AN UPDATE ON HUMANE METHODS OF KILLING OF POULTRY IN EMERGENCIES

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OVERVIEW

- Essentials of humane killing
- Some “traditional methods”
- New developments
INTENTIONS OF KILLING ANIMALS FOR DISEASE CONTROL PURPOSES

• Protecting human health

• Eliminating suffering in diseased animals

• Preventing suffering in susceptible animals

• Maintaining healthy herd or flock

• Sustaining viable farming food supply chain
HUMANE KILLING

- Humane killing is carried out as soon as it is required/possible
- Method of choice should
  - minimise animal fear, suffering, pain and distress
  - cause instantaneous death
  - or instantaneous loss of consciousness that lasts until death
  - if the loss of consciousness or death is not immediate, induction must be non aversive
# WELFARE KILLING

## HPAI OUTBREA IN CANADA 2004

<table>
<thead>
<tr>
<th>Total # birds =</th>
<th>18,900,000</th>
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</thead>
<tbody>
<tr>
<td>Total # Properties=</td>
<td>590</td>
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**Negative Birds =** 17,642,000
- Disposal Completed: Market, Rendering, Composting 14,570,586
  - # Premises: 297
  - # Remaining: 3,071,504
  - # Premises: 253

**Positive Birds =** 1,257,910
- Disposal Completed: # Premises 41
  - # Birds: 1,257,910
  - # Premises: 40
  - # Birds remaining: 0
  - # Premises remaining: 0

**Total# Birds Remaining** 3,071,504

**Total # Birds Disposed** 15,878,496

% Left = 16%
EFFECTIVE PREPARATIONS

- Contingency planning including animal welfare
- Training in advance (key staff)
- Engagement with stakeholders
- List of key experts and team members required
- To some extent people who have other jobs and duties will need to be requested to be available for immediate engagement at very short notice
WORKFORCE AND EXPERTISE

- Team leader
- Veterinarian(s)
- Animal handlers
- Animal killing personnel
- Carcass disposal staff
- Farmer’s knowledge and experience
- Other assistance
METHODS AND EQUIPMENT LIMITS AND CRITERIA

- Nature of disease (e.g. notifiable) or disaster (e.g. floods)
- Location of farm, terrain (transport of equipment)
- Species, number, size and age of animals
- Biosecurity and operators’ health and safety
- Infrastructure
- Availability of resources and expertise
- Cost and efficiency of method
- Isolated outbreak or multiple outbreaks
- Commercial farming or backyard or mixture of both
KILLING METHODS (POULTRY)

- MECHANICAL KILLING
  - Maceration – newly hatched chicks / unconscious poultry
  - Neck dislocation / decapitation of poultry species in small numbers

- ELECTRICAL KILLING
  - Electrical stunning and bleeding / electrocution

- CONTROLLED ATMOSPHERE KILLING
  - Gas mixtures – containerised and whole house gassing systems for poultry using gas mixtures / inert gases
  - High expansion low density foam filled with inert gases (Nitrogen, CO2) for poultry
  - CO2 in form of dry ice
  - Exposure to gas mixture followed by maceration of poultry

- CHEMICAL
  - Anaesthetics in feed or water - poultry and other birds followed by killing (maceration) or other killing methods
MECHANICAL: NECK DISLOCATION
MECHANICAL: CAPTIVE BOLT

Cartridge

Compressed air
ELECTRICAL: HEAD-ONLY STUNNING FOLLOWED BY BLEEDING OR NECK DISLOCATION
MOBILE ELECTROCUTION (WATER BATH)
WHOLE HOUSE GASSING (WHG)
WHG WITH CO2

• Advantages
  - no handling of birds

• Disadvantages
  - Takes a time
  - Some birds are exposed to cold shock before death
  - Requires electricity supply (expansion of CO2 may cause freezing of equipment)
  - Large volumes of CO2 are needed
    - 20 l of CO2 produces 90% CA in 13 m³
    - Poultry house of 3x20x50 m = 3000 m³
  - About 200 CO2 bottles each producing (20 l of CO2) are needed for whole house gassing
WHG - BATTERY CAGES !!!!
FOAM METHODS

High expansion foam - filled with 100% nitrogen is causing Anoxia

In the USA a foam method is developed using low expansion - high density firefighting foam – causing suffocation
FIRE FIGHTING FOAM
LOW EXPANSION FOAM (LEF)
AVIFOAM BY KIFCO
GAS IN HIGH EXPANSION FOAM
# AVAILABILITY OF CONCENTRATES

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Ajax/Kidde</th>
<th>Ajax/Kidde</th>
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<tr>
<td>Name</td>
<td>F-5</td>
<td>F-15</td>
<td>F-25</td>
<td>HTF-1000</td>
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<tr>
<td>Type</td>
<td>Standard Synthetic</td>
<td>Standard Synthetic</td>
<td>Standard Synthetic</td>
<td>Special synthetic</td>
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<tr>
<td>Expansion rate</td>
<td>6-1000</td>
<td>6-1000</td>
<td>6-1000</td>
<td>6-1000</td>
</tr>
<tr>
<td>Ph</td>
<td>6.5 – 8.5</td>
<td>6.5 – 8.5</td>
<td>6.5 – 8.5</td>
<td>6.5 – 8.5</td>
</tr>
<tr>
<td>Freezing point</td>
<td>-5 C</td>
<td>-10 C</td>
<td>-25 C</td>
<td>-10 C</td>
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<tr>
<td>50% Drain time</td>
<td>Low expansion - 20 minutes</td>
<td>Medium Expansion - 15 minutes</td>
<td>High Expansion - 10 minutes</td>
<td>High expansion - 10 minutes</td>
</tr>
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HIGH EXPANSION FOAM

• Advantages
  • Lower volumes of gas needed up to 25% of volume needed compare to WHG
  • Little or no handling of poultry
  • Relatively fast method of killing

• Disadvantages
  - Equipment (firefighting equipment)
DESCRIPTION OF EQUIPMENT FOR SMALL APPLICATIONS OF NITROGEN GAS FOAM

The standard equipment:
- A nitrogen gas cylinder, including hoses and a regulator
- Tap water and soap mix, water hoses
- A foam nozzle in which nitrogen and the water/soap solution are mixed
- Measuring and control equipment to monitor the gas concentration
COMPONENTS

Water and foaming agent

Nitrogen

Foam nozzle

High expansion foam
Figure 1: Photographs and descriptions of the laboratory scale foam generator

Figure 2: Diagram showing the main components of the laboratory scale foam generator
FOAM NOZZLE
HIGH EXPANSION GAS FOAM FILLED WITH NITROGEN OR CO2 CAUSES HYPOXEMIC ANOXIA

1. The animal is submerged in nitrogen foam, it inhales an extremely high concentration of nitrogen (higher than 95%, which means that the oxygen concentration is below 5%)
2. After inhaling 10 breaths of nitrogen (30 seconds) birds reaching a state of unconsciousness due to the lack of oxygen
3. As a reaction of the anoxic situation, the animal loses posture and starts to demonstrate convulsions and headshaking
4. After 1.2 to 1.5 minutes, the heart beat stops, causing the animal to die.

Gerritzen et al 2010 Welfare assessment of gas-filled foam as an agent for killing poultry
SPECIAL FEATURES

- **Simplicity**: control, cleaning and disinfection
- **Cost effectiveness**: Low initial investment. Operational costs are very low: only water, soap and nitrogen
- **Stability of the foam**: upper layer of foam (at least 50 cm above the birds) ensures that the concentration of nitrogen that is located beneath the foam layer remains high, in spite of the convulsions of the animal. The nitrogen can not escape. Even during the time that the animal falls through the upper foam layer, the concentration of nitrogen remains intact
- **Safety**: nitrogen is an atmospheric gas - non toxic - safe to transport - the soap has no adverse effects on humans and the environment
- **Animal welfare**: animal dies within 1.5 to 2 minutes as a consequence of the absence of oxygen
- Suitable as replacement of whole house gassing
USE OF CO2 IN CONTAINERS

Carbon dioxide has been used in,

Skips and waste bins

Controlled Atmosphere Killing (CAK) Containers
DRY ICE IN A CULLING BAGS
DRY ICE IN A CULLING BAG BAG
DRY ICE IN A BAG

• 1.3 kg of dry ice produces 70% concentration of CO2 in a 1000 l bag-liner (expansion ratio 1:554)
• Each liner (in a container) can be used for up to 200 kg of live-weight or 80 birds
• Dry ice is put on the bottom of a bag covered with straw
• Concentration is measured - field method – cigarette test
• Birds are placed on the straw – body warmth will increase production of CO2,
• Further birds are added only when the previous batch are dead
SCIENTIFIC REPORTS AND GUIDELINES

Consult:
American Veterinary Medical Association (AVMA)
   http://www.avma.org/issues/animal_welfare/euthanasia.pdf

European Food Safety Authority (EFSA)

World Organisation for Animal Health (OIE)
   http://www.oie.int/eng/normes/mcode/en_chapitre_3.7.6.htm

Gerritzen et al 2010 Welfare assessment of gas-filled foam as an agent for killing poultry
THANK YOU FOR YOUR ATTENTION

Organisation mondiale
de la santé animale

World Organisation
for Animal Health

Organización Mundial
de Sanidad Animal