Does Composting Inactivate Prions?

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Background

- Prion diseases (TSEs)
- Properties of prions
- Methods of degrading prions

Composting conditions and prions
Prion Diseases of Animals and Humans

- Scrapie of sheep
- Chronic Wasting Disease of Deer and Elk
- Bovine Spongiform Encephalopathy
- Transmissible Mink Encephalopathy
- Kuru (New Guinea highlands)
- CJD (1:1,000,000); vCJD
Normal Histology - Brain

Cluster of Neurons

Neuropil

Glial nuclei
Clear spaces in tissue

- Vacuolated nerve cell

Spongiform Encephalopathy
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Composting conditions and prions
Demonstration of Transmissibility

Scrapie sheep

Months
Protein Nature of the agent: Prions

Biochemical separation of brain infectivity

Protein fraction

Other fractions
Infectivity is the Prion (PrP)

PrPrPc

PrPrPres

from: Garcia et al. PNAS, 2000

Prusiner, ed. Prion Diseases.
Immunodetection in infected tissue

PrPres deposition
Western blot demonstration of PrPres
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Composting conditions and prions
Demonstration of Resistance

Prion infected

Disinfection techniques for conventional microbes

Months

Prion infected mouse
Demonstration of Degradation

Prion infected

Incineration temps
Alkali - ↑ conc / time
Phenolics - ↑ conc / time
Hypochlorite - ↑ conc / time

Prion infected

Months
Disposal of Animal Waste Potentially Contaminated with Prions

- Incineration (site approval is challenging)
- Alkali / heat treatment

Expensive
WR² Alkaline Digestion
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Composting conditions and prions
Disposal of Animal Waste Potentially Contaminated with Prions

Animal Rendering Trends

- Changed regulations and economics
- Decreased service, increased costs

Mortality Composting

- A practical approach to bio-waste (mortality) disposal
Mortality Composting - Windrows

An option being tried by livestock producers
Many days @ 50°C results in marked carcass disintegration.

But are conditions sufficient to degrade prions?
Possible Compost Prion Degradation?

Infected animal

Treat with heat and time (compost-relevant conditions)
Digestion of prion protein in brain from deer with CWD at 50°C

M

Day 0 0 1 1 16 16 1 1 16 16 0 0 55 55

Compost organisms

Gel2_0502
Demonstration of infectivity

Prion contamination

Months
Research Support

• Animal Population Health Institute:
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