Water-based Foam For Mass Depopulation of Poultry

Overview

Mass Depopulation of Poultry

- Euthanasia of large numbers of birds
  - Quickly, efficiently
  - Welfare consideration
- Disease outbreaks
  - Control disease spread to other flocks
  - End suffering of dying birds
- Natural disasters

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 conditions and standards supported by 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
- Decreased labor
  - Fewer personnel required

Advantages

- 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
  - Removal of slats or raised objects
Water-based Foam

- Water
  - Flow (gpm)
  - Pressure (psi)
  - Higher psi breaks down bubble size
  - Lower psi can have too much water

- Foam concentrate
  - 0.3 to 1%

- Air, inert gas, or anesthetic gas
  - Carbon dioxide

Foam Depopulation

- Foam of appropriate consistency and density
- Builds blanket to occlude upper airway
  - Creates atmosphere devoid of oxygen
  - Carbon dioxide causes rapid loss of
    - Consciousness
    - Breathing
    - Heart activity

Water-Based Foam for Depopulation

- 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
  - Foam size, expansion ratio, depth
  - Efficacy

USDA-APHIS Foam Standards

- 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

- Expansion ratio
  - Ratio of volume of foam produced from one unit of solution
  - Higher ratio = drier foam
    - More foam needed
    - Foam harder to work with
  - Lower ratio = wetter foam
    - May not accumulate to sufficient depth

- Medium expansion rate is ideal
  - USDA: 25:1 to 140:1

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
USDA-APHIS Foam Standards

- Consistency depends on
  - Temperature
  - 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

Water

- Rate limiting step
  - Logistics important
- Capacity
  - 25,000-35,000 gallons per day
- Identify sources
- Transport
  - Water tenders
  - Farm water truck
  - Fire engines
  - Transfer to dump tank (e.g., 4,000 gallon)
- Water quality
  - Dissolved solids, salinity, pH, hardness
  - Biosecurity

Equipment Overview

- Foam Proportioning System
  - Digital system
  - Controls foam quality
  - 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 25 psi per 100 feet of 1.5 inch hose
- Nucleation screen
  - Determines bubble size

Types of Foamers

- Nozzle System
  - Hand held
  - Expansion ratio of 35:1
- Generator System
  - Higher expansion ratio - 120:1 to 135:1
  - Less water and personnel

FOAM DEPOPULATION PROCESS

Multi-State Partnership for Security in Agriculture;
Center of Food Security and Public Health

June 2016
Before Beginning
- Trained personnel to properly run equipment
- Water supply/sources
- Condense large areas
  - Construct walls to help obtain/maintain height
    - Plywood and 2x6s
    - Seal seams with duct tape
  - Do not overcrowd

Foam Generator Placement
- Place generator at one end of facility
- Connect to hose/pulley at other end

Foam Generator Operation
- Generator pumps foam and retracts hose as it travels across the house
- Experienced personnel
  - Equipment operator: Outside
  - Pump operator: Inside
- Maintain constant foam production

Foam Degradation
- Persistence at least 30 minutes
- Then degrade quickly to prevent buildup
- 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
- Bar graph showing species termination times (in seconds)
**Responder Safety**

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

**Resources**

- USDA APHIS: Use of Water-Based Foam for Depopulation of Poultry [https://www.avma.org/Policies/Pages/Poultry-Depopulation.aspx](https://www.avma.org/Policies/Pages/Poultry-Depopulation.aspx)
- University of Delaware, Depopulation, Dr. Eric Benson [http://udel.edu/~ebenson/Depopulation.htm](http://udel.edu/~ebenson/Depopulation.htm)

**Acknowledgments**

Development of this presentation was by the Center for Food Security and Public Health at Iowa State University through funding from the Multi-State Partnership for Security in Agriculture.

Authors: Glenda Dvorak, DVM, MPH, DACVPM; Abbey Smith, BS