Humane Slaughter: Overview

Introduction

Slaughter practices in our global food supply chains have gained significant attention recently, both from within companies and from the media and consumers. This document provides an overview of the principles of humane slaughter, an introduction to the main methods of slaughter in use commercially and general recommendations for its inclusion into corporate animal welfare policies. Suitable outcome measures for assessing welfare at slaughter are suggested and their use in continuous welfare improvement programmes discussed.

Council Regulation (EC) No. 1099/2009[1] provides legislation for the protection of animals at the time of killing for countries within the EU and also for exporters of meat into the EU from non-EU countries. In much of the rest of the world, legislation on slaughter is poor or non-existent. The OIE provides Guidelines for the Slaughter of Animals in the Terrestrial Animal Health Code[2] and these recommend good practice but do not, for example, require animals to be stunned before slaughter. The slaughter of livestock represents a significant animal welfare risk within supply chains and requires proactive management.

The information contained in this resource is applicable to cattle, sheep, goats, pigs, rabbits and poultry.

Principles of humane slaughter

In terms of animal welfare, a slaughter method is only humane if the animal dies without pain or distress.

There are three ways in which this can be achieved in principle:

1. **Killing is instant.** This is possible by shooting an animal with a free bullet to the head, some stun-kill electrical stunning methods and maceration (of chicks). Death will only be instant if the method is properly applied.
2. **The animal is instantly made unconscious, *stunned*,** and is then killed using a second process before the animal can recover consciousness. Whilst the animal is effectively stunned it is insensible and cannot experience pain or stress. This is possible with, for example, captive-bolt stunning or electrical stunning followed as quickly as possible by effective bleeding (cutting the carotid arteries) or application of an electrical current across the chest to cause cardiac arrest. There is a risk that the animal will recover consciousness before death occurs if either the stunning or the killing method is ineffectively applied, or if there is too long a delay between the stunning and killing methods.
3. **The method of killing is not aversive or unpleasant.** This is possible, for example, if animals are kept in an atmosphere with very low levels of oxygen where that oxygen is replaced by a non-aversive gas such as argon or nitrogen. In this case, unconsciousness, followed by death, can occur without affecting the welfare of the animal.

However, it is necessary to consider animal welfare through the whole process of slaughter; from arrival at the slaughterhouse and unloading, the movement of the animal in the lairage and through the handling system, to the application of the slaughter method. In practice, there can be conflicts between the need for humane slaughter and for avoiding suffering in the periods leading up to slaughter including transportation and pre-slaughter handling. Examples include:

- Electrical stunning of broiler chickens can be humane when properly applied, but the process of handling associated with electrical waterbath stunning systems (i.e. inserting the legs into a metal shackle from which the birds hang inverted on a moving line) can cause considerable pain and distress[3] (there are further concerns with electrical waterbath systems as a method of electrical stunning for broiler chickens – see later).

- Killing pigs using high levels of carbon dioxide causes severe distress for 15-30 seconds due to the aversiveness of the gas[4]. However, some of the handling systems associated with this method, which allow the pigs to move in groups, result in much lower levels of stress before slaughter compared to other methods which move pigs in single file race systems[5].

There can also be trade-offs in animal welfare between the different methods of slaughter available. For example:

- Gas killing of poultry using carbon dioxide at moderate levels up to 40% may cause some aversion, but systems that use this method in a set-up that allows the birds to remain in their transport crates, avoiding the need for any additional live handling, are widely considered to be substantially more humane than electrical waterbath stunning with the associated handling, inversion and shackling[6].

Methods of slaughter

The main methods of slaughter in use commercially fall into three categories:

1. **Electrical**
   Electrical methods of slaughter include systems which simply stun the animal (*stun-only* methods), and methods which initially stun the animal and are then followed by a second phase which also kills the animal (*stun-kill* methods). In both *stun-only* and *stun-kill* systems, an electrical current passes through the head of the animal to disrupt brain function. In *stun-kill* systems a current also passes across the chest to stop the heart. *Stun-only* methods need to be followed by effective bleeding as soon as possible to cause the death of the animal (see box on bleeding below). In practice, both methods are followed by bleeding in order for the carcases to be used for meat[7].
2. **Percussive**
   The main percussive method of slaughter used is captive-bolt stunning. Percussive methods cause unconsciousness by administering a severe blow to the skull of the animal, with or without penetration of the skull. Both penetrative and non-penetrative captive-bolt stunning methods must be followed as soon as possible by bleeding to kill the animal[8]. Shooting an animal with a free-bullet to the head is considered a percussive method which also kills the animal, but is not commonly used for farmed animals in commercial production due to risks of inaccuracy and risks to human safety[9].
3. **Controlled Atmosphere**
   Controlled atmosphere methods include all gas systems and Low Atmosphere Pressure Stunning (LAPS). Controlled atmosphere methods work by limiting the oxygen available to the animals. These methods can either be stun-only or stun-kill, dependent on the concentrations of gases used and length of time for which the animals remain in the gases. Stun-only methods must be followed by bleeding as soon as possible[10].

Bleeding
When bleeding is used to kill an animal after stunning this can be performed in different ways, dependent on the species of animal concerned. The most humane methods are those which cause a rapid loss of blood so that death is brought about as quickly as possible. These include ventral neck cuts (for poultry, sheep and goats) and chest sticking (for cattle, sheep, goats and pigs). The time interval between stunning and bleeding (the "stun-to-stick interval") should always be kept as short as possible to minimise the risk of animals recovering consciousness before death occurs. The recommended maximum stun-to-stick time for cattle is 60 seconds and for all other species 15 seconds[8].

General recommendations for corporate policies on humane slaughter

1. All animals killed for meat should be slaughtered humanely. The following methods of slaughter have the **potential** to be humane if properly applied:
   - Captive-bolt stunning immediately followed by effective bleeding.
   - Electrical stunning immediately followed by effective bleeding or application of an electrical current across the chest to cause cardiac arrest.

- Killing in controlled atmosphere systems, preferably using an inert gas such as argon or nitrogen, or stunning with a low concentration of carbon dioxide followed by a high concentration of carbon dioxide to cause death.
- A free-bullet to the head to instantly destroy brain function.

2. The killing of animals by bleeding without the use of pre-slaughter stunning is not considered a humane method of slaughter. Corporate animal welfare policies should stipulate that all meat in the supply chain comes from animals that have been subject to pre-slaughter stunning.

3. All systems for killing animals should be effectively managed and monitored. This includes:
   - The development and use of Standard Operating Procedures (SOPs) for all live animal operations. SOPs are instructions for operatives that describe step-by-step actions to be taken in order to achieve a standardised process and desired results. These must also describe procedures for dealing with breakdowns on the line and other emergencies, including procedures for killing casualty animals at unloading or in the lairage.
   - Use and maintenance of animal handling and stunning equipment according to the manufacturer's operating instructions. This will include regular cleaning and testing of the equipment.
   - Availability of back-up stunning equipment. This must be immediately accessible at the point of stunning and slaughter. Additional equipment should be provided in the lairage for the killing of casualty animals.
   - Effective training of all staff involved in live animal operations.
   - Designation of a member of staff responsible for animal welfare in the slaughterhouse, an "Animal Welfare Officer", whose role it is to monitor operations to ensure SOPs are followed and to require remedial action be taken if non-compliance or other issues are found.
   - Use of CCTV in all live animal handling areas, with effective monitoring of the footage.
   - Effective measurement and proactive management of welfare outcomes at slaughter.

4. With electrical methods of stunning and killing:
   - A *stun-kill* method is preferred since it removes the risk of the animal recovering consciousness.
   - With *stun-only* electrical methods, it is essential that effective electrical parameters are used that result in a stun which lasts long enough to ensure death occurs from bleeding before there is any risk of recovering consciousness. Bleeding must be performed as quickly as possible following stunning to reduce the risk of recovery – within a maximum of 15 seconds from the start of stunning.
   - Inappropriate electrical parameters or application of the electrodes which may result in electro-immobilisation (animals being paralysed but still conscious) must be avoided.
   - Electrical waterbath systems have been found not to provide a reliable stun, even in the best run operations[11,12]. The use of electric water bath systems for poultry should be phased out (for further information, see Compassion's documents on Humane Slaughter of Broiler Chickens and on Improving Electrical Waterbath Stunning[13]).

5. With controlled atmosphere methods:
   - A *stun-kill* method should be used to remove the risk of the animal recovering consciousness.
   - Inert gases should be used in preference to carbon dioxide, which is aversive.

Welfare outcomes at slaughter

In order to proactively monitor and improve animal welfare at slaughter it is necessary to start by identifying appropriate measures of welfare. Whilst it is important (and in many cases mandatory[1]) to record non-animal-based measures, such as electrical stunning parameter data, it is also important to look at the animal. Welfare outcome measures are animal based measures which reflect the key issues concerning the welfare of the animals. They are influenced by several factors and corrective action may require investigating a range of potential solutions.

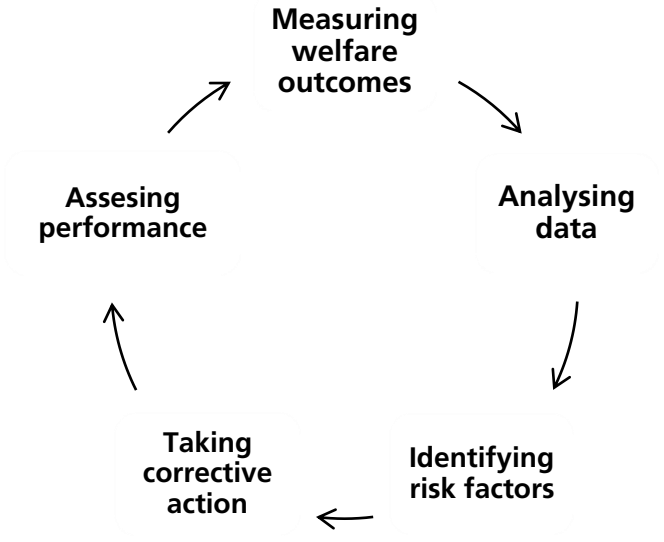
Corporate policies on animal welfare should stipulate that welfare outcome measures are used at slaughter. Recommended welfare outcome measures for use in slaughterhouses include:

Welfare Outcome	Detail	Relevant Species
Behaviour at unloading	A qualitative assessment of the behaviour of animals at unloading e.g. calm, cautious, or flighty.	All
Dead on arrivals (DOAs)	Record the number and percentage of animals dead on arrival at the lairage. *Should be continuously recorded.*	All
Slips and falls	Record the number and percentage of animals that fall down or slip when being moved through the lairage and handling system, including at unloading.	Cattle, Pigs, Sheep, Goats
Injuries in the lairage	Record incidences of injury in the lairage, such as caused by the handling facilities, falls or other animals. *Should be continuously recorded.*	All
Vocalisation	Record the number and percentage of animals vocalising in the stunning pen or restrainer and in the approach race leading up to stunning.	Cattle, Pigs, Goats
Electric goad use	Record the number and percentage of animals that an electric goad is used on and the number of applications per animal. *An electric goad is an electrified prod used to encourage animals to move and should not be permitted.*	Cattle, Pigs
Indicators of consciousness	Assess indicators of consciousness during bleeding, e.g. corneal reflex* and rhythmic breathing, and record the number and percentage of animals that show signs of recovering consciousness. *Should be continuously recorded. If signs of consciousness are seen animals must be immediately re-stunned or stunned with an alternative method.*	All
Double stuns	Record both the number and percentage of double stuns performed during stunning in addition to the reason why a second stun was required. *Should be continuously recorded.*	Cattle, Pigs, Sheep, Goats, Rabbits
Mis-applied stuns	Record the number and percentage of cases in which the stunner was not applied in the recommended position.	Cattle, Pigs, Sheep, Goats, Rabbits

"Red Skins"	These are birds that have entered the scald tank having missed the electrical waterbath stunner and the neck cutter. These birds therefore die by drowning, whilst still conscious[14]. Record the number and the percentage of total birds this represents. *Should be continuously recorded.*	Poultry
Post-mortem lesions	Record post-mortem lesions found from a sample of carcases, e.g. bruising, broken bones and blood spots within the meat, which may be related to the live handling and slaughter procedures.	All
Emergency animal procedures	Record the number and percentage of animals that are emergency killed in the lairage, the reason why this was required and the action taken. *Should be continuously recorded.*	All

* Corneal reflex: one of the simplest indicators of consciousness for use across all species. The absence of a blink reflex when the cornea (the surface of the eyeball) is touched indicates that the animal is unconscious. Presence of a blink reflex must be acted upon immediately: it may not indicate full consciousness but the return of this reflex after stunning is a sign of some brain function returning and it indicates the possibility that consciousness may also be returning. Do not hesitate to repeat the stun or use an alternative method.

Welfare outcome measures should be used as part of a proactive programme of measurement and continuous improvement target setting. A programme should involve a continuous cycle of:



Regular monitoring of welfare outcomes enables swift detection of problems, implementation of corrective action and continuous improvement to be achieved. Some measures should be continuously recorded (as indicated in the table above). For the other measures, it is recommended that they are recorded on a representative sample of a minimum of 100 animals per week[15] or per flock (for poultry). Target setting should be used for all measures, to drive improvement.

Further information on welfare outcome measures can be found in the Compassion's other species-specific resources on slaughter.

References and further reading

1. European Union Council Regulation (EC) No 1099/2009 on the protection of animals at the time of killing: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009R1099&from=EN

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7. Electrical Stunning of Red Meat Animals (2016) Humane Slaughter Association, United Kingdom: http://www.hsa.org.uk/publications/online-guides

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9. Humane Killing of Livestock Using Firearms (2014) Humane Slaughter Association, United Kingdom: http://www.hsa.org.uk/humane-killing-of-livestock-using-firearms-introduction/introduction-2

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12. Humane Slaughter Association Guidance Notes on the Electrical Waterbath Stunning of Poultry: http://www.hsa.org.uk/downloads/hsagn7electricalwaterbathpoultry1.pdf

13. Compassion in World Farming document on Improving Electrical Waterbath Stunning: http://www.compassioninfoodbusiness.com/media/7425704/summary-improving-electrical-waterbath-stunning.pdf

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