Guidelines for In-House Composting Poultry Mortality as a Rapid Response to Avian Influenza

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"Research indicates that Avian Influenza Virus (AIV) can be inactivated in 10 minutes at 140ºF (60ºC) or 90 minutes at 133ºF (56ºC) (Lu et al., 2003)."

SUMMARY OF THE METHOD

Composting is the natural degradation of organic resources (such as poultry carcasses) by microorganisms. Research in Maryland, Delaware, and North Carolina indicates that composting is effective in killing a variety of diseases including avian influenza (AI). In-house composting was successfully used in Delaware and Maryland to control an outbreak of AI. Current research in Virginia indicates that in-house composting can be effective with most bird types and poultry house designs.

Lu et al. (2003) reported that Avian Influenza Virus (AIV) can be inactivated in 10 minutes at 140ºF (60ºC) or 90 minutes at 133ºF (56ºC). Microbial activity within a well-constructed compost pile can generate and maintain temperatures ranging from 130ºF to 150ºF (54ºC to 66ºC) for several weeks, which is sufficient to inactivate the AI virus with generous margins of error.

ADVANTAGES OF IN-HOUSE COMPOSTING

- Contains the disease and limits off-farm disease transmission
- Limits the risks of groundwater and air pollution
- Inactivates pathogens in carcasses and litter
- Limits public concerns over disease exposure
- Relative low cost and uses readily available farm equipment
- Protected from severe weather conditions (frozen ground, etc.)

PLANNING PRIOR TO AN OUTBREAK

- Additional sources of carbon material should be identified and secured to ensure availability.
- Rapid Response Teams, with team leaders and alternates, should be created within each poultry complex to oversee sanitation, depopulation, and in-house composting.
- Rapid Response Team training should include respirator fit testing.
- Worker decontamination plans and equipment should be prepared.
- Movement of carcasses in the houses and equipment brought onto the farm should be limited.
- In-house composting can be done in most poultry houses. Where not possible, composting outside the poultry house using a breathable compost cover or fleece would be an alternative.
- Variations in house designs may require adaptations of euthanasia and windrow construction methods outlined in this fact sheet.

EQUIPMENT AND SUPPLIES

- Skid loader(s), shovels. Tiller and hay spear attachments as needed
- Sawdust, litter, woodchips, or other carbon material
- Compost thermometers (36" or 48" stem length) or wireless/wired temperature probes
- Power washer, disinfecting equipment and recommended disinfectants

A demonstration project of in-house composting of turkeys conducted in Virginia in 2005 showed that tilling and crushing the carcasses increased temperature and decreased downtime by 3 and 11 days respectively.

PROTOCOLS

Prior to euthanizing the flock

- Ensure that all personnel have appropriate personal protective equipment and training.
- Minimize ventilation; raise poultry feeders, and waterers.
- Effective in-house composting must have a minimum of 1.5 pounds of carbon material (based on a 30 lbs/cubic foot material) per pound of bird. (1 lb. of carbon per lb. of bird in the mix and the remaining carbon for cap and cover.)
- Determine total pounds (lbs.) of birds
  - lbs. birds = number of birds X average weight in lbs.
- Determine pounds of litter in house
  - cubic feet of litter = length of house X width of house X depth of litter (in feet)
  - lbs. litter = cubic feet of litter X weight of a cubic foot of litter (Average = 30 lbs; Range = 25 to 35 lbs.)
- Determine amount of additional carbon needed
  - total lbs. carbon needed = lbs. birds X 1.5
  - Cubic yards of additional carbon needed = (total lbs. carbon needed – lbs. litter in house)/(weight per cubic ft. of carbon material)/(27)
    - woodchips, litter or wet sawdust = 30 lbs./cubic ft.
    - dry sawdust = 15 lbs./cubic ft. (due to low density, volume can be reduced by 50%)
- Mobilize euthanasia, composting, and sanitation crews.

Euthanizing the flock

- Birds may be confined to a portion of the house for euthanasia (see Figure 1). If whole-house euthanasia methods are used, windrow construction procedures will differ. (Tablante and Malone, 2005)

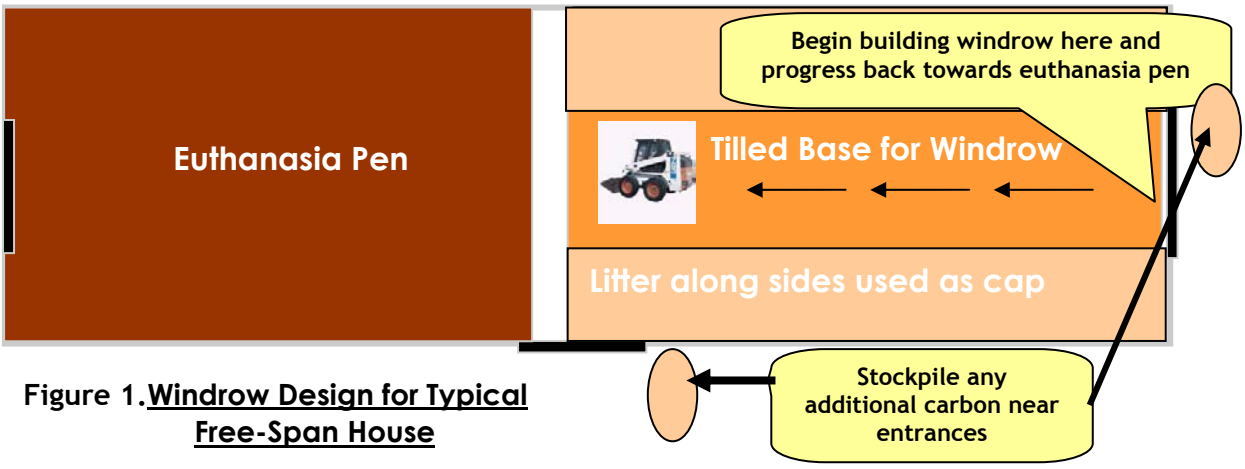

Figure 1. Windrow Design for Typical Free-Span House

Euthanizing the flock (continued)

- Breeder and double-deck houses require alternate windrow designs.
- Unload additional carbon material (if needed) near doors so it is accessible during windrow construction.
- Follow industry guidelines for humane euthanasia.

Construction of Windrows in Free-Span Houses

- Till any excessively caked litter in the house to form a good base (4-6 inches) for the windrow (avoid compacting windrow base with equipment traffic).
- Use the skid loader and/or tractor to crush large birds within the euthanasia pen. May not be necessary for small birds (< 5 lbs.)
- Place any remaining feed on top the birds.
- Begin mixing birds and litter from the euthanasia end of the poultry house alternating 1 loader bucket of birds with 2 bucket of litter/carbon.
- Using the skid loader, begin constructing the windrow with the bird/litter mix on the tilled base at the other end of the poultry house (see Figure 1).
- The windrow should be 4 to 6 feet high and 12 feet wide.
- As the windrow is being constructed, cap with 4 to 6 inches of litter from the sides of the windrow.
- Continue this process until all of the bird/litter mix has been added to the windrow.
- Any remaining litter should be used to cap the windrow.

Considerations for Breeder Houses

- All operations must occur within the 13-foot scratch area between the slats (see Figure 2).
- Base should be a minimum of 4 to 6 inches.
- Compost piles should be constructed 4 to 6 feet high, if possible, and capped as the windrow is constructed.
- Once windrow construction begins, no additional equipment or supplies will be accessible until all birds have been added to the windrow because the skidloader will be confined to the middle of the house.

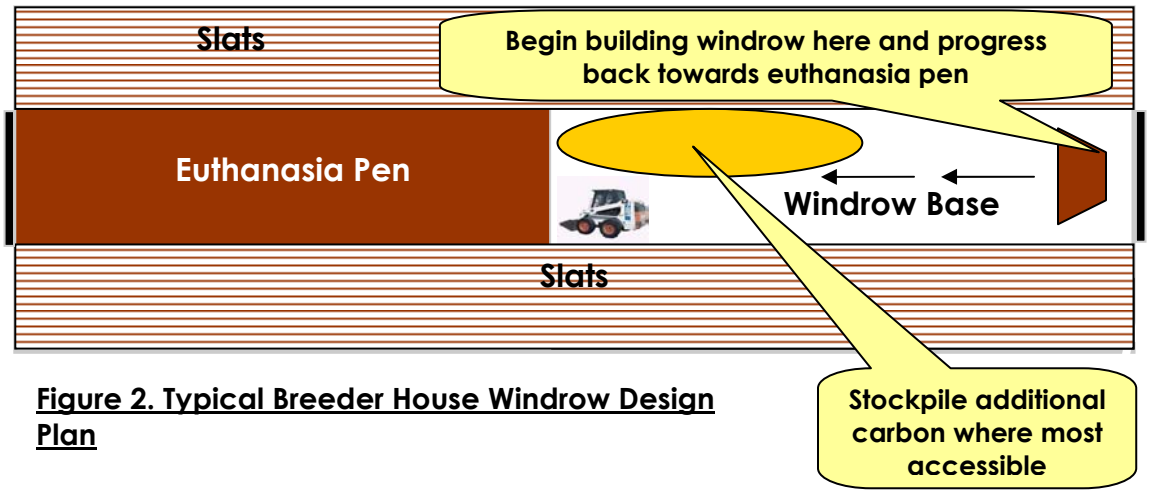

Figure 2. Typical Breeder House Windrow Design Plan

Considerations for Double-Deck Houses

"Composting is the natural degradation of organic resources (such as poultry carcasses) by microorganisms."

- Euthanize birds both upstairs and downstairs.
- Crush birds (if necessary) downstairs with skid loader.
- Establish a minimum of a 4 to 6 inch base.
- Begin composting downstairs by mixing birds and litter; build the first windrow in the side alley of the building (see Figure 3).
- If there is sufficient height, the windrows can be capped after both are constructed, otherwise, they should be capped as constructed.
- Using a small tractor, push only enough birds and litter from upstairs down through the trap doors that can be crushed effectively prior to placing in the next windrow.
- The windrow for the birds and litter from upstairs should be started in the opposite side alley (see Figure 3).
- Alternate pushing birds and litter downstairs, crushing and mixing, and forming the windrow until all birds and litter from the upstairs have been added to the windrow.
- If not capped during construction, cap the windrows with litter or other carbon source so no carcasses are exposed.

TEMPERATURE MONITORING

- Temperatures within the center of the compost piles should be regularly monitored at 50 to 100 foot intervals the length of the windrow and charted. See sample log on page 6.
- Remote temperature monitoring is preferable for biosecurity and worker safety.
- Windrow temperatures should reach at least 130° F within the first week (see Figure 4).

AERATING THE WINDROW

- If the windrow temperature peaks and drops below 105° F, it should be aerated by turning or slowly lifting a hay spear along the length of the pile. Choose the method most appropriate for the situation—turning provides better mixing exposes all material to internal pile temperatures and forking allows oxygen into the pile without disturbing the cap.

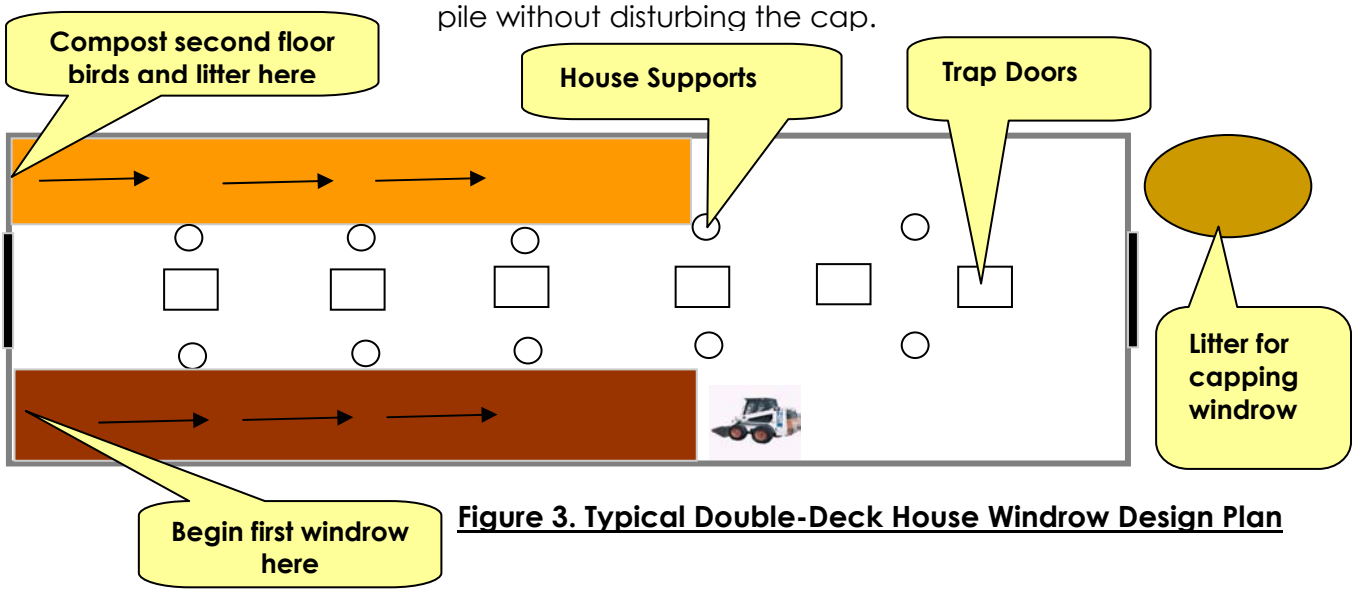

Figure 3. Typical Double-Deck House Windrow Design Plan

TESTING FOR VIRUS

- Virus isolation testing should be conducted after 2 weeks.

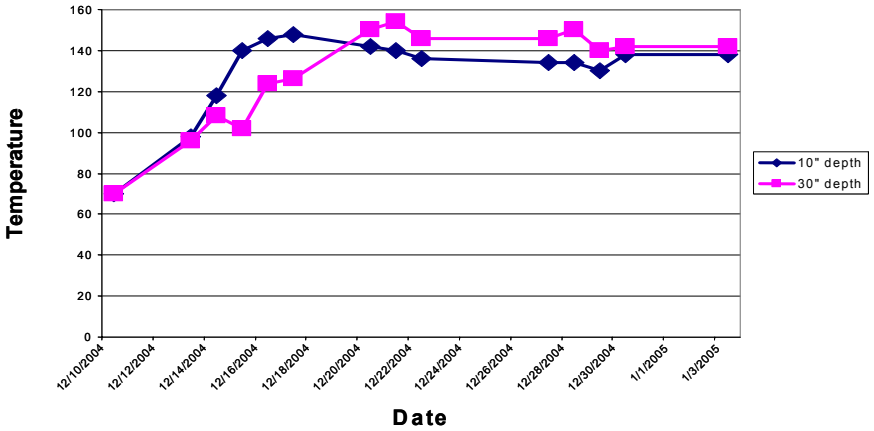

Figure 4. Representative Temperature Graph for Windrow Composting

REMOVING THE COMPOST FROM THE POULTRY HOUSE

- Temperatures should be regularly monitored after construction to ensure inactivation of virus.
- 3 to 4 weeks after construction of windrow, the material within the pile should be inspected to evaluate the decomposition of the carcasses. At this stage, carcasses should be reduced to bones and feathers with little flesh remaining.
- If inspection confirms the near complete decomposition of all fleshy material and virus isolation results (per USDA or State Veterinarian protocol) have come back negative, the compost can be removed from the poultry house and deep stacked in a litter storage shed or on an appropriate site covered with a compost fleece for additional curing.
- A sample should be collected and submitted for nutrient analysis.
- Upon receipt of litter analysis and subject to quarantine release by the State Veterinarian the compost may be land applied at agronomic rates and incorporated if appropriate.
- A transportation subsidy of $10 per ton may be necessary to facilitate the movement and distribution of the compost and overcome the stigma associated with material originating from an AI positive farm.

TROUBLESHOOTING

Problem	Issue	Solution
Excessive flies or odor	Exposed carcasses	Add additional cap material
Leachate from windrow	Mixture too wet	Add additional carbon material, mix and cap
Temperature does not reach 135°F	Mixture too dry (< 40% moisture)	Add water to pile, mix if necessary
Temperature does not reach 135°F	Mixture too wet (> 60 % moisture)	Add additional carbon material, mix if necessary
Temperature drops early	Not enough oxygen	Aerate or mix pile

In-House Composting Temperature Log

Farm Name: _____

House Number: _____

Date	1	2	3	4	5	6	7	8	9	10	Daily Average

LIST OF REFERENCES

Lu H., Castro A.E., Pennick K., Liu J., Yang Q., Dunn P., Weinstock D., and D. Henzler. 2003. Survival of Avian Influenza virus H7N2 in SPF Chickens and Their Environments. Avian Diseases 47:1015-1021

Tablante, N.L and G.W. Malone, 2005. Guidelines for In-House Composting of Poultry Mortalities Due to Catastrophic Disease. www.rec.udel.edu/poultry

ADDITIONAL CONTACT INFORMATION

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