

MASS DEPOPULATION WITH FOAM

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Summary

Mass depopulation of floor-reared poultry flocks is a very difficult task! Until recently, the options were limited to various methods using carbon dioxide gas with no ideal or best method for all farm situations. During the past two years a team of University of Delaware researchers have developed and validated an alternative mass depopulation method using water-base foam. This emerging technology offers great potential, particularly for flocks with a zoonotic disease and those in structurally damaged houses. The advantages include: less time to depopulate farms, a significant reduction in the number of workers and their potential exposure to a zoonotic disease, less physical activity, suppression of airborne particulates, potential enhancement of the in-house carcass composting process, and greater flexibility of use in various style houses and those structurally damaged. This method does require a significant quantity of water, a supply of foam concentrate, and an investment in foaming equipment. There are two major types of foaming equipment being marketed; 1) a nozzle system, and, 2) a generator system. USDA, APHIS has conditionally approved foam and AVMA has endorsed the use of water-base foam for **emergency mass depopulation**. This technology is being rapidly adopted in the U.S.A. for future mass depopulation response needs.

Introduction

In the event of a highly infectious disease outbreak such as avian influenza (AI) the decision may be made to depopulate the flock in an effort to contain and eradicate the disease outbreak. Being prepared to respond swiftly and effectively to such an event is essential. Preparedness involves having knowledge of options for humane depopulation and environmentally sound disposal procedures that can be implemented in a biosecure manner. Other events that mandate mass depopulation of poultry include flocks contaminated with a chemical residue and structurally damaged houses due to fire and natural disasters such as hurricanes, floods and snow/ice storms.

Mass Depopulation Considerations

There is a distinction between euthanasia and depopulation! The USDA, APHIS recently defined euthanasia as; "involves transitioning of an animal to death as painlessly and stress-free as possible" while mass depopulation: "is a method by which large number of animals must be destroyed quickly and efficiently with as much consideration given to welfare of the animals as practical, but where circumstances and

the task facing those doing the depopulation are understood to be extenuating". In the event of an AI outbreak or natural disaster, the options for mass depopulation have been limited. Mass depopulation of broiler flocks in the U.S.A. has been limited to cervical dislocation (not a real option for large numbers of poultry) and the use of carbon dioxide (CO₂). There are four basic methods of using CO₂ gas for mass depopulation of floor-reared poultry flocks. They include whole or partial house gassing, livehaul cage cabinets or other types of containerized gassing systems, and two methods of gassing birds under polyethylene sheeting. Each method may be best suited for certain bird and house types, and all have many limitations. The recent conditional approval of water-base foam by the USDA and endorsement by AVMA gives the poultry industry another option for **mass depopulation** of flocks. All methods used for mass depopulation, particularly for zoonotic diseases, must take into consideration, and balance, poultry welfare and human health; and must minimize biosecurity risk and logistical challenges.

Mass Depopulation Using Water Base Foam

In the midst of responding to a low pathogenic AI outbreak on the Delmarva Peninsula in 2004, the author proposed using foam (like that used by fire companies) as an alternative method for mass depopulation of broiler flocks. Over the past two years a team of researchers at the University of Delaware (E. Benson, B. Malone, B. Alphin, G. VanWicklen and C. Pope) have conducted numerous experiments to validate and develop this method for mass depopulation. Additional equipment developmental and validation work has been done by North Carolina Department of Agriculture personnel. Similar to chemical-induced hypoxia with CO₂, when broilers are submerged in the **proper consistency** of foam, there is a rapid physically-induced hypoxia via airway obstruction. The **initial** starting conditions under which USDA, APHIS has conditionally approved foam for **emergency mass depopulation** include; floor-reared poultry, poultry with a potentially zoonotic disease, poultry experiencing rapid spreading disease that state or federal officials feel can not be contained by other means, and poultry in damaged buildings that does not allow human entry. Furthermore, USDA, APHIS has drafted performance standards for the water-base foam technology that includes specifications for foam type, consistency, bubble size, fluidity, coverage, application procedure, residence time, time to achieve death, and reproducibility under various operating conditions.

To date, compressed air foam, aerated foam nozzles and modified high expansion foam generator systems have been used successfully. The foam technology has many potential advantages over current depopulation methods. They include: ~one-half to one-third less time to depopulate farms, significant reduction in the number of workers and their potential exposure to a zoonotic disease, less physical activity which can be a major issue when having to conform to the personal protection equipment required in a disease situation, suppression of airborne particulates when the house is blanketed with a layer of foam, potential enhancement of the in-house carcass composting process, and greater flexibility of use in various style houses and those structurally damaged. This method does require a significant quantity of water, a supply of foam concentrate, and an investment in foaming equipment that is dedicated for this purpose.

In the U.S.A. there are two major types of foaming equipment being marketed. A nozzle system, developed in North Carolina uses water and foam concentrate mixed in collapsible tanks on the farm. This mixture is pumped through two hoses (up to 400 ft length) into hand held Spumifer™ nozzles. The aspirated foam mixture has an

expansion ratio of ~35:1 (i.e. 1 gallon of mixture produces 35 gallons of foam). Estimated water requirement when applying foam at 3 foot depth in a house is 320 gallons per 1000 ft². This system may require up to 1 hour per house and a total of 5 workers; 2 operating the nozzles, 2 pulling hoses and 1 operating the pumping systems. The University of Delaware has worked with Kifco, Inc. (<http://www.avi-foam.com/>) to develop a modified high expansion generator system. This system has a mobile foam generator cart connected to a water supply (hose reel). The cart is winched to the end of the house and foam dispensed as the hose pulls the cart back to the reel mounted on the trailer. The water pump, hose reel and foam injection system remains stationary on a trailer at the end doors. Water is suctioned from a collapsible tank on the farm. This system produces foam at a higher expansion (120:1 to 135:1) and uses about one-half the water of the nozzle system (~160 gallons per 1000 ft²). With a dual generator cart system it may require ~30 minutes to foam a house at 3 foot depth with 1 person riding the cart and another person outside at the trailer monitoring the system. Although the foam concentrate is added at 1% rate with both systems, the nozzle and generator system typically uses Class A and high expansion foam concentrates, respectively. These foam concentrates are similar to soap, detergent or shaving cream in terms of composition and characteristics. There is an effort by some poultry companies, state agencies, and/or contractual emergency management firms to secure this technology for future mass depopulation response needs.

In summary, mass depopulation of floor-reared poultry flocks is a very difficult task! Realizing there is no ideal or best depopulation method for all situations, it is important we have options. Mass depopulation using water-base foam is an emerging technology that offers great potential, particularly for flocks with a zoonotic disease and those in structurally damaged houses.