Mortality Management Options During an Avian Influenza Outbreak

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The highly pathogenic avian influenza (HPAI) outbreak has become the largest animal health emergency in U.S. history. As of February 2016, the United States Department of Agriculture (USDA) reports 233 detections (212 commercial facilities and 21 backyard flocks) affecting approximately 50 million birds in 22 states. Impacted farms have remained out of production for several months and trade restrictions have been imposed resulting in economic hardships to both growers and the poultry industry. To date, over $950 million federal dollars have been spent on disease control efforts and indemnities. The last confirmed case of HPAI occurred in January, 2016; however, there is concern of future outbreaks due to the continued migration of waterfowl which serve as a reservoir for avian influenza viruses.

Infected birds have either died from the disease or been euthanized to control disease spread. Proper carcass management is vital for managing nutrients and controlling disease. Improper disposal may cause odor nuisance, spread disease, and the resulting leachate (carcass fluids) could negatively impact water sources. The avian influenza virus may still be present within the carcass and could be spread by insects, rodents, predators, and subsurface or above ground water movement, as well as through direct contact with other birds, leading to increased disease transmission risks. For these reasons, proper mortality management practices must be implemented immediately following a catastrophic event.

Mortality management options that were used during the recent HPAI outbreak include composting, burial, incineration, and landfilling. The most commonly implemented option was mass mortality composting which will be discussed later.

Burial is a disposal method in many states that may be conducted on-site and quickly if acceptable land mass is available. A site assessment is required to determine that local environmental guidelines are followed. Common considerations include location, soil type, depth to groundwater, and distance to waterways. Sandy soils, karst topography or areas with a high water table pose a risk of contaminating groundwater supplies. Researchers have demonstrated the potential transport of carcass leachate components, such as nutrients and bacteria, from burial pits to groundwater (Ritter and Chirnside, 1995; Myers et al., 1999; Glanville, 2000; Pratt and Fonstad, 2009). Avian influenza has been reported to survive for weeks in water depending on variables such as temperature, salinity and pH (Brown et al., 2009) and over 1 year in manure amended soil at 5°C (Elving et al., 2012). Furthermore, portions of carcass can persist for years in an anaerobic environment. During construction projects on former poultry farms, old burial pits have been discovered that contain intact birds (B. Malone, personal communication, August, 21, 2015). For these reasons, burial should be given careful consideration when implementing this method of carcass disposal.

Proper incineration requires a closed air unit, can be conducted on-site and is a pathogen inactivation procedure. Depending on the state, an air quality permit may be required. Several incinerators are required during a large animal disease outbreak. Fuel cost and carcass throughput are important factors to consider when adopting this practice.

If locally available, carcasses may be disposed of at a licensed landfill. Landfilling is considered a form of burial. The landfill must be classified to accept carcasses and permission must be granted from landfill management. Landfilling can be convenient and fast for mass mortality disposal. Considerations include tipping fees, additional handling of mortalities and transportation of infected carcasses in sealed roll-off containers. Transportation off-site may increase biosecurity risks during a disease outbreak.

Mass mortality composting was successfully implemented on several poultry operations during the recent HPAI outbreak. The purpose of mass mortality composting was to use biological heat treatment methods to degrade the carcass, inactivate the avian influenza virus, control odors and reduce fly exposure in a safe, biosecure, and environmentally sustainable manner.

By definition, composting is a controlled biological decomposition process that converts organic matter into a stable, humus-like product. Composting animal carcasses is characterized by microbial breakdown of a large centralized nitrogen source, the carcass, which is surrounded by a carbon source, the bulking agent. The bulking agent supplies carbon for microbial energy while the carcass tissues and fluids supply nitrogen for microbial protein synthesis. Optimal conditions for carcass composting include a carbon to nitrogen ratio of approximately 30:1 and a moisture content of approximately 50% (Kalbasi et al., 2005; Berge et al., 2009). The process begins with an initial breakdown of carcass soft tissue by naturally present microorganisms which produce heat, carbon dioxide, ammonia and volatile organic compounds as by-products (Berge et al., 2009). Following soft tissue decomposition, thorough mixing of the bulking agent and carcass promotes an ideal blend of carbon and nitrogen for optimum composting. The bulking agent traps leachate and odors produced during the process, therefore acting as a biofilter between the carcass and the environment. The continuous high temperatures (> 55°C) achieved through proper composting will destroy most pathogens (Kalbasi et al., 2005; Kalbasi et al., 2006; Wilkinson, 2007) including the avian influenza virus (Elving et al., 2012). Microorganisms will eventually degrade the carcass leaving only a few remaining bones. This valuable by-product can then be land applied as a fertilizer source, recycling nutrients and organic matter to the soil.

Composting mass poultry mortalities is a procedure that can be implemented on most commercial poultry farms. This method requires guidance from a trained composting expert, proper equipment, experienced operators, and sufficient carbon, water and open space. During a disease outbreak, composting inside the poultry house is preferred, if possible, to minimize biosecurity risks and access by scavenging animals. Since carcasses are contained on-farm, composting can be more biosecure compared to methods that transport carcasses off-farm. The USDA avian influenza mortality composting protocol requires a 28 day composting process (USDA, 2015). Hence, in-house poultry mortality composting may delay poultry house cleaning and disinfection efforts resulting in extended down times as compared to other disposal methods. Finally, proper composting can degrade poultry carcasses into a useful soil amendment and fertilizer.

Figure 1. In-house turkey mortality compost windrow.

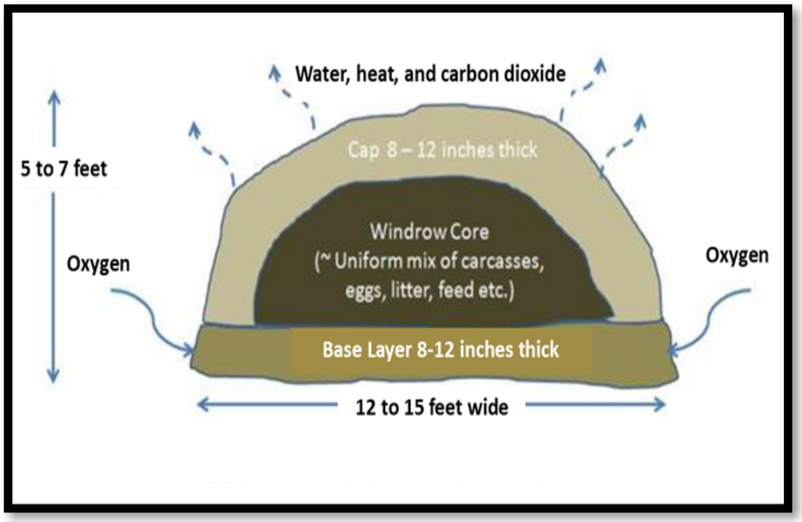

Figure 2. Cross section of a poultry mortality compost windrow. Source: USDA.

Figure 3. Final compost after 28 days with an average as received analysis of 60-46-36 (N-P-K; lbs/ton).

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