Initial Evaluation of the Effectiveness of On-Farm Composting for the Disposal of Market-Aged Turkey Carcasses Resulting from an Outbreak of Low Pathogenic AI (H5N2) in West Virginia

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INTRODUCTION

On March 30, 2007, routine pre-slaughter testing of a flock of turkeys on a Pendleton County, West Virginia farm identified the presence of the avian influenza (AI) virus. The flock did not exhibit clinical symptoms or increased mortality. Additional testing in West Virginia, Virginia and at the USDA National Veterinary Services Laboratory in Ames, Iowa confirmed the presence of AI antibodies and identified the virus as H5N2.

The Pendleton County farm raised 25,560 turkeys in four poultry houses for a Virginia based poultry company. When the virus was identified, the market-aged birds weighted approximately 40-pounds each. On April 1st and 2nd, the turkeys were depopulated resulting in 1,022,400 pounds of carcasses requiring disposal. The farm also contained 20 tons of feed and 350 tons of litter requiring disposal. Composting was selected as the carcass disposal method. Construction of the compost piles was completed on April 4th and the compost material was removed from the poultry houses and turned approximately 3 weeks later. The material will be land applied at agronomic rates as a soil amendment.

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H5N2 VIRUS

H5N2 is a low pathogenic virus quite similar to the H7N2 virus that caused significant economic losses in Virginia in 2002. Unlike the H5N1 highly-pathogenic virus that has been identified in Asia and other parts of the world, H5N2 does not cause significant mortality in birds nor is it known to cause symptoms in humans. This particular strain of H5N2 was typed as a unique wild bird strain of H5N2 that was detected during routine pre-slaughter testing and caused no symptoms in the flock.

However, it is USDA's policy to eradicate low pathogenic strains of AI with subtypes H5 and H7. Unchecked, large reservoirs of virus have the potential to mutate into highly pathogenic strains resulting in far greater economic impact and potential for human exposure. The identification of any H5 or H7 virus requires notification of our international trading partners and can result the loss of international markets. It is therefore critical to quickly eradicate all H5/H7 positive flocks to prevent the spread to other farms and dramatically increase market losses.

PAST RESEARCH AND EXPERIENCE WITH MORTALITY COMPOSTING

The effectiveness of composting as a method of disposal and containment of an AI outbreak was first demonstrated during an outbreak in the commercial chicken industry on the Delmarva Peninsula in 2004. By implementing this method, the virus was confined to 3 farms despite the high density of poultry farms in the area.

The success of composting on the Delmarva Peninsula opened additional discussions on in-house composting in Virginia despite concerns that the method may not be effective with Virginia's diverse poultry industry. Of particular concern was the effectiveness of the method with large birds like those typical to Virginia's meat turkey industry.

<u>Research on Composting Turkeys</u>

In the fall of 2004, the Virginia Department of Environmental Quality (DEQ), Virginia Cooperative Extension, Virginia Department of Agriculture and Consumer Services (VDACS), Cargill and the Virginia Poultry Federation initiated a research and demonstration project to evaluate the effectiveness of in-house composting on turkeys as a means of disposing of catastrophic losses and disease containment. This demonstration project showed that in-house composting could be used effectively on large birds. A project summary can be found on DEQ's webpage.

http://www.deq.virginia.gov/vpa/pdf/In-House_Composting_Of_Turkey_Mortalities_Poster.pdf

ENVIRONMENTAL CONSIDERATIONS

Disposal Methods Considered

On-site burial and composting were the two carcass disposal methods considered. Review of geological and soils maps and test pits excavations were used to evaluation potential burial pit locations. Both on-site and nearby off-farm locations were considered. With the thin soils and porous bedrock underlying the site, burial pits would need to be shallow and extremely large to accommodate a million pounds of carcasses. The two sites considered also posed some additional challenges. The off-farm site would have involved transporting the carcasses down the state road past residences, and posed a significant biosecurity risk. The on-farm site presented the logistical challenge of transporting the carcasses up a steep hill where excavating a pit of sufficient size would be difficult.

Composting Considerations

The location of the outside composting sites was chosen to minimize the potential impact to ground and surface water resources. Windrows were constructed on a plateau above the floodplain was that was relatively level with over 250 feet of permanent sod between the nearest windrow and the stream. Also, drainage from the plateau flows away from the stream towards a floodplain where it would be filtered through over 1,000 feet of permanent sod. Additionally, attention was given to provide a thick base to absorb any release of body fluids.

COMPOSTING CHALLENGES

Composting the farm's birds posed several significant challenges and was, in many ways, a worst-case scenario. First, on-farm composting had only been used as a disease control method for much smaller birds. The use of this method for larger birds had been tested on a demonstration scale in Virginia, but never implemented for the disposal of an entire flock of market-aged turkeys. Composting the farm's 40-pound birds would require modified procedures that had not been used during an outbreak

Secondly, a new method of mass depopulation—fire fighting foam—had been recently approved by USDA and was used to destroy the flock. Traditionally, diseased flocks were depopulated with the CO^2 gas method. The CO^2 method does not add any additional moisture to the poultry houses as does the use of fire fighting foam.

The fire fighting foam method had been used on chickens in response to natural disasters and diseases but had not been used on larger birds. Two different foaming methods were used to depopulate the West Virginia flock. One method worked extremely well, the other generated a significant amount of water, complicating the composting procedure.

Finally, successful composting requires a proper ratio of carbon material (litter) to nitrogen (carcasses). Since the poultry houses had recently been cleaned out and the turkeys were market aged, a large amount of additional carbon material needed to be transported to the site. Transportation of material onto a disease control premise requires additional biosecurity measures, but represents less overall risk than transporting diseased material off the farm.

COMPOSTING LOGISTICS

Windrow Construction

The outside windrows were constructed 12 feet wide with a 12 inch base of coarse mulch. A layer of carcasses was then placed on the base with a payloader, and then capped with 12 inches of the twice-ground mulch. The birds were not crushed prior to placing them in the windrows.

For the in-house composting windrows, the base was tilled to break up the caked litter resulting in a more absorbent base. The team attempted to crush the carcasses with skid loaders and tractors to enhance their decomposition. However, the moisture and surfactants in the fire fighting foam made the carcasses slick and difficult to crush.

The in-house windrows were constructed by placing a 9-12 inch mulch base followed by a layer of carcasses. The windrows were then capped with 12 inches of mulch or litter. Two windrows were constructed in the large houses leaving room to operate equipment along the edges of the houses and between the windrows.

EXPERIMENTAL USE OF COMPOSTING/AERATION EQUIPMENT

During this project we tested both the skid steer mounted and larger tractor mounted Brown Bear horizontal aerators. Our tests were more limited than we hoped due to some transportation and technical difficulties. However, the compost turners completely mixed and aerated the windrows. The only visible evidence of carcasses in the material after aeration at 3 weeks was leg bones, quills and few feathers. No other bones, flesh or bird parts were visible. Flesh that remained at the time of turning (about 5%) was well cooked and fell apart easily. In general, windrows aerated with the compost turner achieved internal temperatures 5º F to 10º F higher than the reformed windrows that were not treated.

METHOD RESULTS

At 2 weeks the windrows were evaluated and carcass decomposition was estimated at 90%. After 3 weeks of composting, the material was removed from their original location and placed in windrows behind the poultry operation. The material was evaluated to assess the degree of carcass decomposition. Overall carcass decomposition at this stage was estimated at 95% in all of the windrows. Once the piles were moved, only large bones, quills, feathers and a few fleshy pieces of carcasses were visible. The compost material had an organic odor without a significant ammonia or rancid smell.

There was no seepage in the outside windrows, and only minimal seepage at the ends of the litter sheds. The windrows in the first poultry house had a few areas of seepage due to the excessive amount of water used by the initial foaming equipment. This seepage was absorbed by adding litter to the windrow during the first week of composting.

Throughout the composting process, windrow temperatures were monitored. The internal windrow temperatures achieved in the first 3 weeks ranged from 110 º F to 135º F. Based on research conducted at Penn State, maintaining a temperature of 98º F for 10 days is sufficient to deactivate the virus. Windrow temperatures in the reformed windrows averaged 135º F at 5 weeks.

Virus isolation testing has resulted in negative results for all samples collected from the compost material. The quarantine was lifted from the farm on May 19, 2007—51 days after the farm was placed under quarantine.

At 10 weeks the compost was evaluated and approximately 75% of the material was determined to be suitable for land application as a soil amendment. Most of the remaining material was located in a slight depression that collected and held rainwater shed from the covered windrows. This moisture wicked into the bottom of the windrows decreasing pore space and limiting aerobic bacterial activity. To ensure suitability for land application, all material was turned for a final heat and is scheduled for land application at approximately 12 weeks.

CONCLUSIONS

While some challenges occurred, the final outcome was successful and will likely contribute to wider acceptance of composting as a reliable carcass disposal method. This event demonstrated that even large poultry carcasses can be composted in 2 to 3 weeks to the degree that the compost can be removed from the poultry houses for final curing.

Subsequent meetings of the West Virginia and Virginia Poultry Disease Taskforces will review and evaluate this event for ways to improve our responses to future disease outbreaks. Additionally, more thorough documentation of the carcass disposal aspect of this outbreak will be prepared to provide guidance for future disease responses.