EMERGENCY KILLING OF POULTRY DURING DISEASE OUTBREAKS IN THE NORDIC COUNTRIES

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SUMMARY

This presentation summarizes methods available for killing poultry during outbreaks of epizootic or zoonotic diseases. Available methods for killing poultry are listed and discussed with relation to practical aspects, biosecurity, animal welfare, occupational hazards and other pros and cons of each method. The stunning methods mentioned are blow to the head, electrical stunning and captive bold stunning, all mainly applicable for small or possibly medium-sized farms. The killing methods discussed are bleeding, neck dislocation, maceration, injection of barbiturates, carbon dioxide (in-house, in containers, in flow-containers), nitrogen and argon gas, of which some are suitable also for large poultry flocks.

Keywords: animal welfare, biosecurity, carbon dioxide, epizootic, euthanasia, gas killing, stunning

OBJECTIVE

This presentation aims at summarizing the various methods available for killing poultry during outbreaks of epizootic or zoonotic diseases, such as Avian Influenza. It is generally acknowledged that from a worldwide perspective, animal welfare has often been severely compromised during efforts to control such disease outbreaks, although there are methods available which could have been considered both efficient from a disease control perspective and acceptable from an animal welfare perspective.

METHODS

This presentation is based on a document produced after a Pan-Nordic meeting on Avian Influenza (AI) in Copenhagen 2006. It covers different options regarding the killing methods that may be used during a possible future outbreak of AI or other epizootic diseases in poultry in the Nordic countries. The document is based on scientific knowledge and practical experiences, both from the Nordic countries and from other parts of the world. The content of the EG Directive 93/119 on the Slaughter and Killing of Animals has been taken into account, as has the Scientific Report of the Scientific Panel for Animal Health and Welfare on a request from the Commission related to welfare aspects of animal stunning and killing methods (Question N° EFSA-Q-2003-093), the Scientific Opinion on Animal Health and Welfare aspects of Avian Influenza (EFSA-Q-2004-075) and the OIE Terrestrial Animal Health Code 2005. The EG Directive 93/119 lists a number of methods which can be used for killing (Annex C), but leaves the field relatively open

for other methods to be used for disease control purposes (Annex E), as long as they adhere to the basic requirements to spare the animals any avoidable excitement, pain or suffering during the process.

RESULTS

Bisecurity

When killing birds during a disease outbreak the main objective is efficient disease control, i.e. to prevent further spreading of the disease in question. Both infected and non-infected flocks may be killed in the process of trying to stop further spreading of an infection. From this, it is obvious that a very important factor when choosing a killing method is its efficiency from a disease control and biosecurity perspective. It must be easily and rapidly available, and the capacity must be large enough to cover all poultry holdings in an infected region and surrounding areas in a relatively short time. However, other factors must also be taken into account.

Animal welfare

Animal welfare consequences must be considered, and the method chosen should involve as little stress, pain or suffering as possible. Basically, one should strive for the same level of animal welfare during emergency killings as during planned killings or standard slaughter. This means that a killing method should either cause immediate death, or sedation followed by death, or death in already stunned/unconscious animals. In general, it should involve as little manual handling of the birds as possible, as birds in large commercial flocks are not used to manual handling and may perceive catching and handling as very stressful.

Workers' safety

Furthermore, operators' safety is a crucial aspect. The method chosen must be safe for the staff involved in carrying out the culling, both with respect to not involving unnecessary risks itself, and by not risking spreading the infection to humans, if it is a zoonosis.

Practical considerations to be made

From a practical point of view, a number of other aspects will also influence the choice of killing method. Such factors are: Type of birds – domestic poultry or wild birds? Species – chickens, turkeys, ducks…? Flock size – Ten birds or 100 000 birds at one site? Age – day olds or adult birds? Body weight – is it possible to carry out manual procedures? Housing system – is it possible to catch the birds? Can the house be sealed?

Contingency plans and training of staff

Whichever method chosen, it is important that the staff involved is well trained for their task and skilled in carrying it out. Contingency plans and basic training should preferably involve technical aspects (how to carry out the different procedures from a technical point of view), practical aspects (back-up, logistics, etc.), animal welfare aspects and also psychological aspects (killing and handling large numbers of dead birds is often very mentally tiring). Poorly trained staff is a risk factor for unsuccessful flock killings, resulting in anything from human frustration and anger or poor animal welfare to inefficient disease control or even disease spreading. It is advisable

always to have an experienced veterinarian present during the entire process. Vets are often also involved in taking blood samples or other types of samples from the birds when the flock is killed. During a larger outbreak of an epizootic disease it can be difficult to find the necessary number of vets with substantial poultry experience. A plan for rapidly training vets who are normally engaged in general farm animal practice should therefore be considered. The applied decision process will have to be well established before an outbreak is even diagnosed, in order to work in the field during an outbreak.

Stunning: Blow to the head

This method is rapid and efficient when carried out properly. Proper practical training and instruction of staff is crucial. However, the method is not suitable for larger flocks, as it is time consuming, tiring and requires large staff, and should preferably only be used at small farms. After stunning, the birds can be killed by neck dislocation or bleeding.

Stunning: Electrical stunning

Small, handheld electrical stunners are commercially available. They are used for small scale poultry slaughter and are relatively easy to use on all poultry species. Such stunners can also easily be mounted on a wall to facilitate rapid stunning of larger numbers of birds. These stunners are suitable for small and mid-size farms.

In some countries, mobile containers incorporating standard electrical water-bath stunners for killing poultry are available. In this case, the stunning is immediately followed by an automatic neck cutter for killing by bleeding. Such mobile containers can kill a relatively high number of birds and may therefore be suitable for mid-size farms, but they can be difficult to clean and disinfect, and transporting them between farms might be considered a biosecurity risk. Using a low frequency and high current setting will lead to cardiac arrest in the birds, and the method can then be considered to be a stun-to-kill method, which eliminates the need for bleeding.

Stunning: Captive-bolt stunning

Captive-bolt guns designed specifically for poultry are commercially available. Depending on what species is involved, a flat or a cone-shaped bolt head can be used. Under non-emergency conditions, the use of a captive-bolt gun should be followed by killing using another method, such as neck dislocation or bleeding. However, the damage to the skull caused by the bolt is normally enough to cause the immediate death of the bird. In an emergency killing situation, omitting the bleeding procedure can therefore be considered.

Killing: Bleeding

Death by a rapid bleed out after the severing of both carotid arteries is the standard procedure during slaughter of poultry, and can of course also be used for emergency killing, unless it is found to be inappropriate from a biosecurity perspective, which is often the case.

Killing: Neck dislocation

Neck dislocation is a method often used by poultry farmers to kill sick or injured birds during the production period. Neck dislocation should be carried out by rapidly stretching and twisting the neck, in order to achieve a separation of the vertebrae and a rupture of the blood vessels. If the dislocation occurs in the upper part of the neck, between the skull and the first cervical vertebra,

there may be damage in the lower parts of the brain, causing immediate unconsciousness and death. However, if the dislocation occurs further down, there is a risk that immediate unconsciousness is not achieved. Because of this, birds should be stunned before killing by neck dislocation is carried out. For very small chicks, approximately under the age of 2 weeks, neck dislocation can be carried out in an acceptable way without prior stunning. When killing hens, broilers and other birds with a body weight up to approximately 3 kg (5 kg if staff is experienced and well trained), neck dislocation can usually be carried out manually without any special equipment, which is one of the advantages of the method. For larger birds, like geese, it is often necessary to use mechanical aids. The method is suitable for small flocks only, as the work is quite strenuous, but can sometimes also be used for mid-sized flocks when other options are not available. Neck dislocation is not an aesthetically pleasing method.

Killing: Maceration (Instantaneous Mechanical Destruction, IMD)

Maceration, which is done by placing chicks in a homogenizer with a rapidly rotating knife, is commonly used for killing malformed chicks or surplus male layer chicks at hatcheries. If carried out correctly, the method leads to instant death in the chickens. It can be used during a disease outbreak for killing day-old chicks at hatcheries.

Killing: Barbiturates

Killing birds by injecting a barbiturate solution (sodium pentobarbital) is very time consuming. A very rapid effect is seen when injecting the fluid intravenously, but this procedure requires skilled personnel. When injecting the fluid intra-abdominally some birds may react, as the substance is irritating, and it has been reported that it takes quite some time before the birds die from the injection. An injection given, by mistake, into the air sacks is another possible bird welfare problem, as it is painful and inefficient. In any case, killing by injecting barbiturates is only recommended for very small groups of poultry, or when other methods cannot be used, e.g. due to aspects of blood or tissue sampling for later diagnostics or other analyses. For geese and ducks however, there are only a limited variety of alternatives, and the method can, under certain conditions, be considered a method of choice for these species. Also other types of drugs used in veterinary medicine can be considered for the euthanasia of small numbers of birds.

Killing: Carbon dioxide (CO_2)

CO_2 is a gas which is commercially used to stun broilers and turkeys prior to slaughter. Depending on the concentration of the gas and duration of the exposure, the gas is lethal. CO_2 is a heavy gas that has been shown to be aversive to birds, especially at higher concentrations. Although the method is debated, it is currently commercially used and widely accepted, especially in disease outbreak situations. To avoid some of the aversion, methods have been developed under which the birds are first exposed to a lower concentration of CO_2 to make them unconscious, and after that to a higher concentration (approx 80%), as aversion is not a problem in already unconscious birds. This is technique is used, for example, when broilers are stunned with CO_2 in slaughter plants. If the duration (exposure time) is long enough, it has been reported that birds will die at considerably lower concentrations, like 40%. Nevertheless, some researchers recommend high concentrations, especially when using CO_2 in poultry houses where the process is less well controlled. By using high concentrations of the gas, losses due to poor sealing and problems related to uneven distribution of the gas inside the house can be compensated for to a

certain extent. From an animal welfare point of view it is essential that all birds are killed rapidly, and it can be argued that high concentrations should be used, to be on the safe side.

The use of CO_2 on waterfowl, such as geese and ducks, is controversial. There are reports showing that the method is effective, but several field reports indicate that the time taken to achieve unconsciousness and death is considerably longer in these species than in hens and turkeys, which raises questions from an animal welfare point of view. If possible, other methods should be used.

CO_2 at hatcheries

CO_2 killing is commercially used for killing half-hatched, malformed chicks or male layer chicks at hatcheries. The chicks are placed directly into a small container with a high concentration of CO_2. The method can be used during a disease outbreak for killing day-old (i.e. < 72 h) chicks at hatcheries.

CO_2 in small containers medium containers or large plastic bags

In some countries, spent laying hens are killed by being put into a relatively small or medium sized CO_2 container, a wheelie bin, which is pulled through the aisles between the rows of cages. The CO_2 concentration is relatively high (50% or higher), and only a limited number of birds are placed into the bin at a time. As soon as one layer of birds appears to be dead, a new layer of birds are placed on top of them, and so on until the container is full. The dead birds are then emptied from the bin, and the procedure starts all over again. The method can be questioned from an animal welfare point of view due to the direct exposure to high CO_2 concentrations, and also from an ethical point of view. In an emergency situation however, the tolerance for this would probably be higher than when killing spent hens. An advantage of this system is that the direct exposure to high CO_2 concentrations will result in very rapid loss of consciousness in the birds, compared to, for example, in-house gassing. The method only requires a small amount of CO_2, and the equipment is inexpensive. Compared to in-house gassing, an advantage is that the birds will not be exposed to cold gas, and neither will there be a problem with noise. One disadvantage is that the birds have to be caught before killing, and the system can mainly be considered suitable for small to mid-size farms. It may also be considered for cage farms, where in-house gassing can be difficult. If the containers are to be moved between farms, thorough cleaning and disinfection will be necessary. Other types of containers have also been developed, for example the mid-size steel container system which has a capacity of 25 tonnes, or commercially available systems with double-layer plastic bags. These system works in the same way as the wheelie-bin system, except for the fact that the containers are placed outside the poultry house, and the birds are carried manually to the containers. Because of this these systems can mainly be considered suitable for small to mid-size farms.

CO_2 in flow containers

A Danish egg producer-owned company has constructed a CO_2 container for killing spent hens, designed to improve the killing rate and the animal welfare aspects of this process. The hens are placed into the container directly on a conveyor belt, taking them from a lower concentration of CO_2 to a higher, thereby killing the birds. After this, another conveyor belt brings the birds out of the gas container again, and into a macerator. The resulting pulp can then easily be evacuated into a closed bulk transport vehicle and transported away. According to the company the system has a

capacity of approximately 4000 hens an hour during killing of spent hens, which makes it suitable for mid-size to large farms.

Whole-house CO_2 gas killing

Whole-house killing with CO_2 is used in some countries as an alternative to the slaughtering of spent hens, especially in remote areas or when flocks are deemed unfit for transport or consumption. It has also been used in some European countries during recent AI outbreaks. The method is generally considered acceptable when used in a disease control situation, although it should be recognized that it has several drawbacks from an animal welfare point of view. When dealing with poultry diseases that pose a danger to human health, the hazards related to catching live birds inside poultry houses must be considered before a decision on the method for killing the birds is made. The method is only suitable if the poultry houses are designed in a way which allows them to be reasonably sealed, although it is not necessary to achieve complete closing up. The main advantage of the method is that there is no need to catch the birds before killing. This speeds up the process, especially on large farms, and also decreases the risks of exposing humans to whatever infection prompted the killing. The method is relatively quick; there are studies indicating a time frame of approximately 10–15 minutes from the start of the procedure until no hens show signs of consciousness. This, however, will depend on the size of the house and the number of gas inlets.

Killing: Nitrogen

Nitrogen is an inert gas; it's odourless and tasteless, does not induce a sense of breathlessness and does thus not cause aversive reactions in the birds. It can, if mixed with CO_2, be used for killing poultry in containers. Trials have also been carried out using liquid nitrogen for the in-house killing of laying hens in battery cage systems.

Killing: Argon

Argon is an inert, heavy, non-explosive gas, which can be used to kill poultry and other animals. In some countries, argon is used for stunning (and in reality also killing) poultry at slaughter plants. Argon is considered an animal welfare friendly gas, as it is odourless and does not cause aversive reactions. It has been shown to work well both for hens, turkey, ducks and geese. It is also considered relatively safe to handle. However, the gas and the necessary equipment are quite expensive and therefore not considered suitable for in-house killing. Argon can be mixed with CO_2 (80%/20%) for container use and might be used for on-farm killing. Such trials have been carried out, mainly in the UK. This system is referred to as the 'containerised gassing unit' (CGU), and is basically a steel chamber in which two sets of standard transport modules with birds are placed before the gas is fed into the CGU, after which death follows very rapidly.

Killing: Carbon monoxide (CO)

Using pure carbon monoxide to kill poultry is regarded as an efficient method. However, it has been questioned if the method is acceptable from an animal welfare point of view, as it has been reported to cause convulsions before the onset of unconsciousness. Usually, the birds are then placed in containers with CO. The primary reason for not using CO is the occupational hazard, as CO is lethal at rather low concentrations and carries a risk of explosion, thus constituting a considerable health and safety risk for the staff involved.

Killing: Shotgun

Using a shotgun to kill birds is not generally recommended. Domestic birds should instead be possible to catch or keep inside a building or a pen. Semi-wild birds reared in enclosures and later released but fed by humans in a limited area may be killed by shooting, but only if catching is unsuccessful. It can be considered contra-indicated to hunt wild birds using a shotgun if a contagious disease is thought to be present in a specific area – it may actually scare and scatter the possibly infected birds over a larger area, thereby increasing the risk of spreading the disease.

Killing: Alphachloralose

The feeding of the lethal substance alphachloralose can be used to facilitate the catching of semi-wild birds in enclosures. As the method often causes unconsciousness but not death, death should always be confirmed using another, more reliable method, and therefore the method is not generally recommended.

Other methods

There is currently research being undertaken on developing a type of foam, similar to fire-fighting foam, for in-house killing of poultry, but until further details of the substances involved and their effects on the birds are known, and reliable reports on bird welfare aspects, operators' safety aspects and biosecurity aspects are available, the method cannot be generally recommended.

Cyanide gas, which is extremely toxic, has previously been a widespread method for in-house poultry killing, but due to questions related to animal welfare and obvious aspects of workers' safety it is no longer recommended when other alternatives are available.

There are several methods which are generally not considered acceptable, mainly for animal welfare reasons but also because some of them would not be optimal from a biosecurity / disease control point of view. Therefore, the following methods should be avoided under any circumstances: Placing live birds in plastic bags and burning them; using impure carbon monoxide (exhaust fumes) for gassing, any type of blunt trauma except a blow to the head for a limited number of birds; drowning; suffocation; and decapitation of non-stunned birds.

CONCLUSIONS

It is concluded that a variety of methods for on-farm killing of poultry during disease outbreaks are available, and that several of them can be considered acceptable from an animal welfare point of view. It is also concluded that a separate decision regarding the method of choice will have to be made for each farm in each case of disease. Furthermore, it is concluded that it is essential to have contingency plans elaborating on these aspects beforehand, as the decision process will have to be very rapid once an outbreak has been diagnosed.

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