Water Based-Foam Depopulation: For Poultry During Animal Health Emergencies

During an animal health emergency, the mass depopulation of poultry may be a necessary response task. Various methods for poultry depopulation under emergency situations have been approved. One such method for use for floor-reared poultry is the use of water-based foam.

Mass Depopulation of Poultry

Euthanasia of large numbers of birds in a quick, efficient manner with welfare consideration. The process is used to control disease spread or end suffering of dying birds during disease outbreak or natural disaster situations

Water-Based Foam for Depopulation

- Conditionally approved by USDA
  - Method for mass depopulation for floor-reared poultry under emergency response conditions or potential zoonotic disease

- USDA APHIS Performance Standards for the Use of Water-based Foam as a Method of Mass Depopulation of Domestic Poultry
  - Conditions and criteria for use, including foam size, expansion ratio, depth and efficacy

- USDA standards supported by American Veterinary Medical Association (AVMA)

Advantages of Water-based Foam

- Rapid method for large flocks
- Less handling of birds
  - Less stress on birds
  - Less risk for injury to birds/responders
  - Less exposure to zoonotic diseases
- Fewer personnel required
- Foam flows into small areas/crevices
- Foam builds to required height
- Less biosecurity risk
  - Reduces dust and airborne pathogens
  - Adds moisture for composting
  - Disinfectant may be added
- Clean up of foam is minimal

Disadvantages of Water-based Foam

- Availability and cost
- Trained personnel
- Requires large amounts of water
- Floor-reared birds only
- Advance preparation is needed

USDA-APHIS Foam Standards

- Efficacy
  - 95% within 7 minutes
  - 100% within 15 minutes
- Bubble size
  - Similar to shaving cream
  - Not to exceed 1/16 inch (0.625 inch)
  - Bubbles greater than 1/3 inch (0.33 inch) may not achieve 100 % mortality
  - Larger bubbles may break down when agitated
- Flow/Fluidity
  - Surround the birds completely, without gaps caused by bird movement
  - Completely cover entire poultry house floor and any building supports/structures
  - Be of appropriate consistency that is readily inspired by birds
- Expansion ratio
  - Ratio of volume of foam produced from one unit of solution
  - Medium expansion rate is ideal
    - USDA: 25:1 to 140:1
  - Higher ratio=drier foam
    - More foam needed
    - Foam harder to work with
  - Lower ratio=wetter foam
    - May not accumulate to sufficient depth
- Consistency depends on
  - Temperature and air humidity
  - Water hardness
  - Wind, if present
  - Type of equipment
- Body/Depth
  - Varies with species/age
  - At least 6 inches above bird height
  - Does not determine efficacy

Just-In-Time training materials can be found at http://www.cfsph.iastate.edu/Emergency-Response/just-in-time-training.php
Observe for any species variations
- Persistence or drawdown time
  - Amount of time for foam to degrade
  - USDA – must be at least 30 minutes
- Cleanable, portable equipment

Water
- Rate limiting step - Logistics important!!
- Capacity can be up to 35,000 gallons per day
- Identify water sources prior to procedures
- Water Transport Vehicles
  - Water tenders, farm water truck, fire engines
  - Transfer to dump tank (e.g., 4,000 gallon)
- Water quality can affect foam production
  - Dissolved solids, salinity, pH, hardness
- Biosecurity

Equipment Overview
- Foam Proportioning System
  - Digital system that controls foam quality and allows adjustment as conditions change
- Pump
  - Capable of 250 gpm at least 150 psi
- Hoses
  - Generally 1½ inch
  - Length can affect psi: Estimate loss of 26 psi per 100 feet with 1.5 inch hose
- Nucleation screen
  - Determines bubble size

Foam Concentrate
Proportioning Equipment
Foam Solution
Finished Foam

Foam Depopulation Process
- Before Beginning
  - Trained personnel to properly run equipment
  - Water supply/sources
  - Condense large areas - Construct walls to help obtain/maintain height; seal seams with duct tape
  - Do not overcrowd the birds
- Foam Generator Placement
  - Place generator at one end of facility
  - Connect to hose/pulley at other end
- Foam Generator Operation
  - As the generator pumps foam it retracts the hose as it travels across the house
  - Experienced personnel
    - Equipment operator: Outside
    - Pump operator: Inside
  - Maintain constant foam production i.e., no stopping to refill water tanks
- Foam Degradation
  - Persistence at least 30 minutes, then should degrade quickly on its own
  - Water within the foam will collect near the floor, taking longer to degrade
- Post-foaming Tasks
  - Clean, disinfect depopulation equipment regardless of disease agent present
  - Clean and disinfect all off-farm equipment upon arrival, departure from the farm
- Species Termination Time
  - Euthanasia times may vary with species
  - University of Delaware depopulation study, Dr. Eric R. Benson

Responder Safety
- Qualified personnel to operate and maintain
  - Fire department as possible resource
- Provide appropriate safety training
- Wear appropriate Personal Protective Equipment
  - Have suitable respirator equipment (SCBA, oxygen) available
- Foam is slippery
  - Higher carbon dioxide concentration near floor
  - Anyone working near foam should be observed at all times
- Dermal irritation/eye irritation

Additional Resources

- AVMA Guidelines for the Euthanasia of Animals

- FAD PReP/NAHEMS Guidelines Mass Depopulation and Euthanasia

- Procedures for Humane Euthanasia. Iowa State University College of Veterinary Medicine
  https://vetmed.iastate.edu/vdpam/about/production-animal-medicine/dairy/dairy-extension/humane-euthanasia

  http://www.oie.int/index.php?id=169&L=0&htmfile=chapitre_aw_killing.htm

- University of Delaware. Depopulation. Dr. Eric R. Benson
  http://udel.edu/~ebenson/Depopulation.htm

- USDA APHIS. Use of Water-Based Foam for Depopulation of Poultry
  https://www.avma.org/KB/Policies/Pages/Poultry-Depopulation.aspx

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