

## The need for monitoring farm animal welfare during mass killing for disease eradication purposes

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### Abstract

The term 'depopulation' is used in this case to describe mass euthanasia or killing of groups of animals on a farm for emergency disease eradication purposes. There are a number of guidelines for monitoring animal welfare during such operations, eg the OIE Terrestrial Health Code and the EU regulation on protection of animals at the time of killing, which can be useful when designing a specific monitoring system for depopulation. In this paper, the responsibilities of the competent authorities are identified, and a systematic approach to monitoring on-farm killing is proposed, including three major critical points: i) animal handling prior to killing; ii) the stun/kill quality, ie the effectiveness of the method used to render the animals unconscious and dead; and iii) confirmation of death prior to carcase disposal. The importance of good biosecurity routines, efficient disease detection systems, relevant training of staff and thorough contingency planning to prevent animal welfare problems from arising is strongly emphasised. It is the responsibility of national competent authorities to provide the appointed official veterinarians in charge of monitoring animal welfare during depopulation with proper tools, including anything from appropriate knowledge and practical checklists to the authority to demand immediate corrective action when necessary, and to develop systems for feedback and incorporation of experiences from previous outbreaks into the national contingency plans.

**Keywords:** animal welfare, biosecurity, contingency planning, depopulation, disease control, euthanasia

### Introduction

The most efficient ways of preventing animal welfare problems during disease eradication operations are to ensure high levels of biosecurity, well-designed surveillance programmes and rapid alert systems for detecting possible outbreaks of different contagious diseases. This way, the need for mass killing will be minimised, and thereby the risk of poor animal welfare during such operations. Nevertheless, disease outbreaks are likely to occur at irregular intervals and may affect several farms in an area or sometimes entire regions or countries. In such cases, killing a large number of animals may be one of the options for controlling the outbreak. It is essential that this is done in a way that does not unduly compromise the welfare of the animals involved, while at the same time the operation must often be carried out rapidly and without unnecessary risks for the workforce involved.

### The concept of depopulation

In this paper, the word 'depopulation' will be used to describe mass killing of animals on a farm for disease control and eradication purposes. In practice, depopulation measures will be applied when diseases are contagious, often referred to as 'exotic' diseases, ie not normally present in the country or region. Such diseases may pose a serious

threat to animal health and to the economy of the farming community and can indirectly threaten food security in vulnerable areas. In some cases the diseases may threaten human health, if they are zoonotic, ie transferrable between animals and humans.

It should be stressed that depopulation is not necessarily a part of all disease control operations. Sometimes there are other options, such as improved biosecurity in adjacent areas, extensive vaccination programmes or treatment of sick animals, or simply surrendering to the presence of the disease. However, sometimes depopulation, which can also be referred to as 'stamping-out', is perceived as the lesser evil, to protect other animals from disease and suffering and to safeguard large monetary values.

Mass euthanasia will often primarily affect infected herds/flocks of farm animals, but may also be used for contact herds where it is considered too risky to wait for the outcome of disease investigation (sampling and analysing) or for other herds located in close vicinity of infected herds (aka pre-emptive slaughter), or for healthy herds which have to be euthanised for animal welfare reasons, for example when routine transport and slaughter cannot be carried out due to transport restriction (aka welfare culls). The issue of overcrowding is particularly relevant for fast-

growing species such as broilers, where the stocking density resulting from the steady growth of the animals will lead to serious animal welfare problems already within one or two weeks past planned slaughter age. Furthermore, farms that are completely dependent on regular and frequent delivery of feed from off-farm sources may relatively rapidly encounter problems when the animals on the premises have consumed all the feed in the silos, and no more feed can be delivered due to biosecurity restrictions. In such cases, euthanasia can be carried out to avoid serious overcrowding, feed shortage etc. Regarding infected herds and contact herds, the decision to depopulate is normally made by the authorities. Regarding animal welfare culls, the legal case is ambiguous, but it can be left to the owner of the animals to decide when to cull a herd (or parts of it) to prevent suffering, unless the animal welfare authorities become involved as the situation deteriorates beyond the point where animal welfare legislation is violated. With the exception of welfare culls, though, it can be said that the decision to depopulate is not primarily a decision made by the individual farmer or farming company but a result of governmental decisions. Such governmental decisions may certainly be the result of economic considerations, based on the intention to maintain disease-free status and avoid immediate trade restrictions.

The killing of healthy animals without the possibility of using the meat for consumption can be seen as an ethical issue and often causes large debate in society. This aspect, however, will not be further discussed here. To mention a few examples to illustrate the magnitude of killing animals for disease control purposes, it has been estimated that 1.8 million pigs were killed during the classical swine flu epidemic in The Netherlands in 1997–1998 (Elbers *et al* 1999). Furthermore, it has been reported that approximately 0.7 million cattle, 5.1 million sheep — plus an unknown number of lamb at foot — and 0.4 million pigs were killed in the foot-and-mouth-disease outbreak in the UK in 2001 (Watkiss & Smith 2005). Since the end of 2003, more than 50 countries have reported various numbers of outbreaks of avian influenza (H5N1) leading to euthanasia of affected poultry flocks during the efforts to minimise the spread of the disease (OIE 2011a). The total number of birds being killed during these disease control efforts is unknown, but depending on the structure of the industry in the regions where the outbreaks have occurred, any single outbreak can involve millions of birds. During the 2003 epidemic of avian influenza in The Netherlands, for example, approximately 30 million birds were killed (Gerritzen *et al* 2006).

### **Animal welfare considerations in relation to depopulation**

The main focus of virtually all contingency plans during a disease eradication operation, especially for zoonotic diseases, will be on preventing further spread of the disease in question to humans or other animals. Speed is often essential to minimise further spread of the disease, but appropriately trained staff and relevant equipment is not always available at short notice. There may also be

concerns about occupational hazards if the animals are potentially dangerous, the methods used are irregular or if the microorganism is known to cause serious or even life-threatening disease in humans. The situation can be very traumatic for both authority staff and farmers involved. While human health and welfare is the main focus in these situations and biosecurity expert involvement is crucial, large-scale on-farm killing operations must also include the involvement of staff with profound knowledge about animal handling in general and animal welfare aspects of such operations in particular. This expertise should be a natural part of the crisis management work and also be involved in the media and public relations.

There are numerous publications, national legislations and guidelines on what methods to choose for on-farm killing for disease control or other purposes (see, for example, Galvin *et al* 2005; Gerritzen *et al* 2006; AVMA 2007; Berg 2007; European Union 2009; Golab 2011; OIE 2011b). The decision to use a particular method will be based on a number of factors, such as the nature of the infectious agent, the species and age of the animals to be killed, the number of animals involved and the time frame given, the location of the farm and the housing conditions, the availability of trained staff and relevant equipment, and also the cost involved. Animals of species normally seen as production animals can be kept as pets (eg pot-bellied pigs, backyard hens), and, in these cases especially the attitude of the owner may influence the choice of method for euthanasia, as a result of the intention to minimise the traumatic experience for an owner who has a more personal relation to the animals involved. According to the OIE guidelines (OIE 2011b) methods used should result in immediate death or immediate loss of consciousness lasting until death. When loss of consciousness is not immediate, the induction of unconsciousness should be the least aversive possible to the animal. This is, in general, very similar to what is expected when slaughtering animals for food or when killing single animals on-farm because of injury or disease.

It is generally recommended that the methods used for mass euthanasia carried out on farms should, whenever possible, be the same as — or similar to — the methods used for standard on-farm killing of sick or injured animals or flocks/animals unfit for slaughter for other reasons. This increases the chance of relevant equipment being readily available, and decreases the risk of failure of stunning or killing due to inexperience or ignorance of staff.

### **Guidelines on depopulation**

In contrast to commercial slaughter, there are very few — if any — pre-designed audit systems or animal welfare assurance schemes covering on-farm depopulation for disease eradication purposes. Furthermore, and also in contrast to commercial slaughter, these events are inherently unpredictable and the conditions under which depopulation usually takes place are far from standardised. Although it can possibly be assumed that serious outbreaks of serious animal diseases will occur sooner or later, neither

the farmers nor the authorities know beforehand what disease it will be, or where or when. In many countries, commercial farms will vary tremendously in size, lay-out and management routines, which makes general contingency planning complicated.

Nevertheless, animal welfare considerations must be incorporated into national contingency planning and emergency preparedness, organisation, training, reporting and follow-up. Detailed provisions on choice of method depending on species and other aspects should be available, including standard operating procedures for each method. Once the authorities have made the decision to apply depopulation as the main strategy during a disease outbreak, part of the focus has to be set on how to avoid unnecessary animal suffering. To be trustworthy, the entire depopulation process has to be monitored from an animal welfare point of view, and a system should be in place to ensure that lessons learned are applied in future handling of such events.

As mentioned above, there are several regulations and guidelines on different levels which to a certain extent cover these aspects. The OIE guidelines can be found in the *Terrestrial Animal Health Code* (OIE 2011b), a document which relates to animal health surveillance in general, with focus on listed diseases and international trade, including prevention and control of disease. There is a specific chapter (7.6) on the killing of animals for disease control purposes. This chapter covers various methods of killing animals under such circumstances, but also includes advice on monitoring of animal welfare, operator safety and biosecurity. The OIE guidelines clearly emphasise that this is a governmental responsibility, to be dealt with by the competent authorities. The guidelines also require a written report to be presented when the depopulation has been completed, describing the euthanasia methods applied and their effect on animal welfare etc. In some respects, the OIE guidelines are quite detailed and prescriptive, in order to facilitate the recognition of roles and responsibilities of the individuals involved. For example, it is clearly stated that there should be an official veterinarian in charge, who appoints personnel and provides guidance during each operation. On each affected premises there should be a specialist team, lead by a team leader and including a veterinarian (or with constant access to veterinary advice), and it is emphasised that the competences and responsibilities of this team leader includes monitoring of animal welfare. It is also stressed that the veterinarian involved must be competent to assess animal welfare, especially the effectiveness of stunning and killing, and to correct any deficiencies. This approach should be encouraged.

Another set of international guidelines, called LEGS (Livestock Emergency Guidelines and Standards project 2009) is also worth mentioning. LEGS is a planning and decision-making tool to support the development of appropriate emergency responses related to livestock, and includes features such as decision-making trees, key indicators and checklists. Although much of the content is universal, it does have a third world focus and addresses all sorts of disasters and humanitarian crises, not just disease control.

In Europe, Regulation 1099/2009 (European Union 2009) will replace the earlier directive 119/93 (European Union 1993) from January 2013 in all EU member states and in countries wanting to export to the EU. In line with the OIE guidelines mentioned above, the EU regulation states that the competent authority responsible for a depopulation operation shall establish an action plan to ensure compliance with the animal welfare regulation, before the commencement of the killing operation, to safeguard the welfare of the animals in the best available conditions. In the preambles of the regulation the problems related to depopulation operations are acknowledged, insofar as stating that whilst it is important that animal welfare rules are complied with at all stages in the process of depopulation, it may occur that under exceptional circumstances compliance with those rules may put human health at risk or significantly slow down the process of eradication of a disease. Accordingly, the competent authorities are given the permission to allow for derogations from certain provisions, on a case-by-case basis. Nevertheless, it is stressed that such derogations should not be a substitute for proper planning.

Furthermore, the legislators have responded to the increasing public demand for transparency by including a requirement that reports on depopulation operations are made available publicly online, including information on the reasons for the depopulation, the number and species of the animals killed, the methods used, description of the difficulties encountered and, where appropriate, solutions found to alleviate or minimise the suffering of the animals concerned.

### Monitoring on-farm euthanasia

According to the *Oxford Dictionary*, the term ‘monitoring’ means to ‘observe and check the progress or quality of (something) over a period of time; keep under systematic review’. This means that the word monitoring is usually used to describe the process of record-keeping, report writing and documenting. However, these actions are quite pointless unless combined with corrective action when necessary, and with learning from previous experiences and difficulties. Hence, when using the term monitoring in this context, the latter steps are usually also included.

There are three major critical points to be monitored: i) animal handling prior to killing; ii) the stun quality, ie the effectiveness of the method used to render the animals unconscious and dead; and iii) confirmation of death prior to carcase disposal. In line with the reasoning above, everybody involved in the operation should know their roles and responsibilities and accept the responsibility for their own actions and the results of these, and everybody should therefore participate in monitoring. Nevertheless, it is always recommended to have a specific person assigned to the task of overall monitoring of animal welfare on the site, and this person — be it a veterinarian or someone else with a suitable background — must have thorough knowledge of animal behaviour, physiology and signs of pain or suffering in this context. Below, this person is referred to as the person in charge of animal welfare monitoring.

Regarding animal handling, it is essential that the staff involved are properly trained and instructed, and provided with personal protective equipment to avoid exposure to zoonotic agents. Sometimes animals can be euthanised in their home pens; in other cases they will have to be caught and brought to another spot on the premises before killing can commence. In general, animals should be moved as little as possible, as moving them in an unfamiliar way to an unfamiliar place will increase the stress level of both animals and staff, and hence the risks involved. Sometimes, however, moving the animals cannot be avoided in order to be able to properly stun and kill them, for example by herding a group of sheep kept on pasture to a mobile pen where they can then be euthanised when kept under control. The person in charge of animal welfare monitoring should verify that all pieces of equipment necessary for safe handling of the animals, such as halters, mobile pens and gates, are available before the operations start. This also includes equipment related to human safety, such as personal protective clothing (Galvin *et al* 2005). Furthermore, this person should verify that there is enough space to handle the animals in a safe way. Apart from obvious human health risks, it can be assumed that if staff are afraid to get injured due to poorly designed handling facilities, they may be less observant on animal welfare. Action should be taken to ensure that animals can be handled without unnecessary disturbance, for example by making sure that media representatives are keeping a safe distance (which is of course also important for biosecurity reasons) and that helicopters sent out by television broadcasting companies are not hovering over the premises. Finally, the person in charge of animal welfare must verify that all the necessary equipment for stunning and killing the animals is present and functioning before killing commences.

During the operation, stun quality should be monitored frequently, to ensure that all animals are properly stunned and killed. If, for example, a captive bolt or a rifle with a free bullet is used to stun the animals, the weapon and ammunition used should be designed for the species and size of the animals in question. For captive-bolt guns, there is a need for cleaning and maintenance regularly during an operation. As the weapon can get very hot during intensive use, several guns are normally needed for rotation. After shooting, death should normally be ensured by pithing whenever exsanguination is not appropriate, and for biosecurity reasons disposable pithing rods are recommended. If electrical stunning is used, it should be immediately followed by electrocution, ie by using an appropriate current level and placing the electrodes in a manner that ensures permanent cardiac arrest. In any case, the indicators of a proper stun are basically the same as when using these stunning methods for conventional slaughter. Examples of such indicators can be found in the EFSA report on welfare aspects of animal stunning and killing (Anonymous 2004). There are also various reports from the Welfare Quality® project describing possible monitoring systems and protocols for the assessment of animal welfare in abattoirs (see, for example, Sandström *et al* 2008), which may be

used — where applicable — for monitoring of animal welfare during on-farm depopulation.

If a lethal gas, including liquefied gas, is used to euthanise the animals, the person in charge of monitoring animal welfare should verify that the concentration of the gas is appropriate and the exposure time long enough to ensure that all animals in the container or house in question are exposed to lethal amounts of gas. If individual intravenous or intraperitoneal injections are used, monitoring should focus on verifying that a lethal dose of the fluid is administered in a correct way to ensure rapid death without prior aversive reactions.

Finally, it must be verified that death is properly confirmed for each individual animal prior to carcass disposal. Inherently, mass euthanasia often involves a large number of animals on each premise and operations are often carried out with great haste. Nevertheless, it is never acceptable to fail to ensure that all animals are irreversibly dead before they are buried or incinerated. This may sound as stating the obvious, but experience shows that this has not always been the case in the past. It should, however, be acknowledged that this is not necessarily an easy task, as the depopulation may result in a considerable number of animals lying dead on top of each other (for example when using whole-house gas to kill laying hens in loose-housing systems) and that there can be aspects of human health risks to take into account, if the disease in question is a highly contagious zoonosis. For animal welfare reasons it is still vital that there is a systematic approach to this issue. Depending on the species, the number of animals involved and the nature of the disease agent, a number of different indicators can be used, often in combination. Examples are absence of heartbeat, cessation of respiration (Galvin *et al* 2005), absence of corneal reflex (however, corneal reflex can be absent also in animals which are only deeply unconscious), absence of movement over a period of several hours and presence of *rigor mortis*.

In summary, the assignments for each and everyone involved must be very clear. The official veterinarian appointed by the authorities has the overall responsibility for animal welfare during a depopulation operation, and one person should be in charge of animal welfare on each site, including writing the report (Galvin *et al* 2005). This person must be given proper authority to act in case of non-compliance with the guidelines set up for the operation. One person (which could be the same person or different individuals, depending on the scale of the operation) should be responsible for monitoring animal welfare during each step mentioned above, ie handling, stunning/killing and confirmation of death, as described above.

Furthermore, there should be a system in place for evaluating animal welfare on-site, giving immediate feedback to the staff involved after each farm. Finally, there should be a system for gathering reports from each premise, to result in useful evaluation, feedback and discussion also at the regional and national levels. Lessons learned should be included in the national contingency plans, for continuous improvement of the procedures.

## Animal welfare implications and conclusion

There are several guidelines available related to animal welfare during euthanasia for disease control and both the OIE guidelines (OIE 2011b) and the upcoming EU regulation (European Union 2009) are useful in this context, but there is still an urgent need for developing on-farm monitoring systems, including checklists, for animal welfare during depopulation. Such a systematic approach should focus on the three major steps in the process, ie live animal handling, stun/kill quality and confirmation of death prior to disposal of the carcasses. It is the responsibility of national competent authorities to provide the appointed veterinarians in charge of monitoring animal welfare during depopulation with such tools, including the authority to demand immediate corrective action when necessary, and to develop systems for feedback and incorporation of experiences from previous outbreaks into the national contingency plans.

If the national authorities fail to do so there is an obvious risk that animals, which have to be killed for disease control purposes, will be exposed to unnecessary suffering during depopulation. Inefficient attempts to euthanise animals are not only unacceptable from an animal welfare point of view, but may also result in less efficient disease control and thereby an increase in the risk of more animals becoming infected. This may lead to risks related to human health and welfare. This problem is partly related to the type of animals handled (large animals, especially if handled poorly or when injured, are more likely to cause severe physical injury to humans) and partly to the type of disease agent involved, as some zoonotic diseases may require extreme caution to avoid spread to humans. In addition to this, large on-farm killing operations are often perceived as mentally traumatic and stressful by the staff and owners involved, and counselling or other types of psychological help and support should be made available. If the best available techniques for handling and stunning/killing of the animals are applied, both the people directly involved and the general public can, to a greater extent, be expected to understand that there is not necessarily a major contradiction between efficient disease control and acceptable animal welfare.

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