

‒ electrical parameters (current intensity [A], waveform type [AC and DC], voltage [V] and frequency [Hz]);

‒ maximum stun to stick interval;

‒ visual or auditory warning system to alert the operator to proper or improper function such as a device that monitors and displays duration of exposure, voltage and applied current.

4) Species-specific recommendations:

Effective electrical parameters should be determined based on scientific evidence for different types of animals.

For head-only *stunning*, minimum parameters are recommended for the following species:

‒ 1.15 [AVMA] to 1.28 A for bovines [EFSA 2020b],

‒ 1.25 A for finished pigs [AVMA],

‒ 1.8 A for sows and boars [AVMA],

‒ 1 A for small ruminants [EFSA 2013c, and EFSA 2015, AVMA].

The minimum parameters above are recommended to be used with an electrical frequency of 50Hz. Where higher frequencies are used, the amperage should also be increased.

Article 7.5.19.

Controlled atmosphere stunning in free-moving animals

1) Animal welfare concerns:

Controlled atmosphere *stunning* methods involve the exposure to high concentrations of carbon dioxide (hypercapnia), low concentration of oxygen (hypoxia) or a combination of the two (hypercapnic hypoxia). Loss of consciousness is not immediate following exposure of animals to controlled atmosphere *stunning*. The main *hazards* causing increased *distress* during induction of unconsciousness are irritant or aversive gas mixtures (e.g. CO2 in high concentrations), low gas temperature and humidity, and overloading of the gondola or restraint. The main *hazards* causing ineffective controlled atmosphere *stunning* are incorrect gas concentration and too short gas exposure time [Anon, 2018; EFSA, 2004; Velarde *et al.*, 2007].

2) Animal-based and other measures:

Animal-based measures of an effective stun are: loss of posture; apnoea; absence of corneal or palpebral reflex; absence of muscle tone.

Animal-based measures of an ineffective stun or recovery of consciousness are: vocalisation; spontaneous blinking; righting reflex; presence of corneal or palpebral reflex; rhythmic breathing.

3) Recommendations:

*Slaughterhouses/abattoirs* should have standard operating procedures that define key operating parameters and follow the manufacturer’s recommendations for *stunning* the species and age group concerned, such as:

‒ gas concentrations and exposure time;

‒ temperature and humidity;

‒ stocking density of the gondola or restraint for pigs;

‒ visual or auditory warning system to alert the operator to proper or improper function such as a device that monitors gas concentration and temperature.

Animal-based measures should be monitored during the induction phase because this can be a point of highest welfare risk for animals. Since animal-based measures are difficult to monitor and adapt during the induction phase, resource-based measures should be used such as monitoring of gas concentration(s) and exposure time. Gas concentrations and exposure time, temperature and humidity should be monitored continuously at the level of the animal inside the chamber.

4) Species-specific recommendations:

*Pigs*:

Gases or gas mixtures that are painful to inhale should not be used except if such methods allow pigs to be stunned in groups, as they can present animal welfare benefits compared to methods requiring individual *restraint*.

Article 7.5.20.

Bleeding of free-moving animals

1) Animal welfare concerns:

The main *animal welfare* concern at the time of bleeding following *stunning* is the recovery of consciousness due to prolonged stun-to-stick interval or due to incomplete severance of the main blood vessels.

Bleeding without prior *stunning* causes animal suffering because the incision to sever blood vessels results in substantial tissue damage in areas well supplied with nociceptors. The activation of these nociceptors causes the animal to experience *pain* [Gregory, 2004; Gibson *et al.*, 2009]. Loss of consciousness due to bleeding is not immediate and there is a period during which the animals experience fear, *pain* and *distress* [Gregory, 2004; Johnson *et al.*, 2015]. 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.

2) Animal-based and other measures:

The main animal-based measure is the blood flow (rate and duration). For animal-based and other measures of return of consciousness after *stunning*, see Article 7.5.16.

In cases of bleeding without *stunning* the animal-based and other measures that indicate loss of consciousness include all the following: absence of muscle tone; absence of corneal or palpebral reflex; absence of rhythmic breathing. Unconsciousness should be reassessed until *death* is confirmed. In addition, cessation of bleeding after a continuous and rapid blood flow can be used as an indicator of *death*.

3) Recommendations:

a) both carotid arteries or the blood vessels from which they arise should be severed;

b) continuous and rapid blood flow should be assured after bleeding;

c) *death* should be assured before further processing;

d) bleeding knives should be sharpened for each animal as necessary to fulfil recommendations a) and b).

In addition, the following should be considered:

*Slaughter with stunning:*

1. the stun-to-stick interval should be short enough to ensure that the animal will not recover consciousness before it dies;
2. unconsciousness should be confirmed before bleeding;
3. animals who are stunned with a reversible method should be bled without delay to avoid them regaining consciousness during bleeding.

*Slaughter without stunning:*

1. bleeding should be carried out by a single incision; any second intervention should be recorded and analysed to improve procedures;
2. further processing may only be carried out when the *death* of the animal has been ascertained.

4) Species-specific recommendations:

Bovines are at risk of prolonged bleed out times and regaining consciousness as the bilateral vertebral arteries are not cut during a neck cut. 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.

Article 7.5.21.

Slaughter of pregnant free-moving animals

1) Animal welfare concerns:

Fetuses in the uterus are considered not to achieve consciousness [EFSA, 2017; Mellor, D. J. *et al.*, 2005]. 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 [Mellor, 2003; Mellor, 2010; EFSA, 2017].

3) Recommendations:

Under WOAH recommendations (Chapter 7.3. Animal transport by land), pregnant animals that would be in the final 10% of their gestation period at the planned time of *unloading* at the *slaughterhouse/abattoir* should be neither transported nor slaughtered. If such an event occurs, an *animal handler* should ensure that pregnant females are handled separately.

The fetus should be left undisturbed in utero for at least 30 minutes after the *death* of the dam [EFSA, 2017; Anon, 2017]. 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.

Article 7.5.22.

Emergency killing of free-moving animals

This article addresses animals that show signs of severe *pain* or other types of severe suffering before being unloaded or within the *slaughterhouse/abattoir*. These animals may correspond to animals unfit to travel as listed in Article 7.3.7. Principles described below should be described in the emergency plan and may also apply to animals that are not suitable for *slaughter* for commercial reasons, even if they do not present signs of *distress*, *pain* or suffering.

1) Animal welfare concerns:

Some animals can arrive at *slaughterhouses/abattoirs* with injuries or severe illnesses that can cause *distress* and *pain* and suffering.

2) Animal-based and other measures:

Animals requiring emergency *killing* are unable to walk independently or present severe injuries such as fractures, large open wounds, or prolapses. They may also present clinical signs of serious illness or being in a state of extreme weakness. New-born animals or animals that gave birth within the last 48 hours may also belong to this category.

3) Recommendations:

Animals should not be moved unless it can be done without causing *distress*, *pain* or suffering.

*Animal handlers* should euthanise the animal as soon as possible.

Emergency *killing* should be systematically recorded and analysed in order to improve procedures and prevent recurrences.

 Article 7.5.23.

Methods, procedures or practices that should not be used for free-moving animals

1) The following practices for handling animals should not be used under any circumstances:

a) crushing, twisting or breaking tails of animals;

b) applying pressure using an injurious object or applying an irritant substance to any part of an animal;

c) hitting animals with instruments such as large sticks, sticks with sharp ends, piping, stones, fencing wire or leather belts;

d) kicking, throwing or dropping animals;

e) grasping, lifting or dragging animals only by body parts such as their tail, head, horns, ears, limbs, wool or hair;

f) dragging animals by any body part, by any means, including chains, ropes or by hand;

g) forcing animals to walk over other animals;

h) interfering with any sensitive area (e.g. eyes, mouth, ears, anogenital region, udder or belly).

2) The following practices for restraining conscious animals are unacceptable and should not be used under any circumstances:

a) mechanical clamping of the legs or feet of the animals as the sole method of *restraint*, including tying limbs together or lifting one or more limbs off the ground;

b) breaking legs, cutting leg tendons or blinding animals;

c) severing the spinal cord, by using for example a puntilla or dagger;

d) applying electrical current that does not span the brain;

e) suspending or hoisting them by the feet or legs;

f) severing brain stem by piercing through the eye socket or skull bone;

g) forcing animals to sit or lay down by one or more handlers jumping on and lying across the animal’s back;

h) trip floor boxes that are designed to make animals fall.

3) Breaking the neck while the animal is still conscious during bleeding is also an unacceptable practice.

Article 7.5.24.

Arrival of animals in containers

On arrival at the *slaughterhouse/abattoir*, animals would already have been exposed to *hazards* that may have negative impacts on their welfare. Any previous *hazards* will have a cumulative effect that may impair the welfare of the animals throughout the *slaughter* process. Therefore, animals should be transported to the *slaughterhouse/abattoir* in a manner that minimises adverse animal health and welfare outcomes, and in accordance with Chapters 7.2. and 7.3.

1) Animal welfare concerns:

Animals in *containers* have smaller space allowances than on farm, undergo water and *feed* deprivation, may have suffered from injury and may be exposed to thermal stress due to adverse weather conditions and stress from social disturbance, noise, *vehicle* vibration and motion. In addition, stationary *vehicles* may have insufficient ventilation. Delays in *unloading* *containers* will prolong or exacerbate the impact of these *hazards*. Under these circumstances, injured or sick animals requiring urgent attention will not be identified and therefore the duration of their suffering will be increased.

2) Animal-based and other measures:

It can be difficult to assess animal-based measures while animals are in the *containers* and especially whenthe *containers* are on the *vehicle* or when many *containers* are stacked on top of each other*.* Some measures that may be assessed include animals with injuries, or those that are sick or have died. Panting, reddening of the ears (heat stress in rabbits), shivering and huddling may indicate thermal stress. In rabbits drooling and licking may indicate prolonged thirst.

Time from arrival to *unloading* and *slaughter*, the environmental temperature and humidity (e.g. ambient, inside the *vehicle*) can be used to establish relevant thresholds for corrective action.

3) Recommendations:

Animals should be slaughtered as soon as they arrive at the *slaughterhouse/abattoir*. If not possible, *containers* should be unloaded, or *vehicles* should be placed in *lairage* or in sheltered and adequately ventilated area, promptly on arrival. This is facilitated by scheduling the arrival of the animals at the *slaughterhouse/abattoir* to ensure that there are sufficient personnel and adequate space in the *lairage* area. Time at *lairage* should be kept to a minimum.

Consignments of animals assessed to be at greater risk of compromised *animal welfare* (e.g. from long journeys, prolonged lairage, end-of-lay hens) should be unloaded first or should be considered for prioritised *slaughter*. When no available space is immediately available, creating space should be a priority. Provisions should be made to provide shelter, shade, cooling or heating systems or additional ventilation during waiting periods, or animals should be transported to an alternative nearby location where such provisions are available.

4) Species-specific recommendations:

Birds may get trapped or their wings or claws may get caught in the fixtures, mesh or holes in poorly designed, constructed or maintained transport systems. Similarly, rabbits may trap their paws in the fixtures mesh or holes in poorly designed, constructed or maintained transport systems. Under these situations, operators *unloading* birds or rabbits should ensure gentle release of trapped animals.

Article 7.5.25.

Moving of animals in containers

This article addresses the handling of animals in *containers* during *unloading* and *lairage*, and into the *killing* area.

1) Animal welfare concerns:

During *unloading* and moving *containers*, animals can be exposed to *pain*, stress and fear due to tilting, dropping or shaking of the *containers*.

During *unloading* and moving *containers*, animals can be exposed to adverse weather conditions and experience *pain* and *distress* [EFSA, 2019].

2) Animal-based and other measures:

a) animals with broken limbs or dislocated joints;

b) animals that collide with facility structures;

c) animal vocalisations referring to *distress*;

d) body parts (i.e. wings, limbs, feet, paws or heads) stuck between *containers*;

e) animalsinjured by sharp projections inside *containers.*

3) Recommendations:

*Containers* in which animals are transported should be handled with care, moved slowly, and should not be thrown, dropped or knocked over. Where possible, they should be horizontal while being loaded or unloaded mechanically and stacked to ensure ventilation and prevent animals piling on one another. In any case, *containers* should be moved and stored in an upright position as indicated by specific marks.

Animals delivered in *containers* with perforated or flexible bottoms should be unloaded with particular care to avoid injury by crushing or jamming of body parts.

Animals that are injured, jammed or sick require immediate action and, when necessary, should be taken from the *containers* and euthanised without delay. Refer to Article 7.5.34.

Staff should routinely inspect the *containers* and remove the broken *containers* that should not be re-used.

 Article 7.5.26.

Lairage of animals in containers

1) Animal welfare concerns:

Animals may be exposed to several *hazards* to *animal welfare* during *lairage* including:

1. *feed* and water deprivation leading to prolonged hunger and thirst;
2. poor ventilation;

c) absence of protection against adverse weather conditions leading to thermal stress;

d) sudden or excessive noises, including from personnel, leading to fear;

e) insufficient space to lie down and move freely leading to fatigue and aggressive behaviour;

f) not being inspected or accessible for emergency *killing* when necessary.

2) Animal-based and other measures:

a) thermal stress (e.g. panting, shivering, huddling behaviour, reddening of the ears);

b) space allowance;

c) excessive soiling with faeces;

d) injuries (e.g. splay leg, open wounds, fractures, dislocations);

e)sick ordead animals.

3) Recommendations:

Animals should be slaughtered upon arrival at the *slaughterhouse/abattoir*.

Staff should routinely inspect and monitor *containers* while in the *lairage* to observe animals for signs of *distress*, fear and *pain* and take appropriate corrective action to address any concerns.

The *lairage* should provide animals with protection against adverse weather conditions.

Animals should be protected from sudden and excessive noise (e.g. ventilation fans, alarms, or other indoor or outdoor equipment).

 Article 7.5.27.

Unloading animals from containers before stunning

1) Animal welfare concerns:

Animals are removed manually or mechanically by tilting the transport *containers*.

When the *containers* with animals are manually or mechanically emptied by tipping, animals fall on to conveyors. Dumping, piling up and shock may occur, especially for the last animals, which are often removed by manual or mechanical shaking of the *containers*.

Other *hazards* include:

a) narrow openings or doors of the *containers*;

b) *containers* placed too far away from the place of shackling or *stunning*;

c) inappropriate handling and removal of animals from *containers*;

d) incorrect design of manual or mechanical tipping equipment that cause animals to fall from a height;

e) conveyor belts that are running too fast or too slowly or are not properly aligned resulting in piling or injury.

2) Animal-based and other measures:

a) falling;

b) struggling, including wing flapping;

c) escape attempts;

d) vocalisation referring to *distress*;

e) injuries, dislocations, fractures;

f) piling up of animals.

3) Recommendations:

Removal of animals from *containers* in a way that causes *pain*, e.g. by one leg, wings, neck or ears, should be avoided.

Animals should be removed from *containers* by the body or by both legs using both hands and one animal at a time. Animals should not be grabbed and lifted by one leg, the ears, wings or fur and they should not be thrown, swung or dropped.

Animals should not be mistreated in the process of *unloading* and shackling prior to *stunning*.

Modular systems that involve tipping of live animals are not conducive to maintaining good animal welfare. These systems, when used, should have an incorporated mechanism to facilitate animals sliding out of the transport system, rather than being dropped or dumped on top of each other.

It should be ensured that every animal is removed from the *containers*.

Article 7.5.28.

Restraint for stunning animals from containers

1) Animal welfare concerns:

The purpose of *restraint* is to facilitate the correct application of the *stunning* and bleeding procedures. Incorrect *restraint* or handling cause *distress*, fear and *pain* and may lead to ineffective *stunning* and bleeding.

Other *hazards* include:

1. Inversion can provoke compression of the heart and lungs or air sacs by the viscera and might compromise breathing and cardiac activity. This will cause *distress*, fear and *pain* in conscious birds and rabbits.
2. Shackling animals upside down by inserting both legs into shackles. During shackling, the animals are also subjected to compression of their legs and wing flapping by their neighbour(s), leading to *distress*, *pain* and fear.
3. Inappropriate shackling (e.g. shackles are too narrow or too wide, animals are shackled by one leg, or when one animals is shackled on two different adjacent shackles) leads to *distress*, *pain* and fear. Line speed, without a concomitant increase in workforce, can contribute to poor shackling outcomes.
4. Drops, curves and inclination of the shackle line or high speed of the shackle line create fear and possible *pain* due to the sudden changes in position as well as increased effects of inversion.

2) Animal-based and other measures:

a) wing flapping for birds;

b) escape attempts;

c) vocalisations referring to *distress*;

d) injuries;

e) respiratory distress.

3) Recommendations:

*Stunning* methods that avoid handling, shackling and inversion of conscious animals should always be preferred.

Where this is not possible, animals should be handled and restrained to minimise struggling or attempts to escape.

Shackle lines should be constructed and maintained so they do not jolt animals because this is likely to stimulate wing flapping or struggling. Shackle line speeds should be optimised so that they do not cause the animals to struggle. Shackling duration prior to *stunning* should be kept to a minimum.

To minimise wing flapping or struggling, breast support should be provided to the birds 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.

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 should not be used with heavy birds such as parent *flocks*, turkeys or with birds that are more susceptible to fractures (e.g. end-of-lay hens).

Poultry should not be lifted or carried by the head, neck, wings or one leg.

Article 7.5.29.

Head-only electrical stunning of animals in containers

1) Animal welfare concerns:

Electrical *stunning* involves application of an electric current across the brain of sufficient magnitude to induce immediate unconsciousness [EFSA, 2004; Grandin, 1980]. The main *hazards* preventing effective electrical *stunning* are: incorrect electrode placement, poor contact, dirty or corroded electrode, electrical arcing, high contact resistance caused by hair and feathers or dirt on the animal surface and inappropriate electrical parameters (low voltage/current or high frequency [EFSA, 2004]).

2) Animal-based and other measures:

Multiple indicators should be used to determine whether a stun is effective and the animal is unconscious.

Animal-based measures of an effective stun are: tonic-clonic seizures; apnoea; absence of corneal or palpebral reflex.

Animal-based measures of ineffective stun or recovery of consciousness are: vocalisation; spontaneous blinking; righting reflex; presence of corneal or palpebral reflex; rhythmic breathing; spontaneous swallowing and head shaking.

3) Recommendations:

Animals should be stunned as soon as they are restrained.

In the case of ineffective *stunning* or recovery, animals should be re-stunned using a backup system or be killed immediately. Ineffective *stunning* or return to consciousness should be systematically recorded and the cause of the failure identified and rectified.

*Stunning* equipment should be used, cleaned, maintained and stored following the manufacturer’s recommendations.

Constant current stunners ensure that the minimum current is provided to the animal independently from individual impedance and should always be preferred to constant voltage stunners.

Regular calibration of the equipment according to the manufacturer’s procedure is recommended. Effectiveness of the *stunning* should be monitored regularly.

*Slaughterhouses/abattoirs* should have standard operating procedures that define key operating parameters and follow the manufacturer’s recommendations for *stunning*, such as:

‒ shape, size and placement of the electrodes [AVMA, 2016];

‒ contact between electrode and head;

‒ electrical parameters (current intensity [A], waveform type [AC and DC], voltage [V] and frequency [Hz]);

‒ visual or auditory warning system to alert the operator to proper or improper function such as a device that monitors and displays voltage and applied current.

4) Species-specific recommendations:

Effective electrical parameters should be determined based on scientific data on the welfare outcomes for different types of animals in accordance with point 5 of Article 7.1.4.

For head-only *stunning*, minimum parameters are recommended for the following species:

‒ 240 mA for hens and broiler chicken [EFSA, 2019],

‒ 400 mA for turkeys [EFSA, 2019],

‒ 600 mA for geese and ducks [EFSA, 2019],

‒ 140 mA for rabbits (100V of a 50 Hz sine wave AC) [EFSA, 2020a].

Article 7.5.30.

Electrical water-bath stunning for poultry

1) Animal welfare concerns:

In electrical water-bath *stunning* poultry are inverted and shackled by the legs from a shackle line. The bird’s head has direct contact with the water-bath, and an electric current is passed from the water through the bird to the leg shackle. *Hazards* that may prevent effective electrical *stunning* are: lack of contact between head and water, differences in individual bird resistance, improper system grounding, pre-stun shocks due to wings contacting water before the head, and the use of inappropriate electrical parameters (low voltage/current or high frequency [AVMA 2016]).

*Hazards* that increase the likelihood of animals experiencing pre-stun shocks are: poor handling at shackling, inappropriate line speed, physical contact between birds, incorrect angle of entry ramp, entry ramp wetted by charged water, incorrect water-bath height, and shallow immersion.

Factors affecting individual bird resistance include the resistance between the shackle and the leg (leg/shackle interface), shackling on top of a severed foot, shackling by one leg, poor shackle position, incorrect shackle size, dry shackles, scale on the shackle surface, and keratinised skin on the legs (e.g. older birds).

Where insufficient electrical *stunning* parameters are used, conscious animals are at risk of being electro-immobilised or paralysed causing *pain* and suffering.

2) Animal-based and other measures:

Multiple indicators should be used to determine whether a stun is effective and the animal is unconscious.

Animal-based measures of an effective stun are: tonic-clonic seizures; apnoea; and absence of corneal or palpebral reflex.

Animal-based measures of ineffective stun or recovery of consciousness are: vocalisation; spontaneous blinking; righting reflex; presence of corneal or palpebral reflex; rhythmic breathing; spontaneous swallowing; and head shaking.

3) Recommendations:

The height of the water-bath stunner should be adjusted so that the birds’ heads are completely immersed in the water. Avoid distractions such as people walking under the birds because this can cause birds to pull up.

Personnel should watch for short or stunted birds as these birds will not be able to make contact with the water and will not be stunned. These birds should be stunned in the slaughter line (e.g. penetrative captive bolt) or removed and euthanised.

The rail of the shackle line should run smoothly. Sudden movement such as jolts, drops or sharp curves in the line may cause birds to flap and avoid the stunner.

To minimise any disturbance to birds during shackling, where shackles are wet to improve conductivity, they should be wetted only prior to birds’ legs being placed in them.

Pre-stun shocks should be avoided and can be reduced by having a smooth shackle line and entry to the water-bath and by adjusting the water level of the bath to minimise overflow.

In the case of ineffective *stunning* or recovery, animals should be re-stunned using a backup system or be killed immediately. Ineffective *stunning* or return to consciousness should be systematically recorded and the cause of the failure identified and rectified.

*Stunning* equipment should be used, cleaned, maintained and stored following themanufacturer’s recommendations.

Constant current stunners should be preferred to constant voltage stunners because the former ensure that the minimum current is provided to the animals independently from their impedance.

Regular calibration of the equipment according to the manufacturer’s procedure is recommended. Effectiveness of the *stunning* should be monitored regularly.

*Slaughterhouses/abattoirs* should have standard operating procedures that define key operating parameters or follow the manufacturer’s recommendations for *stunning*, such as:

‒ water level;

‒ number of birds in the water-bath;

‒ contact between water and head, as well as between the legs and the leg shackle;

‒ electrical parameters (current intensity [A], waveform type [AC and DC], voltage [V] and frequency [Hz]);

‒ visual or auditory warning system to alert the operator to proper or improper function, such as a device that monitors and displays voltage and applied current.

Ensure an optimum combination of voltage and frequency during electrical water-bath *stunning* practices, to maximise the effectiveness of *stunning*.

*Hazards* to *animal welfare* such as inversion of conscious birds, pre-stun shocks, and variability in electrical current delivered to each bird are inherent risks of electrical water-bath *stunning*. Thus, alternative *stunning* systems which avoid these associated *hazards* should be preferred.

4) Species-specific recommendations:

Effective electrical parameters should be based on scientific evidence for different species of birds.

Effective electrical parameters should be based on scientific data on the welfare outcomes for different types of animals in accordance with point 5 of Article 7.1.4.

For water-bath *stunning* depending on the frequency, minimum parameters are recommended for the following species [EFSA, 2019]:

‒ For frequency below 200 Hz:

‒ 100 mA for chicken,

‒ 250 mA for turkeys,

‒ 130 mA for ducks and geese,

‒ 45 mA for quails.

‒ For frequency from 200 to 400 Hz:

‒ 150 mA for chicken,

‒ 400 mA for turkeys.

‒ For frequency from 400-600 Hz:

‒ 200 mA for chicken,

‒ 400 mA for turkeys.

Birds should receive the current for at least 4 seconds.

Ducks, geese and quails should not be stunned at frequencies higher than 200 Hz [EFSA, 2019].

Chicken and turkeys should not be stunned at frequencies higher than 600 Hz [EFSA, 2019].

Article 7.5.31.

Mechanical stunning of animals arriving in containers

The mechanical methods described here are penetrative and non-penetrative captive bolt systems. Effective mechanical *stunning* requires a severe and immediate damage to the brain caused by the application of mechanical force. For that reason, cervical dislocation and decapitation cannot be considered as *stunning* methods.

1) Animal welfare concerns:

Mechanical methods require precision and often physical strength to restrain and stun the animals. Common causes of the misapplication of these methods are a lack of proper skill and operator fatigue.

*Penetrative and non-penetrative captive bolt*

An incorrect shooting position or incorrect captive bolt parameters (not hitting the skull with sufficient force) will mis-stun the animal, leaving it conscious and leading to serious wounds and consequently *distress*, fear and *pain*.

Improper captive bolt parameters may be linked to: the use of an inappropriate gun (bolt diameter); inappropriate cartridges; or an overheated or badly maintained gun.

2) Animal-based and other measures:

*Penetrative and non-penetrative captive bolt*:

Severe convulsions (wing flapping and leg kicking i.e. uncontrolled muscular movements) occur immediately after the mechanical *stunning* intervention. This is due to the loss of control of the brain over the spinal cord. Since mechanical *stunning* is applied to individual animals, its efficacy can be assessed immediately after the stun [Nielsen *et al.*, 2018].

Animal-based measures of an effective stun are: the absence of corneal or palpebral reflex; apnoea; loss of posture; presence of tonic-clonic seizure.

Animal-based measures of ineffective stun or recovery of consciousness are: vocalisations; spontaneous blinking; righting reflex; presence of corneal reflex or palpebral reflex; rhythmic breathing.

3) Recommendations:

Penetrative and non-penetrative captive bolt should only be used as backup or for small- throughput slaughtering as in small *slaughterhouses/abattoirs* or on-farm slaughter or for emergency *killing*.

*Penetrative and non-penetrative* *captive bolt*:

The captive bolt gun should be 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.

Because it requires precision, this method should only be applied with proper restraint of the head of the animal. In addition, in the case of birds, they should be restrained in a bleeding cone to contain wing flapping.

The captive bolt should be pointing perpendicularly on the parietal bones of birds.

Placement is different for birds with and without combs:

*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 [AVMA, 2020].

*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 [AVMA, 2020].

*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 [Walsh *et al.*, 2017].

There should be a sufficient number of bolt guns such that they are allowed to cool between operations.

4) Species-specific recommendations:

Turkeys, ducks, geese and chickens may be also properly stunned by non-penetrative captive bolt [Walsh *et al.*, 2017; Woolcott *et al.*, 2018; Gibson *et al.*, 2019, Stiewert *et al.* 2021; HSA, 2023].

Article 7.5.32.

Controlled atmosphere stunning for animals in containers

Animals may be exposed to controlled atmosphere *stunning* methods either directly in crates or after being unloaded on a conveyor belt. Animals are not subject to restraint. Controlled atmosphere *stunning* includes exposure to carbon dioxide, inert gases, mixtures of carbon dioxide with inert gases or low atmosphere pressure (LAPS).

1) Animal welfare concerns:

A common concern of all controlled atmosphere *stunning* methods is the risk of insufficient exposure of animals to the modified atmosphere, which can result in animals recovering consciousness before or during bleeding and causing respiratory distress, fear and *pain*. The insufficient exposure to the modified atmosphere may be due to either too short exposure time, a too low concentration of gas, too high stocking density or a combination of these variables.

These variables are critical because animals being stunned in large groups need special attention to ensure unconsciousness prior to neck cutting. For this reason, the duration of unconsciousness induced needs to be longer than required by other *stunning* methods 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 aversive reactions.

Low atmospheric pressure systems (LAPS) should not be confused with decompression: LAPS utilise a slow removal of air where animals exhibit minimal to no aversive behaviours. Decompression is a fast process that is associated with *pain* and respiratory distress.

2) Animal-based and other measures:

It may be difficult to monitor the effectiveness of controlled atmosphere *stunning* because of limited access to observe animals during the *stunning* process. All chamber-type systems should have either windows or video cameras so that problems with induction can be observed. If problems are observed, there is a need to take immediate corrective measures that could alleviate the suffering of the animals concerned.

Therefore, it is essential that the unconsciousness of animals is confirmed at the end of the exposure to the controlled atmosphere.

Unconsciousness can be confirmed by apnoea, absence of corneal or palpebral reflex, dilated pupils and relaxed carcass.

Since animal-based measures are difficult to monitor, resource-based measures should also be used such as monitoring of gas concentration(s), exposure time, gas displacement rate, and rate of air removal (for LAPS).

3) Recommendations:

Conscious animals should not be exposed to carbon dioxide concentrations exceeding 40%. Any compressed gas should also be vaporised prior to administration and humidified at room temperature to prevent the risk of animals experiencing thermal shock.

The duration of exposure and the gas concentration should be designed and implemented in such a way that all animals are rendered unconscious until *death*.

Gas concentrations and exposure time, temperature and humidity should be monitored continuously at the level of the animal inside the chamber.

*Stunning* systems should have visual and auditory warning system to alert the operator to improper function, such as inappropriate gas concentration or decompression rate.

In the case of low atmosphere pressure *stunning* the rate of air removal should be monitored continuously. The decompression rate should not be greater than or equivalent to a reduction in pressure from standard sea level atmospheric pressure (760 Torr) to 250 Torr in not less than 50 s. During the second phase, a minimum atmospheric pressure of 160 Torr should be reached within the following 210 s.

In the case of ineffective *stunning* or recovery, animals should be re-stunned immediately using a backup system. Ineffective *stunning* or return to consciousness should be systematically recorded and the cause of the failure identified and rectified.

4) Species-specific recommendations:

The use of Low Atmosphere Pressure *stunning* should be restricted to broilers and newly hatched chicks [Gurung *et al.*, 2018; Jongman and Fisher, 2021] and therefore should not be used for other animals until further information is available.

Article 7.5.33.

Bleeding of animals arriving in containers

1) Animal welfare concerns:

The most common animal welfare concern at the time of bleeding is recovery of consciousness due to ineffective *stunning* practices or an ineffective bleeding. There are many of factors that determine the efficacy of a *stunning* procedure such as type of animal, animal weight, voltage, frequency, impedance and duration of *stunning* or gas (mixture) concentration and exposure [Zulkifli *et al.*, 2013; Raj, 2006; Wotton & Wilkins, 2004].

Improper *stunning* practice leads to the risk of animals experiencing *distress*, fear and *pain*, during *slaughter* if they regain consciousness. There is an additional risk of injury to bones, wings and joints due to struggling if animals regain consciousness.

Bleeding without prior *stunning* causes animal suffering because the incision to sever blood vessels results in substantial tissue damage in areas well supplied with nociceptors. The activation of these nociceptors causes the animal to experience *pain* [Gregory, 2004; Gibson *et al.*, 2009]. Loss of consciousness due to bleeding is not immediate and there is a period during which the animals experience *distress*, fear and *pain* [Gregory, 2004; Johnson *et* *al.*, 2015].

In case of bleeding without *stunning*, more cases of injury, bruising, haemorrhage and broken body parts are expected to occur due to wing flapping and violent muscular contractions [McNeal *et al.*, 2003).

Bleeding duration also plays an integral part in processing, where animals that have not undergone a sufficient bleeding period, may still be alive upon reaching the scalding tank. Live and conscious birds, if not removed prior to scalding, will then be subjected to additional *pain* from the heat inside the scalding tank and *death* by drowning.

2) Animal-based and other measures:

The main animal-based measure is the blood flow (rate and duration). For animal-based and other measures of return of consciousness after *stunning* (see Article 7.5.26. to Article 7.5.29).

One of the most common parameters in determining bleeding efficiency is the percentage of blood loss, where the amount of blood loss is estimated from the difference between pre-slaughter weight and post-slaughter weight [Velarde *et al.*, 2003; Sabow *et al.*, 2015].

For birds, the presence of ‘red-skin’ carcasses may be the result of ineffective *killing* with live birds entering the scalding tank.

3) Recommendations:

The *slaughterhouse/abattoir* operators should ensure that:

‒ both carotid arteries are severed;

‒ qualified personnel take random samples of animals after the end of *stunning* and before bleeding to ensure animals are not showing signs of consciousness;

‒ immediately after bleeding, qualified personnel check that the jugular veins, carotid arteries and trachea were cut thoroughly, guaranteeing an efficient bleeding process.

 Decapitation should be applied as bleeding method only to unconscious animals.

4) Species-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.

Article 7.5.34.

Emergency killing of animals arriving in containers

This article addresses animals that show signs of severe *distress* or *pain* before being unloaded or within the *slaughterhouse/abattoir*. These animals may correspond to animals unfit to travel as listed in Article 7.3.7. Principles described may also apply to animals that are not suitable for *slaughter* for commercial reasons, even if they do not present signs of *pain* or suffering.

1) Animal welfare concerns:

Some animals can arrive at *slaughterhouses/abattoirs* with injuries or severe illnesses that can cause undue *distress*, *pain* suffering.

2) Animal-based and other measures:

Animals requiring emergency *killing* are those with severe injuries such as fractures, bone dislocations, and large open wounds.

They may also present clinical signs of serious illness or be in a state of extreme weakness.

3) Recommendations:

*Animal handlers* should euthanise the animals as soon as they are identified at arrival, during lairage or at the time of shackling.

Emergency *killing* should be systematically recorded and analysed to improve procedures and prevent recurrences.

 Article 7.5.35.

Methods, procedures or practices that should not be used for animals arriving in containers

1) The following practices for handling animals should not be used under any circumstances:

a) applying pressure using an injurious object or applying an irritant substance to any part of the body of an animal;

b) hitting animals including with instruments such as sticks, notably sticks with sharp ends, piping, stones, fencing wire or leather belts;

c) kicking, throwing or dropping animals;

d) stepping on or crushing animals;

e) grasping, lifting or dragging animals only by body parts such as their tail, head, ears, limbs, hair or feathers.

2) The following practices for restraining animals should not be used:

a) mechanical clamping of the legs or feet of the animals as the sole method of *restraint*;

b) breaking legs, cutting leg tendons or blinding animals;

c) applying electrical current that does not span the brain;

d) severing the brain stem by piercing through the eye socket or skull bone;

e) crushing the neck.

In birds, electro-immobilisation for neck-cutting or preventing wing flapping during bleeding, or the method of brain piercing through the skull without prior *stunning* should not be used under any circumstances.

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