Mass killing

Mass killing of large numbers of farm animals may be required in the event of an emergency animal disease outbreak to control and prevent further spread of the disease. Other circumstances in which mass killing may be required include natural disasters or for animal welfare reasons, such as where transport to an abattoir cannot occur causing on-farm overcrowding or feed shortages.

General considerations

In any circumstance where mass killing is required, animal welfare must be one of the primary considerations when deciding on the most appropriate method. The purpose of this document is to provide general guidance on the animal welfare considerations associated with some of the current accepted methods for mass killing.

Application of any method of mass killing of farm animals must be subject to professional and expert advice and ensure compliance with relevant animal welfare legislation and with the Australian Model Codes of Practice for the Welfare of Animals. A person experienced in the killing of the species and trained in animal welfare aspects of killing must be present at all times during the mass killing process.

Further guidance on mass killing can be found in:

AUSVETPLAN Operational Manual: Destruction of animals Version 3.2,2015

AVMA Guidelines for the Depopulation of Animals: 2019 Edition

EFSA Panel of Animal Health and Welfare: Welfare of pigs during killing for purposes other than slaughter

ANIMAL WELFARE

When mass killing is required, there are three critical points in which animal welfare must be considered:

1. **Animal handling prior to killing**
2. **Effectiveness and choice of the stun/kill method**
3. **Confirmation of death**

1. Animal handling prior to killing

When handling animals low-stress handling techniques must be used, to handle animals in a calm and quiet manner with an awareness of their flight zone. Any animal handling or restraint must occur in a way that does not cause pain, injury, suffering or distress to the animal.

Some welfare situations should override disease control/eradication considerations in regard to, the order and priority certain animals are given during the mass killing process. Some of these welfare situations may include:

- animals that cannot obtain feed or water or that have compromised shelter/housing, should be killed as a matter of priority
- sick and distressed animals should be killed before healthy animals
- young and unweaned animals should be killed before or at the same time as their mothers
- special consideration must be given to animals in parturition or late pregnancy
- potentially dangerous or aggressive animals (such as bulls, sows with litters, or boars).

2. Effectiveness and choice of killing method

The aim of the killing method is to humanely kill animals. RSPCA Australia defines humane killing as when an animal is either killed instantly or rendered insensible until death, without pain, suffering or distress. When possible, the method of mass killing should be the same or similar to methods used for standard on-farm killing of sick/injured animals or killing of animals determined unfit for human consumption at the time of slaughter.

Animal-related factors that must be considered when choosing the most appropriate killing method include:

- type of infectious agent and sampling considerations
- species and age of animals to be killed
- number of animals involved
- state of domestication (tame, handled, wild)
- stress and handling of animals
- location and housing system of the farm
- method and location of killing (on-farm, move to another location, slaughterhouse/abattoir)
- presence of other nearby farms/premises with animals
- removal, disposal and destruction of carcasses

Other factors that must also be consider when choosing the most appropriate killing method include:

- public safety risk (i.e. zoonotic disease)
- facilities on farm
- availability of trained staff/equipment
- response time frame
- biosecurity and environmental issues
- decontamination
- human health and safety
- legal and regulatory requirements
- financial cost

3. Confirmation of death

After the killing method has been applied, at least three signs to confirm death must be checked on each individual animal. Signs to confirm death may include:

- loss of consciousness (not enough in itself, as the animal may only be stunned)
- absence of rhythmic respiratory movements (may also be temporary respiratory failure)
- loss of corneal reflex or 'blink' (also happens in heavily anaesthetised animals)
- pupillary dilation
- glazing of the eyes (cornea becomes opaque, dry and wrinkled)
- absence of heartbeat (requires expertise to detect; heartbeat can persist for some minutes)
- absence of a pulse (requires expertise to detect)
- loss of colour in the mucous membranes (become pale and mottled, without refill)
- lack of response to painful stimuli or withdrawal reflex (not a reliable method)
- lack of jaw muscle tension and slack tongue (may be difficult to determine)
- rigor mortis (onset after several hours).

Pigs

Mass killing methods

Methods for mass killing of pigs currently accepted include:
carbon dioxide gas, captive bolt (penetrating for adults and non-penetrating for piglets), gunshot, and lethal intravenous injection.

Carbon dioxide gas (CO_2) – often only practical and possible on farm in piglets <5kgs

Option for piglets <5kg in small purpose-built containers, in which multiple piglets can be killed at the same time.

Method

- A gradual displacement method is less likely to cause pain as unconsciousness should occur before ocular and nasal nociceptor activation by carbonic acid.
- CO_2 should be introduced at a constant rate of 10-30% of container volume per minute to avoid sudden exposure to high concentrations. Pigs do not appear to respond to CO_2 concentrations of <30%.
- CO_2 concentrations of >70% should be achieved after loss of consciousness to ensure death.
- CO_2 should be maintained for at least a minute after respiratory arrest is observed.
    - Pigs should be kept in chamber for at least 20 minutes to ensure death. Currently there is not enough research on time lengths required to achieve death from CO_2 in pigs. The AVMA guidelines states that when in an appropriate container with a displacement rate at 20% container volume per minute for 5 minutes, should cause unconsciousness within 2 minutes and death within 10 minutes.

Welfare considerations

- Gas inlet and gas flow must not be in direct contact with piglets to avoid the risk of freezing piglets if placed in direct contact with liquid/gas before unconsciousness.
- Piglets must not be exposed to CO_2 concentrations of >30% until unconscious.
- Ensure container allows for visual observation of piglets during gas exposure.
- Gas concentration, temperature and flow rate must be monitored at all times.
- Behavioural responses to CO_2 can differ due to pig genetics, with more excitable breeds often having more adverse reactions in comparison to calmer breeds.
- Whole shed gas killing is currently not possible for adult pigs due to technical issues and carcass removal challenges.
- On-farm gas container killing is possible but currently often not practical for adult pigs due to time limitations and need for specialised equipment and construction.

Non-penetrating captive bolt – only in piglets <5kgs

The Zephyr euthanasia and a modified CASH Special captive bolt devices have both been shown to be effective at killing piglets.

Method

- Same placement and method should be used as the penetrating captive bolt used in adult pigs (see below).

Welfare considerations

- Requires individual handling, catching and restraint of piglets.
- Captive bolt guns are at risk of over-heating with repeated use therefore it is essential that multiple captive bolt guns are available, and use is rotated.
- Correct positioning when firing is essential to ensure animals are effectively killed.

Penetrating captive bolt – piglets/pigs >5kgs

Captive bolt gun must be designed and calibrated for adult pigs.

Method

- A frontal shot should be used. This is midway across the forehead (for adult pigs) and ~2cm above eye level slightly off centre.
- Death must be ensured by a secondary method such as pithing or exsanguination after, this is especially important in adult sows and boars where captive bolt use may only cause unconsciousness not death due to their thick skulls.
- After bolt administration there can be a significant period of involuntary muscle movement (considerations must be made for live animals in close proximity and for staff safety).

Welfare considerations

- Handling considerations by pig age/weight:
    - Weaners (5-25kgs) should be either confined to small pens or caught and restrained individually.
    - Growers and finishers (25-100kgs) should be confined to small pens, races or single-deck transport vehicles (as appropriate) when using a captive bolt gun.
    - Gilts, sows and boars (>100kgs) should be held in pens with sufficient space so as not to cause distress in pigs.
    - Nursing sows in farrowing crates should be removed from farrowing crates before being killed. Unweaned piglets must be killed concurrently with their mothers.
- Requires individual handling, catching and restraint of pigs.
- Captive bolt guns are at risk of over-heating with repeated use therefore it is essential that multiple captive bolt guns are available, and use is rotated.
- Correct positioning when firing is essential to ensure animals are effectively killed.
- Pithing or exsanguination is essential after, especially for adult pigs to ensure death.

Firearms, free bullet – only for pigs >5kgs that are unable to be caught or handled.

Firearms should only be used in pigs >5kgs when they are unable to be caught or handled such as in outdoor production systems.

Method

- When using firearms, a frontal shot should be used. However, a temporal shot is acceptable in adult pigs only if unable to achieve an appropriate frontal shot.

Welfare considerations

- The type of gun and bullet must be appropriate for the age and size of the pigs as well as the distance in which the shooting is taking place.
- Pigs should be moved into small yards/pens if possible, to allow for more accurate aiming of the firearm and to facilitate carcass collection/disposal after death is confirmed.
- Considerations must be given on how animals will be checked following gunshot to ensure death and if pithing or exsanguination as a secondary method is required.

Injectable agents – IV Barbiturates only in piglets <5kgs

Method

- Intravenous (IV) dose rate 100mg/kg Pentobarbital required. This dose rate should only be administered intravenously in conscious animals as via other routes can cause significant irritation to tissue.
- If piglets are unconscious other administration routes such as intracardiac, intraperitoneal, or intrahepatic in unweaned piglets (<1 month old) could be utilised.

Welfare considerations

- Requires individual handling, catching and restraint of pigs.
- Requires appropriate IV administration. Could use automatic syringes to facilitate administration.
- Requires veterinary administration or supervision.