

Carcass Disposal: A Comprehensive Review

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Report prepared by the National Agricultural Biosecurity Center Consortium
Carcass Disposal Working Group

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Consortium Partners:

Kansas State University, National Agricultural Biosecurity Center

Purdue University, School of Agriculture and Animal Disease Diagnostic Laboratory

Texas A&M University, Institute for Countermeasures Against Agricultural Bioterrorism

Preface

Background

The US agricultural sector represents one of the world's most bountiful, healthy, and economically valuable food systems. The US agricultural sector accounts for about 13% of the US gross domestic product and nearly 17% of US jobs. Animal agriculture comprises a substantial portion of the overall agricultural sector. According to the USDA Economic Research Service, the value of US livestock commodities amounted to \$105 billion during 2003. Each year, US animal agriculture contributes approximately 26 billion pounds of beef, 19 billion pounds of pork, and 35 billion pounds of poultry to the food supply.

The enormity of US animal agriculture magnifies a number of agricultural security problems, one of which is carcass disposal. Typically, animal-production mortalities and natural disasters in the US create an annual disposal requirement of about three billion pounds of carcasses. This number, while already considerable, could easily escalate in the event of an intentional or accidental introduction of foreign animal disease(s). Whether at the hand of accidental disease entry, the weather, or an act of bioterrorism, widespread livestock deaths pose daunting carcass-disposal challenges that, if not met quickly and effectively, can spiral into major food security problems and result in devastating economic losses. The ever-increasing concentration of modern animal production operations, combined with the tremendous mobility of food-animal populations, accentuates the country's vulnerability to high death losses due to disease outbreaks.

A rapid and effective disease eradication response is vital to minimizing livestock losses, economic impacts, and public health hazards. Speed is of the essence; and rapid slaughter and disposal of livestock are integral parts of effective disease eradication efforts. However, realization of a rapid response requires emergency management plans that are based on a thorough understanding of disposal alternatives appropriate in various circumstances. This report was commissioned to provide a comprehensive summary of the scientific, technical,

and social aspects of various carcass disposal technologies. This report is therefore intended to serve as an evidence-based resource for officials tasked with planning for the safe and timely disposal of animal carcasses.

Terms of Reference

2002 witnessed the establishment at Kansas State University (KSU) of the National Agricultural Biosecurity Center (NABC), which evolved from KSU's ongoing Food Safety and Security program. Commissioned to collaborate with other land-grant universities and strategic partners, including the US Department of Agriculture Animal & Plant Health Inspection Service (USDA-APHIS), the NABC coordinates the development, implementation, and enhancement of diverse capabilities for addressing threats to the nation's agricultural economy and food supply. The NABC participates in planning, training, outreach, and research activities related to vulnerability (threat and risk) analyses, incident response (including assessment of intergovernmental management issues), and detection/prevention technologies.

In 2002, USDA-AHPIS entered into a cooperative agreement project with the NABC to address three critical agricultural security needs. These included the evaluation of pertinent aspects for the disposal of potentially contaminated animal carcasses; the assessment of agro-terrorism exercises with regard to their execution, inter-governmental management, and effectiveness; and the analysis of pathways by which agricultural pathogens might enter the country, including life-cycle analysis for the most significant threat agents.

This report addresses solely the findings related to the first topic area (evaluation of carcass disposal options and related issues) of the cooperative agreement project. The objectives of this topic area included the following:

- characterize, summarize, and integrate available information relative to existing carcass disposal technologies,

- frame the cross-cutting logistical, social, and economic considerations of general large-scale carcass disposal, and
- identify knowledge gaps warranting research or educational efforts.

To address these objectives, a consortium of collaborators was assembled to form the Carcass Disposal Working Group (CDWG). This body included experts from a variety of institutions, including Texas A&M University's Institute for Countermeasures Against Agricultural Bioterrorism, Purdue University's School of Agriculture and Animal Disease Diagnostic Laboratory, Sandia National Laboratories' International Environmental Analysis Unit, as well as KSU's National Agricultural Biosecurity Center.

The Working Group's Approach

The working group approached the objectives of the project by considering two broad categories of subject matter: the carcass disposal technologies currently available and the cross-cutting issues related to carcass disposal. In concert with this categorization, the CDWG elaborated a two-part report; Part 1 is comprised of chapters addressing carcass disposal technologies, and Part 2 is comprised of chapters addressing cross-cutting issues. An Executive Summary is also provided which summarizes key information from each chapter.

Part 1: Carcass disposal technologies

Within the category regarding carcass disposal technologies, task groups were formed to address burial, incineration, composting, rendering, lactic acid fermentation, alkaline hydrolysis, anaerobic digestion, and non-traditional/novel technologies. For each of these technologies, task groups were charged with characterizing the following information:

- **Principles of operation** – Including the general process overview; expertise and/or personnel requirements; throughput or capacity constraints; materials, fuel, chemical, and/or energy or utility requirements; location considerations; remediation requirements; and cost considerations.

- **Disease agent considerations** – Including the fate of disease agents during disposal, and disease agents (or classes of disease agents) for which the disposal method is or is not appropriate.
- **Implications to the environment** – Including the potential or documented effects on ground water, surface water, soil, air quality, etc.; the regulatory considerations (i.e., local, state, and federal) to address environmental issues; and monitoring requirements.
- **Advantages & Disadvantages** – A discussion of the advantages and limitations of the disposal technology, and historical lessons learned.

Part 2: Cross-cutting and policy issues

Within the category regarding cross-cutting issues, task groups were formed to address the following topics, all of which have a bearing on the carcass disposal problem: economic and cost considerations, historical documentation, regulatory issues and cooperation, public relations efforts, physical security of disposal sites, evaluation of environmental impacts, geographic information systems (GIS) technology, decontamination strategies, and transportation issues.

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