On-site Composting for Biocontainment and Safe Disposal of Infectious Animal Carcasses and Manure in the Event of a Bioterrorism Attack

Jiewen Guan  
Canadian Food Inspection Agency

Brian Brooks  
Canadian Food Inspection Agency

Lloyd Spencer  
Canadian Food Inspection Agency

Paul Kitching  
Canadian Food Inspection Agency

See next page for additional authors

Follow this and additional works at: http://lib.dr.iastate.edu/abe_eng_conf

Part of the Bioresource and Agricultural Engineering Commons, and the Veterinary Preventive Medicine, Epidemiology, and Public Health Commons

The complete bibliographic information for this item can be found at http://lib.dr.iastate.edu/abe_eng_conf/227. For information on how to cite this item, please visit http://lib.dr.iastate.edu/howtocite.html.
On-site Composting for Biocontainment and Safe Disposal of Infectious Animal Carcasses and Manure in the Event of a Bioterrorism Attack

Abstract
The purpose of this project is to develop composting methods that can be applied on farms or at other sites to ensure the biocontainment of infected poultry or livestock carcasses and their manure in the event of a bioterrorism attack employing foreign animal disease viruses. The methods developed in this project will be efficient at destroying viruses and degrading carcasses to earth-like material. Methods will also be developed to detect and identify volatile organic compounds contained in off-gases produced during composting. An assessment will then be made of the key chemical categories and specific compounds in the gases released. Studies on the gases released and on the breakdown of animal DNA will aim to determine whether this information could be used to predict the overall safety of the compost for disposal on land. Standards will also be developed to determine virus survival under defined composting conditions.

Disciplines
Bioresource and Agricultural Engineering | Veterinary Preventive Medicine, Epidemiology, and Public Health

Comments
This is an abstract of a poster presented at the CRTI Summer Symposium, 13–15 June 2006, Gatineau, QC.

Authors
Jiewen Guan, Brian Brooks, Lloyd Spencer, Paul Kitching, Thomas D. Glanville, Jacek A. Koziel, Donald L. Reynolds, Heekwon Ahn, Neslihan Akdeniz, Kim Stanford, Tim McAllister, Douglas Inglis, Francis Larney, and Xiying Hao

This abstract is available at Iowa State University Digital Repository: http://lib.dr.iastate.edu/abe_eng_conf/227
On-site Composting for Biocontainment and Safe Disposal of Infectious Animal Carcasses and Manure in the Event of a Bioterrorism Attack

Objectives

The purpose of this project is to develop composting methods that can be applied on farms or at other sites to ensure the biocontainment of infected poultry or livestock carcasses and their manure in the event of a bioterrorism attack employing foreign animal disease viruses. The methods developed in this project will be efficient at destroying viruses and degrading carcasses to earth-like material. Methods will also be developed to detect and identify volatile organic compounds contained in off-gases produced during composting. An assessment will then be made of the key chemical categories and specific compounds in the gases released. Studies on the gases released and on the breakdown of animal DNA will aim to determine whether this information could be
viruses. The procedures yielded extracted DNA with a molecular size of approximately 20 kilobase pairs (kbp). There were inhibitors in the extracted compost DNA, and studies to date to purify extracts showed that the limit of detection of bovine DNA in 4 nanograms (ng) of compost DNA was 0.1 ng. At this level of sensitivity, the bovine growth hormone gene was not detected in mature compost suggesting total decomposition of the animal tissue.

Project partners at Iowa State University developed sampling methods and analyses to monitor the emissions of specific volatile organic compounds emitted from simulated compost. Results from their laboratory trials suggest that emissions of volatile fatty acids (i.e., acetic, propanoic, isovaleric, valeric and hexanoic acids) and esters (i.e., butanoic acid ethyl, propyl, 2-methylpropyl, butyl, 3-methylbutyl and hexanoic acid ethyl esters) are the best indicators of plant material decay, while selected sulfur- (i.e., carbon disulfide, dimethyl disulfide, trisulfide dimethyl, methyl mercaptan, and 1,4 dimethyl tetrasulfide) and nitrogen-containing compounds (i.e., indole and skatole) are clear indicators of decaying animal material under both aerobic and anaerobic conditions. The team also found that the volatile fatty acid emissions from corn silage composting were lower in concentration under aerobic conditions than under anaerobic conditions, while ketone emissions were lower in concentration under anaerobic conditions. The team believes that the emissions of these compounds (volatile fatty acids, esters, ketones, alcohols, and nitrogen-containing compounds) will decrease at the end of the field composting and will be an indicator of the stabilized compost material.

The project will be completed by March 31, 2009.

Impact

The knowledge and technology that is being cooperatively developed between Canada and the United States through this project will yield information that can be used to assist other countries to more effectively eradicate highly contagious, viral animal diseases. A reduction in the incidence of these diseases abroad will thereby reduce the likelihood of their entry into North America. Furthermore, the methods developed in this project will give Canada the capability to limit the spread of such diseases in the face of introductions through bioterrorism.