

Research, Policy, Response Capability, and Education Needs Identified by Participants of the 4th International Symposium on Managing Animal Mortality and Health Risk

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Executive Summary

Emerging zoonotic pathogens and incidents of catastrophic poultry and livestock mortality have imposed substantial risks to food safety and security throughout the world. The 2010 outbreak of Foot and Mouth Disease in South Korea is an example of the devastating consequences of a livestock disease outbreak on the agriculture and food industry sectors of a nation, and on the social and economic health of affected regions.

To identify gaps in knowledge and capacity that hinder effective emergency responses to catastrophic losses of livestock and poultry, participants at the 4th International Symposium on Managing Animal Health and Risk (Dearborn Michigan, May, 2012) were surveyed to capture and aggregate their views on needed research, policy development, education and training, and improved response capability.

Analysis of survey data identified a number of specific gaps including a need to: better coordinate research, education and training, and development of new policies and response capabilities; improve planning and infrastructure for international cross-border events; and minimize damage to food and agriculture critical infrastructure as a result of a catastrophic event.

Introduction

Low Probability--High Consequence

As with other natural disasters, the social motivation to invest the time and money to prevent and prepare for catastrophic poultry and livestock losses is weakened by the low probability of such events, and by failure to recognize their potential impacts on the food production system, environment, and economy of the regions or countries involved. Recent events in South Korea, however, provide a reminder of the impacts of catastrophic livestock loss. Between November 2010 and February 2011, during a Foot-and-Mouth Disease (FMD) outbreak there, 3.5 million animals were euthanized and buried in more than 4500 burial sites throughout the countryside. The estimated costs of emergency culling and carcass disposal, compensating farmers for lost stock and land area, and launching a nationwide vaccination program was 2.7 billion \$US. Two years after the outbreak, costs continue to accumulate as air (odor) and water pollution concerns require pumping, transport, and treatment of leachate from the burial pits. In addition, some burial sites are being remediated with excavation and composting in an effort to minimize further environmental impacts and to allow rural owners to return precious land resources (conscripted for emergency burial) to productive use (Ahn, 2012).

The Korean experience is but one of many similar large-scale catastrophic animal loss incidents that have been reported throughout the world in recent years including: Classical Swine Fever in the Netherlands (1997); anthrax in Australia (1997); Newcastle Disease in Australia (1999); FMD in Great Britain (2001); avian influenza in the U.S. (2002) and Canada (2004); massive livestock losses in the U.S. caused by hurricanes Katrina and Rita (2005); an anthrax outbreak in wild ungulates in northern Canada (2012); and a developing avian influenza outbreak in China (April, 2013). Expanded use of highly concentrated animal production methods, transport of large numbers of poultry and livestock (and people associated with livestock production) over long distances, and a trend toward more frequent damaging weather incidents suggests that the frequency of catastrophic food animal loss incidents may increase. As examples of recent damaging weather events, more than 10,000 cattle and buffalo reportedly died from extreme cold in Vietnam in 2011, and thousands of cattle, yaks, horses and sheep died during winter storms in Kyrgyzstan in 2012.

While the impacts of catastrophic losses depend on the scope of the event (size/number of farms affected; type of production system; effectiveness of disease containment), and the environments (political/regulatory; natural; economic) in which it occurs, the potential impacts are extensive and somewhat predictable. In an assessment of potential causative factors and impacts of an FMD outbreak in Pacific Northwest economic region of the U.S. and Canada, Swallow (2011) compiled previous U.S. and Canadian studies and predicted that a major FMD outbreak in this region could halt U.S. and Canadian international food trade, collaterally affecting not only the beef and pork industries but poultry and grain production as well. A similar and more recent study by the Center for Agricultural and Rural Development Food and Agricultural Policy Research Institute estimated that the cost of introduction of Foot and Mouth Disease to the USA would average \$12.9 billion per year to the pork and beef industries and a loss of 58,000 full-time jobs. Over a ten year period, cumulative revenue cost were

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estimated at \$200 billion spread across the pork, beef, poultry, corn, soybean and wheat industries (Webb 2013).

Many Response Scenarios and Strategies

Lessons learned from previous catastrophic animal losses point to a need for flexible and coordinated response options. Identification and implementation of such options often require modifications to response procedures and governmental policies, with supporting research and education. For example, in his summary of the Korean FMD outbreak and new governmental initiatives implemented to reduce the risks and impacts of future outbreaks, Ahn (2012) cited major changes in: governmental administration of quarantine and inspection practices; increased reliance on vaccination for disease prevention and control; changes in how and when emergency alerts will be issued; linking of emergency farmer compensation to producer disease prevention effort; licensing of livestock production operations and mandatory farmer training; and greater diversification of animal mortality disposal methods and a significant research program to evaluate safety of such methods.

Of all the aspects of animal mortality disposal, large-scale outbreaks of trade-limiting diseases in domestic livestock require the most attention as such outbreaks disrupt trade and lead to social and economic devastation of livestock industries and associated regional, national, or international economies. Equally important, outbreaks may cause fatal infections in both humans and animals, resulting in long-term effects on food and health security such as the current (2013) avian influenza outbreak in China. Globalization of trade and intensification of agricultural production systems has created a particularly vulnerable target for natural or intentional (bioterrorist) outbreaks of infectious livestock disease.

The risks of global travel and trade, climate change, and increasing human and livestock population densities make the provision of regulatory guidelines challenging during catastrophic emergencies caused by outbreaks of highly communicable disease. North America (NA), for example, covers approximately 25 million km² (9.4 mi²) with an estimated population of 460 million people and spans eight major climate zones. The climate zones range from north to south subarctic and very cold to hot-dry and hot-humid based on heating degree days, average temperatures and precipitation. Estimated cattle populations in Canada, Mexico and United States are 130 million head. A fatal livestock disease outbreak affecting only one animal per 2,000 (0.05%) of the entire cattle population in NA would result in a total carcass mass of approx. 30,000,000 kg (66,140,000 pounds or the weight of 20 Boeing 747 airliners) to be disposed. This estimate of cattle mortalities is plausible based on the number of cattle reportedly exposed to anthrax in Australia in 1997.

In current high-intensity livestock production systems (which includes 62% of swine, 33% of dairy cows, and 8% of cattle/calf inventory in the US), large numbers of animals housed on a single premises are susceptible to rapid disease transmission. In the past, culling has been the primary method for preventing the spread of pathogens, but with the high-intensity livestock production systems of today, the implications of culling must be thoughtfully weighed as large numbers of carcasses and volumes of contaminated by-products will be generated and limited land may be available for disposal. Selection

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of appropriate animal mortality disposal methods can be complicated by the variety of situations and potential involvement of both wildlife and domestic livestock. Wildlife disposal, for example, can range from highway road-kills to beached marine mammals, while livestock disposal includes both routine mortalities and large-scale losses due to catastrophic events.

When selecting a carcass management strategy during animal health emergency response, the nature of the threat must first be considered, including, for biological agents, the infectious dose, mode(s) of transmission, environmental persistence and risk of zoonosis. In all cases, discharge of infectious materials and other wastes to the environment must be minimized. Carcass weight, animal maturity, and number of affected animals and mortalities need to be considered, as well as space requirements for the chosen disposal technology, and other resources required. Off-farm transportation of carcasses must be developed and evaluated along with existing infrastructure and climatic conditions which can affect the feasibility and ease of implementing control strategies and control areas.

Carcass disposal options will vary according to the animal and pathogen, but most commonly include (in no particular preference order) incineration, rendering, burial (either on-site or in approved landfills), and composting.

Objectives of International Symposium

In recognition of the potential threats to world food safety and security posed by catastrophic animal losses, educators, researchers, regulatory officials and public policy specialists from eight nations located on five continents met in Dearborn, Michigan in May of 2012 to share their knowledge and experiences during the 4th International Symposium on Managing Animal Mortalities, Products, & Associated Health Risk. The Symposium was sponsored by 22 partnering universities, agencies, and organizations in the U.S. and Canada. Major support was provided through a cooperative agreement between the U.S. Department of Homeland Security and the National Center for Foreign Animal and Zoonotic Disease Defense (FAZD Center) that was subsequently implemented through a sub-award to Michigan State University. The symposium focused on the 3Ds of emergency response to catastrophic animal losses—depopulation, disposal, and decontamination—and the overall symposium objectives were twofold:

- To discuss new research and policy developments and share lessons learned from catastrophic animal losses experienced worldwide; and
- To identify and prioritize future needs relevant to research, emergency response capacity, training and education¹, and public policy.

New information discussed by symposium presenters can be found in the Symposium proceedings posted at <http://umaine.edu/byproducts-symposium/> and this white paper summarizes the nature and priority of current and future needs that were identified by Symposium attendees.

¹ For the purposes of this paper, the authors use the word "training" to denote activities focused on teaching specific useful skills ("know how"), while "education" refers to learning of broader fundamentals ("know why") that facilitate analysis and formulation of potential solutions to new or evolving problems. Both are equally valuable in responding to emergency situations.

Needs Survey & Analysis

Future needs discussed in this white paper were gathered primarily using a “Future Needs Survey” administered throughout the Symposium. This was supplemented by a summary of opinions compiled during a Cross-Border FMD Response Simulation Workshop conducted on Thursday of the Symposium, and by answers to two questions contained in a more general end-of-meeting survey concerning all aspects of the Symposium.

The Future Needs Survey (Appendix A) was designed to capture transient ideas that are often generated during session discussions—and forgotten by the time an end-of-conference survey is filled out. To accomplish this, the survey forms were distributed and collected at the beginning and end of each symposium session and tour. To further encourage submission and discussion of ideas throughout the symposium, comments collected each day were posted on bulletin boards located in the central break/luncheon area so that participants could scan the ideas proposed and post additional relevant thoughts.

The survey asked symposium participants to identify specific needs, which occurred to them during the symposium, and to recommend actions or items that they felt would help to fulfill these needs. To aid interpretation and analysis of the survey responses, participants also were asked to classify the needs they described into one (or more) of five general categories (research, policy development, response capacity, training and education, or other), and to assign priority ratings (low, medium, high, uncertain) to each need category. To minimize the potential for misunderstanding of complex lengthy needs descriptions, participants were asked to restrict content submitted on each survey form to a single need and to submit additional single-need forms as needed to cover multiple needs. Needs survey data were entered into a spreadsheet by staff at Michigan State University Agricultural & Natural Resources Communication and Events Services. Members of the symposium White Paper Committee subsequently sorted the data by category (research, education, policy, response capacity) and aggregated them into associated groups of prioritized conclusions.

Supplemental input on current and future needs was captured during the Cross-Border FMD Response Disease Simulation Workshop held on Thursday morning of the symposium. This four-hour workshop gave participants an opportunity to work in teams of 7-8 conference participants to analyze a fictitious cross-border (Canada/U.S.) FMD outbreak scenario and to identify incident-specific gaps in capacity relevant to four key issue areas: movement control; depopulation; disposal; and decontamination. Reporters for each team were charged with summarizing the ideas discussed by each group. Ten team reports (2-Decontamination; 2-Movement Control; 3-Depopulation; 3-Disposal) were received and their key points were subsequently summarized by symposium graduate student interns Dyan Pratt (University of Saskatchewan) and Lam Nguyen (Iowa State University) and are included in Appendix B of this paper.

A third source of information for this paper was obtained via the five-page conference evaluation that participants were asked to complete by the end of the symposium. In addition to asking participants to rate the quality and usefulness of each day’s sessions and tours, this survey asked attendees to “identify

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critical gaps in research, outreach, policy and/or response capabilities,” and to suggest how and by whom these gaps might be resolved. A total of 79 symposium evaluations were submitted, and responses describing critical gaps were summarized by an evaluation committee led by Mary Schwarz (Cornell University) (see Appendix C).

Identified Needs & Priority Ratings

White Paper Committee members volunteered to evaluate and summarize feedback in the category most closely associated with their area of expertise. Dr. Kim Stanford – Alberta Agriculture Food & Rural Development (co-chair), and Dr. Tim Reuter – Alberta Agriculture and Rural Development, summarized research-related feedback. Policy-related comments were handled by Dr. Heather Simmons--Texas A&M University; results pertaining to Response Capacity by Dr. Patrick Webb--National Pork Board; and those on Training/Education by Dr. Tom Glanville--Iowa State University (co-chair).

Survey Participation & General Results

A total of sixty eight (68) Future Needs survey forms were submitted. Twenty-five (25) listed “Research” as the respondent’s main area of expertise, followed by “Regulatory” (23), “Educator” (14), “Livestock Production” (7), “Policy” (5), and “Other” (7). The expertise total (81) exceeds the total number of surveys submitted because 14 survey participants indicated two main areas of expertise and one listed five. Nine (9) surveys did not identify an area of expertise. Four surveys indicated “Other,” specifying expertise on “disease control (2),” “biogas industry,” and “in-vessel composting”.

The majority of survey participants came from North America (44), followed by Africa (10), Europe (5), Australia (4), and Asia (2). Three surveys did not indicate the participant’s continent of origin.

The survey strategy to capture participants’ thoughts throughout the three-day symposium—in contrast with the typical post-conference survey—was successful in capturing feedback following every tour and session. Sixty-nine percent (69%) of surveys identified the tour or session after which the survey was submitted and, as shown in Figure 1, two to seven surveys were returned following each tour or session. The greatest number of returns occurred during the first day of breakout sessions (#’s 1 through 4). Fewer surveys were returned during the second day of breakout sessions, and there also was a trend toward lower survey response for some of the sessions occurring late in the afternoon of each day (#4, #7, and #8). Overall, the survey strategy did not stimulate high participation; roughly 5-15% of participants in each session returned a survey and the total number of Future Needs Surveys for the week averaged less than one per participant. Several reasons may account for this. It was noted that some session leaders forgot to remind participants of the purpose and importance of the survey, and no time was allotted at the end of each session for participants to discuss their ideas and respond to the survey. Furthermore, repeated surveying of participants’ thoughts is uncommon for scientific conferences and—lacking repeated reminders from session leaders—many participants may have assumed a “one-per-customer” limit, suffered “survey burnout,” or were preoccupied by conversations with other participants and a need to move promptly to the next event. It is also possible that

participants identified the majority of their gaps at early stages of the Symposium and did not think of any additional gaps in later sessions.

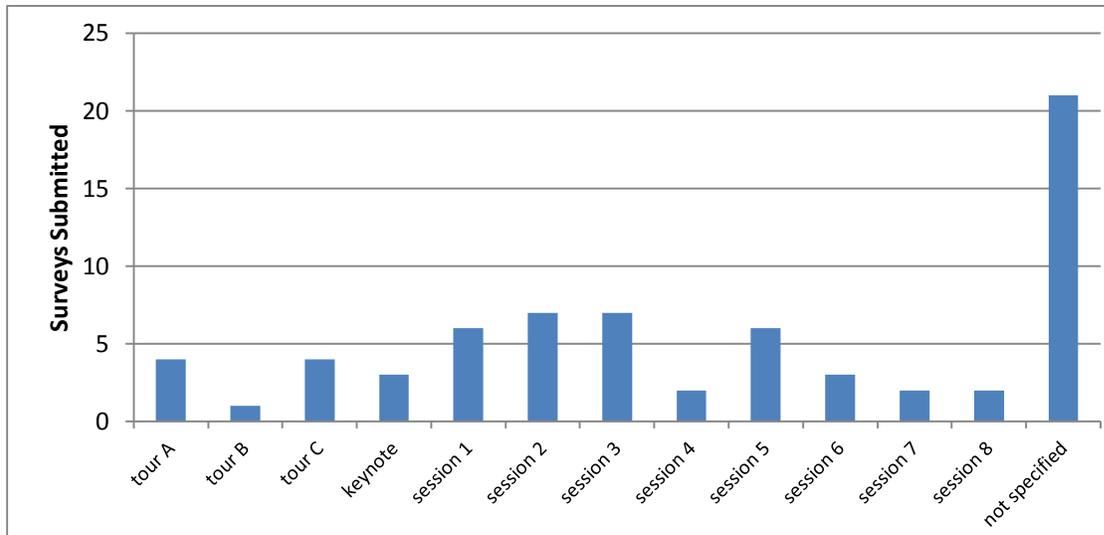


Figure 1. Distribution of surveys submitted by tour or session (“keynote” includes both keynote addresses).

Each of the four general needs categories were associated with 20 or more surveys, but the greatest number of needs were in the areas of Research (37) and Training/Education (35) (Table 1). Although survey instructions directed participants to specify one main general need category, 22 surveys indicated multi-component needs (11 associated with four component categories, eight with three, and three with two) and assigned priority ratings for each component. Ratings in order of priority were: strong/4, medium/3, small/2 and no idea/1. Though not initially anticipated by the survey designers, such multi-component responses emphasize the complexity of many (if not most) emergency animal disposal needs. Policy developments, for example, are often made in direct response to emergency response capacity issues; and training and education are logical follow-ups that facilitate efficient dissemination and adoption of new developments in any of the other three general categories. Since many reported needs were associated with more than one need component, the total number of needs (119) shown in Table 1 exceeds the number of surveys returned.

If participants felt that a need they identified contained components that were not adequately described by any of the four general categories, they were given the option to describe and rate the need in a 5th category entitled “Other.” Six did so, but none indicated a priority for the need described under “Other,” and hence there is no “Other” column shown in Table 1. Based on their wording, these special needs were associated with one of the four standard survey categories and assigned a “strong” priority rating.

Table 1. Category and priority rating of future needs identified by symposium participants.

Priority	Number of needs associated with a category				Total
	Research	Policy	Response Capacity	Training/ Education	
Strong (4)	22	8	10	21	61
Medium (3)	14	6	9	12	41
Small (2)	1	6	7	1	15
No Idea (1)	0	0	1	1	2
Total	37	20	27	35	119

Research Needs and Priorities

Broad categories were identified and their priority based on frequency at which this item or category was identified. Numbers of responses include those in the formal future needs survey as well as in the cross-border exercise summary and the overall symposium evaluation.

1. Disinfectants

(High Priority - identified in 44 responses)

More information on disinfectants/disinfecting various equipment/structures was the most frequently identified research need. Specific needs identified included:

- i. Development of recommended methodology for disinfecting wood or other porous surfaces was requested by multiple respondents along with methodology for decontaminating slaughter or rendering plants.
- ii. Development of surrogates for use in disinfectant efficacy testing along with evaluations of disinfectants for virus control was also mentioned.
- iii. One respondent believed that development of better detergents to remove pathogens was more important than porous surface disinfectants.
- iv. Spot tests to determine efficacy of disinfectants against key pathogenic organisms were also suggested by multiple respondents.
- v. Degradation of disinfectants and the possible need for “de-contaminating the decontaminants” was identified as a need by several respondents.
- vi. Research to develop improved protocols for decontamination of manure, feed and drinking water associated with an infectious disease outbreak was also mentioned along with evaluating the impacts of recycling water used in decontamination in drier climates.

2. Composting and burial

(Medium Priority - identified in 37 responses)

Additional information required for mortality disposal by composting and/or burial was the second broad category of research needs identified. Composting/burial needs included:

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- i. Applicability of composting and/or burial across geographic and climatic zones, including an evaluation of a variety of amendments for composting carcasses.
- ii. The fate of pathogens during mass composting, or burial disposal, including translocation of pathogens over time.
- iii. Determination of possibility of aerosol and/or effluent transmission of pathogens during composting when using carcass grinding technologies and during pile construction.
- iv. Surveys using satellite, soil-testing or other data to select locations suitable for mass burial or mass composting sites. A comparison of burial for disposal under a variety of soil types was also suggested.
- v. Evaluation of the fate of highly toxic drugs/chemicals used for humane euthanasia during compost biodegradation and burial and possibility of toxic leachate was suggested by multiple participants.
- vi. Impact of the age of animals (aged horses) on disposal by composting.
- vii. Fate of antibiotic residues during composting.

3. Mortality disposal methods in general

(Medium Priority - identified in 36 responses)

The third broad category was for further research on mortality disposal methods in general, or for information that would be required for all mortality disposal methods. Suggested topics included:

- i. Impacts of density of human and livestock population, local climate, available technologies, and infrastructure, on selection of mass disposal options.
- ii. Determination of the carbon footprint for various mortality disposal options.
- iii. Development of information on methodology for de-populating large numbers of animals of a variety of domestic species.
- iv. Evaluation of allowable waiting times for slaughter of infected animals, along with safety and potential uses of the slaughter products.
- v. Knowledge of wild ungulates in general and efficacy of various depopulation strategies.

4. Research Database

(Low Priority - identified in 7 responses)

A readily accessible and searchable data base should be developed and shared across jurisdictions. This would contain economic analyses on different methods of carcass disposal suitable for specific situations. Using this research data base, standard operating procedures and guidelines could be drafted which would aid in producing rapid, uniform responses to international or cross-state outbreak

situations. Although not strictly a research need, training/education, and response planning were also identified as a research need as the extension of research data to the end user is often overlooked. A compilation of mortality disposal research data would help to avoid duplication of resources by providing better focus for scarce research funding.

5. Foot and Mouth Disease specific studies

(Low priority - identified in 16 responses)

Additional information needed for disposal during an outbreak of Foot and Mouth Disease was the fifth broad category of research needs identified. Foot and Mouth Disease (FMD) specific research included development of on farm tests for bulk milk and pork, methods for disposal of milk during an outbreak of FMD and establishment of protocols for mitigating FMD viruses as a result of disposal by composting, burial or rendering.

Conclusions - Research

Based on the input of Symposium attendees, the most frequently identified research needs were in order of priority:

- i. Development of methodology or new disinfectants for disinfecting porous surfaces
- ii. Fate of specific pathogens (with viruses of special interest) during mortality disposal and impacts of disposal methodology on human health risks and the environment (equal ranking)
- iii. Degradation of toxic chemicals used for de-population of livestock and environmental impacts of decontaminating agents.
- iv. Impacts of climate, soil types, human and livestock population density on the economics and overall suitability of mortality disposal options.

In terms of avoiding duplication of research resources, development of compilations of research data or making the research results easily accessible to the end user is a key step. Existing research information could at least partially fill some of the less-frequently identified research needs, but is of no use if end-users are not aware that it exists. A two-pronged approach would be required which includes further research to address key needs in knowledge of mortality disposal along with a coordinated plan for training and education to ensure current and future research information is widely distributed for use in development of future policy and guidelines.

Policy Needs and Priorities

The survey responses suggested a real need for a more unified policy among different policy-making entities. In a constantly changing field, the policies in place should allow sufficient flexibility to address the unique situation at hand, and maintain a sufficient level of uniformity to practices and protocols.

1. Best Management Practices for farm-level emergency response and communication

High Priority (Identified in 6 responses)

Additional needs were identified related to policy for disinfection, disposal, and emergency management. Specific needs included:

- i. The need to convene key stakeholders to develop farm-level best management practices. Specifically, participants recognized the need to coordinate efforts between all regulatory and expertise agencies (Agriculture, Environment, Department of Health, Extension, and Academia) to develop these practices.
- ii. The need for clear, concise, and consistent risk communication messages for on-farm hygiene, such as disinfection, proper biosecurity protocols and Best Management Practices (BMP) on infected premises. The communication should then be linked to public policy.
- iii. Clear guidance and lists of available options for disinfection and disposal of large volumes of mortalities in case of food safety or animal disease related events. These guidelines also need to be evaluated in terms of environmental regulations. APHIS and FSIS have recently published these lists/guidelines, but their existence and location needs to be better publicised.

2. Framework from policy to implementation

Medium Priority (identified in 3 responses)

New technology and information technology capacity was recommended to understand a country's overall response capacity for carcass disposal. Development of broader databases to connect agencies', resources, and models of response at the state and/or regional level was also mentioned. One respondent believed that the development of a real-world resource tool for identification, coordination, prioritization, management, and response planning is needed. Sharing experience between countries is important for future containment of high consequence diseases.

3. Disposal options, indemnity and governmental policy

Medium Priority (identified in 4 responses)

Another need identified was to conduct comparisons between disposal options in order to determine which option may provide the greatest biosecurity, while remaining cost effective and farmer friendly. One respondent stated the need to determine the drugs that were administered to animals prior to death and what effects those drugs may have on the environment as an animal decomposes. Another need identified was to determine if there is a correlation between carcass size, pile size, and temperature reached by piles during composting. Finally, a need for better government policy clarification on the topic of indemnity was also identified by participants.

Conclusions - Policy

Upon reviewing the submitted evaluations, it became evident that from the point of view of the attendees, in the area of policy, there were three specific needs that need to be addressed. The most commonly identified needs for public policy were in order of priority:

- i. Development of best management practices for farm level response and communication
- ii. Understanding the framework from policy to implementation and development of new resources to aid policy decision makers.
- iii. An established and well communicated policy on indemnity

Response Capability Needs and Priorities

In the event of a cross boundary highly transmissible disease of livestock, numerous activities need to be rapidly coordinated and implemented to provide the best management practices for containment and mitigation of the disease incident. This includes rapid identification of disposal sites, technologies, and resources and their deployment in cases where mortality, and/or humane euthanasia / mass depopulation (done for disease and/or welfare considerations) leads to contaminated and non-contaminated carcasses.

Needs and Priorities – Response Capability

The needs identified by the participants can be classified in three general categories: 1) research which will specifically enhance response, 2) providing rapid response capabilities / capacities and 3) improving response through outreach / education.

Based on total responses, regardless of assigned priority, research needs garnered the most responses with 14, rapid response capabilities and capacities scored the second highest need with 12 responses followed by education and outreach with 3 responses. Total responses by priority category saw in most cases the needs identified for research and response capabilities and capacities equally matched with education coming in third. The highest priority category only contained needs for research.

Research needs by respondents priority (1-4):

- Aerosolization of disease agents, materials/particles during treatment /disposal of carcasses (1)
- Human, animal and environmental health risk concerns in Africa (2)
- Correlation between carcass size, pile size and temperature reached by piles (2)
- Comparisons of disposal methodology related to biosecurity, cost-effectiveness and ease of use on-site by farm personnel (2)
- Disposition of veterinary compounds in carcasses under different disposal methodologies (3)
- Translation of carcass disposal research into applicable standard operating guidelines for use by responders under different environmental conditions and situations (3)(4)(4)
- Persistence and inactivation of highly pathogenic avian influenza using different disposal methodologies and translation of results into standard operating guidelines (3)
- Type and size of aerosol particulates detected downwind during mass composting processes (4)

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- Evaluation of current technologies as to effectiveness in volume reduction and pathogen control and costs for on-site mortality from normal production losses or depopulation (4)
- Retrospective survey of workers from recent agricultural emergencies to develop occupational health and safety guidelines for workers who participate in the management of mortalities (4).
- Review literature and develop guidance on inactivation of high consequence disease agents, which affect animal health or food safety, in large volumes of raw milk and disposition of treated product (No priority given)

The role of the responder(s) is to evaluate any given situation, determine and/or acquire the available resources to facilitate an effective response factoring in human safety in an effort to successfully mitigate an incident. The level of knowledge of the responder can help speed up the response process by providing explicit information that will aid in their observations of the situation. Highly knowledgeable responders will be able to orient themselves to determine the appropriate responses by which they can decide the course of action and carry out the activity.

Research themes focused on better understanding of the technologies and methodologies available for mortality management, the ability of these technologies and methodologies to inactivate disease agents and prevent spread prior to, during and after they are applied. A better understanding of appropriate methodologies for disposal of carcasses or animal products that have undergone treatment by another technology or methodology is also needed. Respondents strongly supported the translation of scientific information into usable standard operating guidelines for emergency responders.

The majority of research needs listed identify certain pieces of information that if known before an incident can speed up the response process. For example, having a better understanding of aerosolization and pathogen reduction by a particular disposal methodology, the responder can develop a plan that takes into account considerations regarding personal protective equipment for the responder and selection of a disposal method that reduces or eliminates the risk of disease spread by aerosols.

Rapid Response needs by respondents' priority (1-4):

- Development of national and regional projects in Africa for rapid response training for disease outbreaks (2)
- Develop guidance for storage and treatment of carcasses when final disposition is prohibited or not practical (2)
- Provide training and conduct exercises to increase readiness for identifying appropriate burial sites and handling /disposal of carcasses in African nations (2)
- Determine availability of in-country resources for transportable gasifiers in Australia (3)
- Identify disinfectants compatible with foaming for use in Australia poultry operations (3)
- Develop a resource that:
 - archives after-action reports and lessons learned for emergency responses involving animal mortalities around the world (3)
 - provides resource identification and quantification by country, region, or locality (4)
 - provides a list of experts and their contact information by geographic area (4)
 - connects agencies, resources and models of response at the state or provincial or regional level (4)(No priority given)

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- provides updated list of disposal technologies or methodologies, best practices when using them and identifying which technologies work in which environments and under what circumstances.
- Invest cost share dollars to help producers acquire disposal technologies that limit disease spread and that can be used prior to and during emergencies (4)

Response themes focused on the development and categorization of resources (human, technologies, plans) and scenario-based training of responders to determine and implement the appropriate technologies, methodologies and related standard operating guidelines for incidents involving animal mortalities in carcass disposal.

Improving Response through education/training needs by respondents' priority (1-4):

- provide education that highlights new technology including the application of the technology towards value-added markets (2)
- Engage and enlist a broader range of national and international authorities in order to protect countries from trans-boundary high-consequence livestock diseases
- Continue to provide international opportunities for education and outreach

To successfully mitigate mortality events, responders have to have knowledge at their fingertips that allows them to determine the best course of action based upon the disease agent, the method by which mortalities were achieved (morbidity for disease, method of euthanasia), approved disposal methodologies in the affected jurisdiction, an understanding of how various methodologies mitigate the disease agents so they are no longer infectious to animals and/or humans, and how to implement the appropriate methodology.

Education themes identified the importance of providing education (new technologies, SOPs, lessons learned) to stakeholders to facilitate better planning, training and execution of response plans involving animal mortalities in carcass disposal.

The level of knowledge of the responder is a main contributing factor to the speed of any given response however the real world application of that knowledge is just as important. Providing opportunities for outreach and education to highlight new technology is important, but is only one small part of the training continuum. Responders need to undergo real world training experiences that allow them to assess a mortality event, determine what disposal resources exist on site, what disposal resources are needed, how those resources can be acquired, and then finally use those resources to successfully carry out the response. An accurate site assessment and managing logistics are just as, if not more, important than physically carrying out the action with the chosen disposal methodology. If education and outreach do not touch on the full continuum of the response process for assessing and managing mortalities on a site then response can be delayed and ineffective in reducing the risk of pathogen spread.

Conclusions – Response

Participants' comments highlighted a continuum where research should be translated into usable information to bolster response capabilities and capacities through the development of standard operating guidelines. These response capabilities and capacities and resultant standard operating guidelines should then be provided to emergency responders to expand their ability to respond to

catastrophic losses of livestock and poultry. Some of these guidelines have been published on the APHIS website as FADPreP, but their existence needs to be better publicized.

Training/Education Needs and Priorities

Thirty-five (35) surveys indicated need for training/education. Three of these focused on the quality of a particular presentation or session and were not relevant to current or future needs.

Surveys calling for training/education were clustered in three subject matter areas: Alternative Disposal Technologies (10 responses); Biosecurity (9 responses); and Emergency Preparedness and Response (13 responses).

Eighty (80%) percent of the survey responses focusing on Alternative Disposal Technologies, and 67% of those targeting Biosecurity, identified concurrent needs involving training/education in conjunction with research, policy development, improved emergency response capability, or a combination of these. Education played a more predominant role in the area of Emergency Preparedness and Response, where only 46% of surveys identified concurrent needs and 54% listed training as the only need.

Fifty (50%) percent of surveys targeting training/education specified or implied a target audience. Livestock producers/producer groups/commodity organizations (5) were mentioned most frequently, followed by: agencies/officials/policy makers (4); general public/news media (3); professionals/professional associations (2); and developing countries/Africa (2). Mention of most target audiences were scattered among several of the subject matter areas, but mention of general public/news media was associated only with Emergency Preparedness and Response in recognition of the potentially powerful role that public opinion can play during large-scale animal disposal emergencies.

In priority order (highest priority discussed first)—as indicated by survey responses—training and education needs were as follows:

1. Alternative Disposal Technologies

(10 responses)

Training/education needs in this subject area were grouped into the following subcategories:

- Composting (average priority = 3.8) - Six surveys indicated a need for training/education on composting. Four of these called for general information on methods and equipment and their application to different species or sizes of carcasses. The remaining two indicated a desire for education regarding degradation and release of barbiturates and other animal health drugs into the environment during the composting process.
- Technology Comparisons (average priority = 3.0) – Four surveys requested training/education comparing costs, effectiveness, practical application considerations, and aerosol releases associated with current and emerging disposal technologies.

2. Biosecurity

(9 responses)

Training/education needs in this subject were grouped into the following subcategories:

- Decontamination (average priority = 3.7) – Three surveys specified a need for training/education on disinfection methods and equipment. On-farm hygiene practices, disinfection of large volumes of raw milk, and information regarding the persistence of specific pathogens, such as highly pathogenic avian influenza, were areas of concern.
- Disease & Environmental Risk (average priority = 2.8) – The focus of this subcategory was on improving general awareness and understanding of biosecurity concepts with emphasis on disease prevention, suppression of disease transmission, and environmental protection. A comparison of the biosecurity of various disposal options, and information on disease management in developing countries were specific items of interest. Two responses emphasized the need for producers to understand the relationships between animal health, human health, and environmental health.

3. Emergency Preparedness & Response

(13 responses)

Training/education needs in this subject were grouped into the following subcategories:

- Public Awareness (average priority = 3.3) – Three surveys emphasized a need for education of the general public and news media regarding all phases of livestock production and including the societal impacts of depopulation and disposal during animal disease emergencies. Suggested educational materials included talking points and media-ready press releases that will help emergency response personnel to deal proactively with public perceptions during livestock emergencies.
- Assessing & Building Response and Recovery Capacity (average priority = 3.4) – Ten surveys highlighted the complexities facing emergency responders and the need for a wide variety of training and education events and products. These included: training exercises; demonstrations; regional planning projects; case studies; and cross-border discussions that provide opportunities for emergency responders of all types to see the “whole picture,” collaborate effectively, and address the equally important topics of post-incident recovery and business continuity.

Conclusions - Training/Education

Training and education are vital to transformation of research reports, policy analyses, and emergency response plans into concepts that front-line responders can understand and put into practice. Future needs survey responses confirmed widespread support by symposium attendees for training and education that complement research, policy development, and emergency response capacity assessment and development. The general topic of alternative disposal technologies—specifically composting, and practical comparisons of alternative technologies—received the highest priority ranking from symposium participants. Two biosecurity-related topics—decontamination, and disease

and environmental risks—ranked second in overall priority. The third general topic of importance was emergency preparedness and response—where education on the topics of dealing with public perceptions, and assessing and building response and recovery capacity, were high priorities.

Conclusions

The greatest number of needs identified by Symposium participants were in the areas of Research and Training/Education. Fewer needs were associated with the areas of Policy and Response Capability, but both areas were well represented. No additional categories of need were suggested by survey respondents.

Although respondents to the Future Needs Survey were asked to associate their suggested needs with a single need category (research, public policy, emergency response capacity, or training/education) to aid the subsequent analysis of responses, many respondents identified multiple categories. The relatively high percentage of participants who chose to respond in this manner indicates that symposium participants saw policy development, research, education, and development of emergency response capacity as interrelated parts of a continuum of activities necessary for improved response to catastrophic animal losses. This emphasizes the importance of interaction between policy makers and regulators, educators, researchers, and emergency responders in venues such as the International Symposium.

In the area of Research, priority needs focused on: disinfection of porous surfaces; environmental fate of pathogens and toxic chemicals used in depopulation; and impacts of climate, soil type, and human and livestock population density on the economics and overall suitability of mortality disposal options. Key Policy needs included: development of best management practices for farm level response and communication; and establishment and communication of clearly defined indemnity policies. Development and distribution of standard operating guidelines was the most critical issue in the area of Response Capability. The most frequently mentioned Training/Education needs were for updates on: new developments in research, policy, and emergency capacity; information on composting; and practical comparisons of alternative disposal technologies to aid livestock producers in selecting routine and emergency disposal methods.

A growing need identified by symposium participants, and by external reviewers of this white paper as well, is for a centrally-located and easy-to-search compendium of newly released information. Reviewers noted that new policies, guidelines, and technical bulletins prepared by sources from around the globe address many of the needs suggested by Symposium participants. An example is the recently-released two-volume guidance document entitled *APHIS Foreign Animal Disease Preparedness & Response Plan (FAD PReP)* (USDA, 2012). Locating new materials can be a time-consuming process that can be frustrating during emergency situations. A central repository for new materials would make them easier to locate, and also could provide a valuable opportunity to compare new policies and research results from around the world, and to identify topic areas needing additional funding and study.

Recommendations for Future Symposia

To identify and prioritize future needs relevant to research, public policy, emergency response capacity, and training/education, opinions were gathered from: the Future Needs Survey form (Appendix A) that was distributed before each Symposium session; table recorders' summary notes captured during the cross-border workshop (Appendix B); and the general Symposium evaluation (Appendix C).

Since future needs information was collected using three methods that were developed and carried out by different symposium committees, the resulting data differed in format and focus, and this increased the difficulty of interpreting and compiling the results (although number of responses was likely enhanced). Survey participants' rating of the priority of perceived needs, for example, were collected in the Future Needs Survey, but not in the other surveys. Opinions collected via the Future Needs Survey and the General Symposium evaluation were rendered in writing in the participants own words, while those collected during the cross-border workshop were expressed orally and hurriedly paraphrased by individuals assigned to serve as table recorders. The general Symposium evaluation was designed to cover a broad range of topics (to be used in planning future symposia), such as participants' rating of the conference facilities and program and achievement of learning objectives, in addition to their opinions regarding future needs. For the most part, however, results from the three survey methods appeared to agree and the authors of this paper tended to draw primary conclusions from the Future Needs Survey and used data from the other two sources to augment these conclusions.

For planners of future Symposia, the White Paper authors have identified several areas for possible improvement in the way that participants are engaged, and their ideas collected and analyzed. The first regards the issue of "one participant, one vote". The anonymous survey used during the 2012 Symposium allowed individuals to repeatedly submit a topic of personal significance, and white paper authors were unable to discern whether one person raised the same issue repeatedly, or six people identified a similar need. Issuing future Symposium participants a registration number (which qualifies them for a prize, such as free registration at a subsequent Symposium) that must be entered on feedback surveys could help to reduce survey bias caused by participants who repeatedly submit ideas focused on a single issue.

Repeated surveying of participants regarding knowledge gaps and future needs was successful in gathering feedback throughout the Symposium, but this strategy did not achieve the high overall participation rate that was sought. Participants at scientific conferences are not typically asked to assess and express their opinions more than once, and convincing them to do so requires repeated (and potentially irritating) reminders from session chairs, as well as allocation of time at the end of each session for discussion of ideas and completion of surveys of personal opinions. A more realistic approach may be to survey participant opinions following a participatory conference event—such as the Cross-Border Exercise held during the 4th International Symposium—that provides attendees time and motivation to discuss real-world scenarios in a small-group format. Such an approach engages participants during a period of heightened interest (as opposed to post-conference surveys) and limits feedback gathering to a single time period during the conference. To focus group responses, thereby aiding aggregation and interpretation of results, it is recommended that small groups be asked to

Summary of future needs identified by participants at the 4th International Symposium on Managing Animal Health and Risk (Dearborn Michigan, May, 2012)

respond, as a group, by listing and prioritizing specific perceived needs associated with various scenarios, and specific actions that will fulfill these needs. The use of electronic media such as Facebook and Twitter for gathering feedback was attempted, but was little used during the Symposium. Future Symposia are encouraged to re-visit these technologies as adoption may eventually be higher, especially in the younger demographic.

Summary of future needs identified by participants at the 4th International Symposium on Managing Animal Health and Risk (Dearborn Michigan, May, 2012)

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Appendices

Appendix A - Future Needs Survey

Participant Feedback Card—4th International Animal By-products Symposium
May 21-24, 2012 Dearborn, MI

Tour / Session # _____

Tell us what YOU think?

The primary sponsor of the Symposium (U.S. Department of Homeland Security) requires development of a Symposium White Paper identifying and prioritizing future knowledge and capability **needs**— as suggested by symposium attendees — in the areas of **research, policy, response capability, and training/education**.

As you think about ideas discussed during this tour or presentation, please respond to the following:

1. Based on your experience and expertise, describe an important future need (one idea per card please use another card for additional ideas). If this need applies only to a specific country, please indicate the country.
2. What are your suggestions for meeting this need?
3. Please categorize this need and its priority by checking one box in the table below.

Priority Rating	Category				
	Research	Policy	Response Capability	Training/ Education	Other Describe & Rate
Strong (4)					
Medium (3)					
Small (2)					
No Idea (1)					

4. What is your main area of expertise?
 Policy development Regulatory Research Livestock Production
 Educator/Extension Other (please specify) _____
5. Please tell us where you are from.
 Africa Asia North America South America Europe Australia
 Country (optional) _____

Many thanks for your valuable contributions of ideas.

4th International Symposium White Paper Committee

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Appendix B – Summary Notes Compiled During Cross-border Exercise

Timely review and exercising of response plans is critical for preparedness and provides opportunities to identify and address needs and modify plans to take advantage of new information and technologies. Participants of the 4th International Symposium on Managing Animal Mortality and Health Risk participated in a Cross-Border FMD Response Disease Simulation Work Shop. The workshop included a breakout session and a facilitated scenario discussion. Participants were provided an opportunity to analyze a fictitious cross-border FMD outbreak and identify issues and needs related to movement, depopulation, disposal and decontamination activities. The following section provides a summary of the issues that affect response capabilities.

General Comments

Participants identified needs that fell into 2 general categories: 1) lack of basic information or knowledge regarding incident management, roles and responsibilities of government agencies and current FAD response and communication plans at the state/provincial and federal levels and, 2) Needs related to the operational components directly related to movement, depopulation, disposal and decontamination activities. The following highlights needs and suggests mechanisms to address them.

Awareness of Plans

Needs identified a lack of general information regarding pre-established plans, current memorandums of understanding, evaluations of past exercises to identify needs and efforts to address them.

Relationship Building

The needs identified reflected a lack of information regarding pre-established and ongoing relationships between responsible State and Federal agencies that are tasked with responding to an FAD event.

Communications

Needs in communication identified a lack of information regarding the process of intra-agency communication prior to and during an FAD event. This information is most likely outlined in state/provincial and federal emergency operations plans and in Incident Command System training but may not be available in a readably accessible format for review prior and during an FAD event or exercise.

Pre-Planning

Needs identified a lack of information regarding the responsibilities of state/provincial and federal authorities for developing and implementing response plans for foreign animal disease outbreaks. More specifically there is a lack of knowledge regarding who is responsible for developing and implementing specific plans for movement, depopulation, disposal, and decontamination. Areas that need resolution or clarification include:

- Who is the primary federal regulatory authority in charge of the activity
- Who is the primary state regulatory authority in charge of the activity
- Who is responsible for writing the plan?
- Who approves the plans?
- Where are approved plans located?
- Who is responsible for developing standard operating guidelines (SOG's) within the plans?
- Who approves SOG's ?
- Location of approved SOG's ?

Standard Operating Guidelines for:

Movement Control:

Needs included a lack of information regarding the responsible parties for determining and implementing movement controls for live animals, equipment and carcasses along with the type of equipment and human resources needed to control movements.

Depopulation:

Needs included a lack of information regarding the responsible parties for selecting and approving methods for depopulation along with the type of equipment necessary and human resources available to carry out the tasks. Areas that need resolution or clarification include:

- Who is responsible for selecting and approving depopulation methods?
- Who determines the best method for selected sites?
- Who provides final approval of the methods for a site?
- Where are the SOG's of the approved methods located?
- What equipment and resources are needed for approved methods?
- Where is the equipment and resources?
- What needs to be done to prepare the site for action?

Disposal:

Needs included a lack of information regarding the responsible parties for selecting sites for disposal, and conducting and approving environmental assessments. Responsible parties also needed to be identified for determining the approved disposal methods available by site according to available resources and final approval for approved and newly developed plans based on situational awareness. Areas that need resolution or clarification include:

- Who is responsible for selecting the disposal sites?
- Who does the environmental assessment of selected sites?
- Who determines the acceptable methods used on selected sites?
- Who provides final approval of the methods?
- Where are the SOG of the approved methods located?

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- What equipment and resources are needed for approved methods?
- Where is the equipment and resources?
- What needs to be done to prep the site for action?

Decontamination:

Needs included a lack of information regarding the responsible parties for selecting and approving methods for decontamination, decontamination site selection, type of disinfectants needed based on the agent and the type of equipment necessary and human resources available to carry out the tasks. Areas that need resolution or clarification include:

- Who is responsible for selecting and approving the disinfectants and methods used?
- Who is responsible for determining the location of disinfection sites?
- Who determines the acceptable methods used on selected disinfection sites?
- Who provides final approval of the methods?
- Where are the SOG's of the approved methods located?
- What equipment and resources are needed for approved methods?
- Where is the equipment and resources?
- What needs to be done to prep the site for action?

Discussion

In 2001, the FAD outbreak in England sparked a wave of federal and state/provincial planning and exercises and progress was made in identifying responsible agencies, interagency communications, and plan development and refinement. For many of the gaps identified in the workshop state and federal emergency operations plans, after action reports, previous gap analysis and resolution will most likely contain this information but it may not be available in a summarized readily accessible format for easy review prior to or during an FAD event or exercise. The development of simple one page fact sheets that address a response activity (e.g. communications, movement control, depopulation, decontamination etc.) could help address these gaps. These types of resources could be valuable to providing a quick review by newly elected officials, new state and federal employees and other responders. They could also prove valuable to exercise or workshop participants to help provide background on those issues that have been resolved so more focus can be applied to accomplishing the objectives of the exercise.

Subsequent Exercises/ Workshops

Exercises and workshops are valuable. The Cross-Border FMD Response Simulation workshop at the 4th International Symposium on Managing Animal Mortality and Health Risk identified many needs in information sharing. Many needs may be easily addressed through better communication of incident management roles and responsibilities of government agencies and current FAD response and communication plans at the state/provincial and federal level. In subsequent exercises or workshops participants may benefit from exercising the operational objectives necessary for managing mortalities and health risks at the local level based on the scope of a simulated outbreak. To achieve this, a scenario can be developed using a simulated Control Area that contains geographical information and geospatial

Summary of future needs identified by participants at the 4th International Symposium on Managing Animal Health and Risk (Dearborn Michigan, May, 2012)

locations of livestock and livestock densities. A master events list can be generated to help focus on the objectives of the exercise or workshop. Scenario background information can be developed to communicate simulated policy decisions and Incident Command Structure and operational activities that help to focus participants on achieving the defined objectives of the exercise or workshop.

Appendix C – Input Collected On General Symposium Evaluation

MONDAY May 21 TOURS:

Overall rating, prior knowledge and new understanding

Tour A, A Trip Across the Border—Animal Inspection Procedures and Routine Mortality Disposal Methods, had 33 participants, of which 22 (66.7%) filled out evaluations.

Critical needs Identified and suggestions for resolving:

Tour A: Eight people identified 5 needs and 1 indicated a way to fill the need.

1. Four indicated that needs existed in livestock movement during an outbreak, especially when restricted areas exist in both countries; producers need to know the disease risk associated with the movement. There is a need for broader understanding among all affected by the process, procedures, and regulations on cross border movement and import/export issues. One person suggested that documenting the actual logistics of how movement controls will occur could fill this need.
2. There needs to be consistency in border policies (1 respondent).
3. The movement and persistence of pathogens in landfills needs to be determined (1 respondent).
4. Need to know how to disinfect wood and porous surfaces (1 respondent).
5. BFI and WM need to be at the table referencing catastrophic carcass disposal (1 respondent).

TUESDAY May 22

Seventy-seven of the 79 evaluations turned in evaluated Tuesday's sessions representing 52.4% of attendees.

Critical needs Identified and suggestions for resolving:

There were 13 needs identified in 3 areas.

1. **Policy** (4 respondents): Consistency in policy/preplanning; policies that are connected across the borders; .more information on actual/current USDA policy is needed; legislation in many instances is far too restrictive/prescriptive when flexibility is needed to allow for sound decision making.
2. **Communication** (6 respondents): There needs to be better understanding and communication between professional disciplines and governmental agencies (might best be done by emergency planners and coordinators as they understand the real and potential risks); greater sharing of policies and response capabilities; coordination between state and federal government to distinguish and share information; greater community awareness of what needs to be done during an emergency; public policy and risk communication; public perception—there is a fair amount of information the public should know in order to build confidence.
3. **Research** (3 respondents): carbon footprint/CCA comparisons of different disposal methods; build knowledge base and step up research in the area of animal disposal methods; need surrogates to use in disinfectant efficiency test and need to have virus genre mapped for disinfectants.
4. Need to know how to disinfect wood and porous surfaces (1 respondent).

WEDNESDAY May 23

Seventy-four of the 79 evaluations turned in evaluated Wednesday's sessions representing 50.3% of attendees.

Critical needs Identified and suggestions for resolving:

There were 13 needs identified in 3 areas.

1. **Policy and Planning** (4 respondents): Plans, policies and practice exercises are critically needed due to new understanding and experiences; lack of clarity around roles and responsibilities is a major stumbling block; still need more collaboration research and more consistent policies between states; broader discussion needed among government, industry and academia; How are regulations so different between countries if we're all dealing with the same topic?
Suggestions for filling these needs included: Cross-border discussion and planning need to be reviewed and exercised regularly; communications and relationship building between decision makers and the entire industry needs to happen when there is no emergency; Standard operating procedures for mass disposal; guidelines and planning documents for first responders
2. **Research** (6 respondents): Pentobarbital – effect of xylazine on chemical breakdown of sodium pentobarbital (SP); xylazine/ketamine in leachate? What does SP break down to?; Milk disposal methods during an FMD outbreak; Comparative analysis of various methods for animal mass disposal; Research on burial of animals in different types of soils – clay, silt, alkaline, acidic; Need to know more about disposal options and fate and transport; Find out whether better detergents to remove pathogens is more important than porous surface disinfectants
3. **Emergency Disposal** (3 respondents): Regional logistical and capacity limitations—these will be dependent on geology, climate, industry, species and available infrastructure; Availability and mobility of mobile disposal alternatives; Mass disposal

THURSDAY May 24—CROSS BORDER FMD RESPONSE DISEASE SIMULATION WORKSHOP

Sixty people filled out an evaluation for the FMD workshop which represents 40.8% of conference attendees and 75.9% of evaluations turned in.

Critical needs Identified and suggestions for resolving:

8 people identified needs in 4 areas.

1. **Communication:** (4 respondents): Communication with industry and local law enforcement; agreements for response and notification of encroaching disease; communications—there is a need for international planning and understanding; countries should have a critical understanding of FMD control methods/policies practiced by their neighbors in order to have a firm understanding of FMD outbreaks. One of the respondents suggested that groups should meet to get an understanding of expectations and authority involved.
2. **Sovereignty** (1 respondent): Need to better integrate tribal nations and help attendees understand the sovereignty of tribal nations/tribal lands
3. **Resource allocation** (2 respondents): Allocation of people; need to know who has disposal expertise in each geographic area and their desire to work on an ICS team. It was suggested that there should be a technical skill set used to analyze people so that it will be know where to place them from the point of view of overall response.
4. **Logistics** (1 respondent): Transportation and euthanasia methods need more discussion.

THURSDAY May 24—DEMONSTRATIONS

Forty people filled out an evaluation for the demonstrations, which represents 27.2% of conference attendees and 50.6% of evaluations turned in.

Critical needs Identified and suggestions for resolving:

1 person identified need: The biggest need is working alone instead of with other agencies/governments/countries and industry in developing permitting requirements.

OVERALL SYMPOSIUM

Seventy-five people filled out this page of the evaluation which represents 51% of conference attendees and 95% of evaluations turned in.

Critical needs identified after attending the symposium and suggestions for resolution:

20 people wrote comments in 7 categories

1. **Mass Mortality** (6 respondents) Massive mortality from disease outbreak is a challenge. Disposal of the carcass is not a goal, the goal is to disinfect the pathogens and utilization of carcasses for value added products; need a lot of work to address large volume mortalities; response capacity of operational agents for on-site and off-site mass mortality composting; inventory and response and distribution resources in mass mortality events; overall logistics (start to finish) for an emergency; broaden engagement of all entities to identify roles, responsibilities and resources in light of changes to response plans to events. **Suggestions for resolving** (3 respondents): new technology development, knowledge exchange, education and industry involvement should be encouraged; define inventory and resources/distribution better; create timelines with targets and include bottlenecks and limitations.
2. **Research** (5 respondents) Fate of sodium pentobarbital and other components during composting; where does pentobarbital go (water) when it leaves the compost site and in what form, and is it active and/or detrimental; information on euthanasia; farm side test for bulk milk, pork for FMD detection to facilitate continuity of business; more documented research needed for the mitigating of FAD viruses as a result of composting, burial, rendering, etc.
3. **Communication** (3 respondents) Communication and how to communicate sensitive subjects to the public/retailers; public perception and support for the work we are trying to get done; communication among primary stake holders is key. **Suggestions for resolving** (2 respondents): more proactive media releases to highlight the beneficial and proactive work that is going on in preparation for a FAD; need to continue to develop relationships.
4. **Money** (2 respondents) Public funding for farms to implement state of the art mortality management systems; limited funds deter risk analysis—where is it best spent for maximum impact/efficiency/safety?
5. **Policy** (2 respondents) Consistency of policy (regionally); understanding and consistency of policies. **Suggestions for resolving** (2 respondents): better preplanning using lessons learned; get all stakeholders here—politicians, government officials, vets and owners and hash out some of the inconsistencies.
6. **Transportation** (2 respondents) transportation of carcasses
7. **Data Tools** (1 respondent) new data tools for capturing disease information and for emergency procedures.