

Composting of carcasses: Biosafety Issues and Solutions

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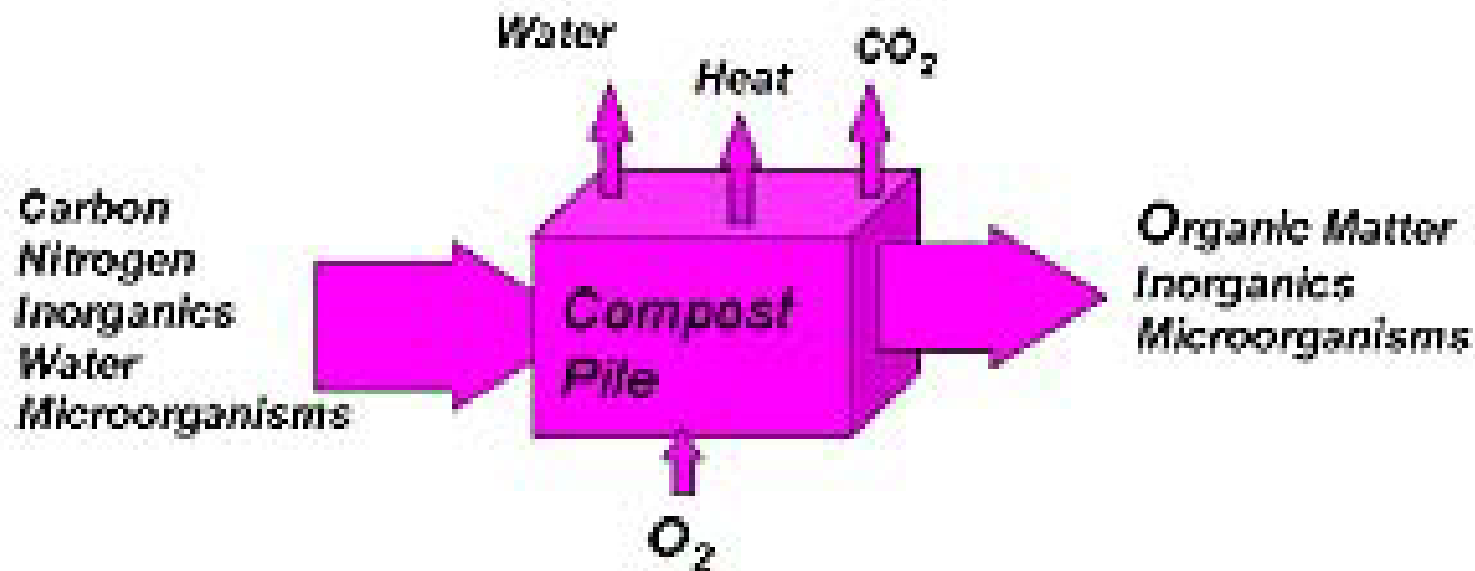


What is Novartis Animal Health doing in IOWA

- 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 oC 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

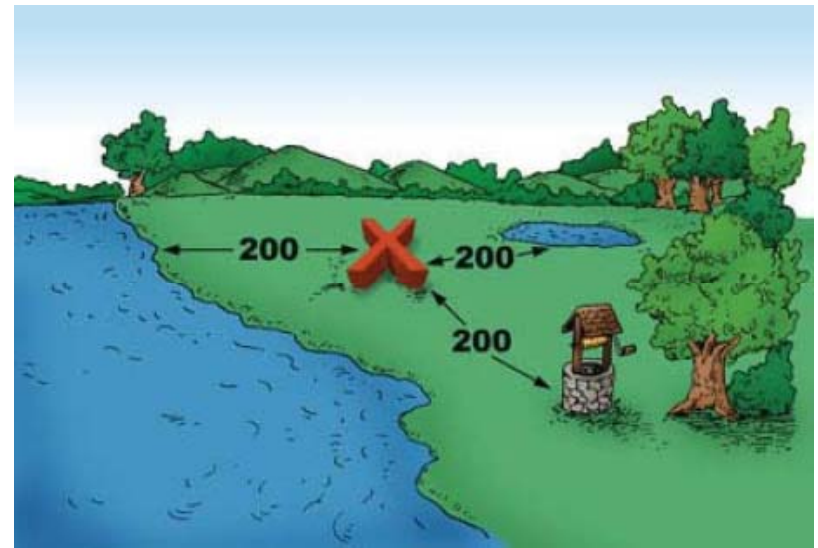


Iowa Regulations

- 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 investmens 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