Composting of carcasses: Biosafety Issues and Solutions

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What is Novartis Animal Health doing in IOWA

- Vaccine manufacturing for cattle, pigs, sheep, goats and horses
- Biological Research and Development
- Both operations use animals
- Annually, there are about 125 tons of carcasses to be disposed of
What is composting

- Speeds up normal decomposition processes of organic matter
- Affected by the “diet” and environment of the pile

Keep these key operating parameters in mind
Why did we move to composting

- Options for carcass disposal:
  - Autoclaving and landfill: Not possible due to volume and size of large animals (cows, horses, pigs, sheep and goats)
  - Rendering: Not possible due biosecurity and objections of regulators
  - Incineration: Feasible but: Logistically and cost prohibitive
  - Tissue digestion: HSE and cost issues

- Solution: Use composting as accepted method (Veterinary Services Memorandum 800.56, dated April 2008)
  - Verified with the USDA

- But: how to do it on a large scale???
Issues to be resolved

- Personnel health and safety
  - Prevention of Hypersensitivity Pneumonitis
  - Prevention of infectious disease
  - Ergonomic issues: lifting weights

- Environmental safety
  - Ground water contamination
    - Validated inactivation of viruses and bacteria: USDA and Public Health
  - Nutrient management plan
  - Vectors/Scavengers

- Odor
Solutions: First steps

- Literature research
- Established contact with leading researchers
  - Iowa State University
  - Cornell
- Feasibility established
  - Tour to several farms with small composting projects
- Design and capacity requirements, incl. Risk Assessments
- Obtained external and internal approval
- Convinced finance department....
Personnel Health and Safety

- Prevention of Hypersensitivity Pneumonitis while turing the pile:
  - Use of N-100 half face respirator
  - Exploring use of hepafiltered HVAC on loader cab

- Prevention of Infectious disease, incl. spread:
  - Use of gloves, gowning and hygiene

- Ergonomic issues:
  - Use of loader for large animals
  - Use of teams to deposit smaller animals
Environmental Safety

**Construction**
- Concrete floor and poured walls, slope inward
- Metal structure to cover the bins from rain, birdproofed
- Chain-link fence to keep vermins out

**Operations:**
- Use of bulking agents to absorb effluents: while turning the pile
- Integrated pest management program:
  - No rats or mice found
  - Flies controlled
  - Two cats captured proactively
Odor control

- **Proper pile profile:**
  - Bulking agent: ground layer, carcasses, top layer
  - Layers: leave enough space between the carcasses

- **Use seed compost:**
  - Jumpstarting the process with the right mixture of fungi/bacteria

- **Turning the pile (every 30 days at least):**
  - Re-oxygenating of the pile to avoid fouling

- **Top-layer**
  - Always use about 40-60 cm of bulking agent for absorption of odors
    - At the beginning
    - After turning the pile
Odor control in practice
Process: Operations

- **Overall Management**
  - Bulking agent: Crop residues, saw dust, wood chips etc
  - Proper pile composition: Layering and spacing of carcasses
  - Proper Carbon/Nitrogen ratio: you gotta feel and smell...

- **Moisture**: 40-60% humidity: Squeeze test

- **Temperature**: 60-70°C for 15 days

- **Turning of the pile**: every 30 days
  - Re-oxygenates the bulking agent,
  - Ensures uniform compost process
  - 90-120 days (depending on environmental temperature) process completed
Operations details
Biological Results

- **Viruses:**
  - Bovine respiratory viruses, Influenza viruses all tested negative after 7 days

- **Bacteria:**
  - Literature shows, that the temperature and the time profiles would kill all relevant bacteria
  - We are in the process to verify elimination of
    - Bacteria used e.g. C. Perfringens and Pasteurella spp.
    - E.Coli O157:H7, Salmonella spp. C. Jejuni

- **Parasites**
  - We do not work on those currently. If so, we would verify elimination of e.g. eggs
Final result
Iowa Regulations

- Animals must be composted within 24 hours of death
- Prevent runoff, leachate, control odors, flies, rodents and vermin
- Dead animals are not to be removed until flesh, internal organs, and other soft tissue are fully decomposed
- Storage of finished compost limited to 18 months
  - Applied to cropland or pastureland at a rate consistent with nitrogen use levels necessary to obtain optimum crop yields
  - Application to other lands require approval by the DNR
Iowa Regulations

- Must be done on an all-weather surface
- Compost facilities shall utilize rot-resistant material
- Composting must be done:
  - Outside of wetlands or the 100 year flood plain
  - 100 feet from private wells
  - 200 feet from public wells
  - 50 feet from property lines
  - 500 feet from inhabited residences
  - 200 feet from flowing or intermittent streams, lakes or ponds
Economics

- The option used so far, incineration, costed
  - 176‘000 USD per year
  - Pro memoria: Costs for rendering were 6000 USD per year

- Investment in composting facility:
  - 76‘000 USD
  - ROI: 6 months and the investments are paid for

- Cost of operations:
  - 5% FTE= 9000 USD per yer
  - Cost for testing (virus/bacteria, soil testing)
  - Savings: Fertilizer not bought
Benefits of composting

- Compost is an excellent fertilizer and improves soil quality
- Reduces use of fossil fuel based fertilizers
- Avoids transport of infected animals
- Increases biosafety and biosecurity of operations
- Fits the motto of Novartis: caring and curing