Disposal and Composting: Science and Theory

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• Disposal options
• What is composting?
• Scientific validation of composting
• Daily mortality composting procedure
• Mass emergency mortality composting procedure
• Use of composting during outbreaks
“When HPAI outbreaks occur in poultry, the preferred eradication and control methods are quarantine, enforcement of movement restrictions, and depopulation (culling) of all infected, exposed, or potentially infected birds, with proper disposal of carcasses and rigorous cleaning and disinfection of farms and surveillance around affected flocks.”

USDA APHIS VS EMD, 2007
• 100 million birds depopulated worldwide in 2004 due to LPAIV or HPAIV (Clark and Hall, 2006)

• In Delmarva region, serious outbreak could result in 2,500,000 birds in – or every – 48 hours
  – Rapidly overwhelm ability to dispose of carcasses
• Internationally, some countries have few disposal vendors
  – Bulgaria: 2
  – Romania: 1 (or 0)
• Limited vendors may handle daily mortality
  – *Will be* overwhelmed by emergency
Disposal Options
Disposal Goals

- Maximize biosecurity
- Ensure inactivation of virus
- Rapid disposal
- Minimize cost and complexity
- Minimize transportation
- Ability to handle required carcass and litter volume
• Selection of disposal procedure
• State emergency poultry disease team
  – With company personnel
  – State veterinarian
• Select
  – Depopulation procedure
  – Disposal procedure
• Based on individual farm situation
USDA-APHIS has developed preferred list of procedures

1. On farm, in-house composting
2. On farm, outside composting
3. On farm burial
4. On farm mobile treatment
5. Transport off farm (landfill or incinerator)
• Transport implicated in spread of 2002 H7N2 AIV outbreak
  – VA, NC, WVa
  – Common link to rendering plant for daily mortality
• Virus spread by
  – People
  – Contaminated equipment
• Minimize transport to reduce movement of virus

Senne et al., 2003
Relative Costs Of Disposal - USD

Costs based on Sanders et al (2006) and Benfeldt et al. (2006)

Relative Costs Of Disposal - CE
Disposal Options

- Pit burial
- Landfilling
- Incineration
- Rendering
- Composting
• One of the least expensive options
• Can be done on site
• Not suitable for all soil conditions
• May cause adverse public reaction
• Can leave infectious material
• Can contaminate air and water resources
• Litigation
• Long term management
• Frozen soil or shallow ground water

(Sander et al., 2002; Kalbasi et al, 2005; DeRouchey et al., 2005)

Images: AP
• Disposal of the birds in public or private dumping ground

• Landfilling used in various responses
  – 2002 VA/WV/NC
  – 2001-2 PA

• Sealable trucks required
  – Trucks cleaned prior to returning
• Allows birds to be rapidly removed from a farm
• Influenza virus can survive for years in landfill
  – Simulation study
  – Water or leachate
  – 30 d to 660 d

(Graiver et al., 2009)
• Expensive
• Tipping fees
  – $45 - $140/Ton
• Requires movement of infectious or potentially infectious material
  – Movement implicated in 2002 VA outbreak
• Introduces biosecurity risk
• Transportation logistics

(Sander et al, 2002; Bendfeldt et al, 2006; Senne, Holt, and Akey, 2003)
• Burning of the carcasses
• Biosecure
• Ensures destruction of all pathogens
• Fuel costs
• Movement and transportation?
• Post outbreak clean up
• Air quality and health implications

(Sander et al., 2002; Wilkinson, 2007, Kastner and Phebus, 2004)

Open incineration is used internationally and domestically.
• **Three methods**
  – Open air
  – Air curtain
  – Fixed facility

• **Air curtain**
  – 4 t/hr to 37 t/hr

• **Fixed facility**
  – Limited production rates

(Kastner and Phebus, 2004)
• Open Air Formula
  – 100 lb straw
  – 12,000 lb coal
  – 100 lb wood
  – 20 gal diesel
  – Per 50 head cattle or 200 sheep
  – Avoid including metal, plastic or rubber

• Alternate Formula
  – 150 bales hay
  – 150 timbers
  – 2,500 lb kindling
  – 25,000 lb coal
  – 50 gal diesel
  – Per 50 head cattle, 250 sheep, or 250 swine

(Kastner and Phebus, 2004)
• Cooking of carcasses
• Destroys pathogens
• End products can be used in animal feed
• Transportation logistics
• Movement of infectious material
• Reluctance to accept infectious material

(Sander et al., 2002; Swayne and Akey, 2006)