Animal Decontamination: Current Issues and Challenges

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National Alliance of State Animal and Agricultural Emergency Programs (NASAAEP)

Summary:

- In emergency incidents, animals may become contaminated with hazardous substances including biological agents, hazardous chemicals, and radioactive materials. Mixed contaminants incidents may occur in situations such as floods where both chemical and biological contaminants may be presumed to be present. In most cases, animal contamination will occur simultaneously with contamination of people and the environment. Animal populations include livestock for food production (which vary considerably in numbers and type with geographic locations[1]), pets (which occur on the average of 0.67 pets per person in the typical U.S. community), and other animal populations such as captive wildlife, native wildlife, and laboratory animals. Animals may have economic, cultural, emotional, or environmental value to their owners or the public. The nationwide presence of large and diverse populations of animals almost ensures that any large-scale incident where people or the environment is contaminated will also contaminate animals. Animals are diversely valued in our society for companionship, food, fiber, draft, and recreation (e.g. horses). In the aftermath of a radiological or nuclear incident, many people may attempt to either care for animals in place or evacuate from a contaminated area with their animals. Animals used for food could potentially introduce contaminants into the food supply if appropriate protective decisions are not made on a timely basis. The capability to effectively decide when and how to decontaminate animals is a necessary element of effective emergency management. In the last two decades there has been significant research and validation pertaining to the decontamination of oiled wildlife. Some work has also been done concerning the biological decontamination of animal production facilities and vehicles and animal carcasses, but has not typically addressed decontamination of live animals themselves. Little scientific research and validation of other animal decontamination processes and procedures has been performed. There is also a need for trained teams of properly qualified and credentialed personnel to carry out large-scale animal decontamination operations. No community can be expected to maintain catastrophic animal decontamination capabilities, but currently there is no validated set of operational guidelines, national equipment cache, or proven capability to dispatch to the scene of a major biological, hazardous materials, nuclear, or radiological incident for the purpose of addressing animal decontamination issues. This paper details the challenges surrounding animal decontamination and makes some essential recommendations towards creating credible national capability for animal decontamination.

General Assumptions:

- While there are many physiological similarities between people and animals, there are in fact also many significant differences that do not allow for broad extrapolations of data between human and animal decontamination. In addition, behavioral and medical concerns for various animal species must also be considered.
- First responders, including hazardous materials response teams, are not typically trained or equipped to handle animal issues.

[1] US animal agricultural populations are detailed at: http://www.agcensus.usda.gov/Publications/2007/Full_Report/usv1.pdf

- In any hazardous materials incident where large-scale evacuations are necessary, people can be expected to evacuate with corresponding numbers of pets and other animals.
- Animal decontamination involves many challenges not found in human decontamination, including
    - Challenges of physical restraint, including rescue and recovery by persons wearing personal protective equipment (PPE), animal escape, and potential for handler injury such as bites, scratches, kicks, and crushes
    - Inability of animals to assist with decontamination efforts
    - Hair (and sometimes feathers and scales) instead of readily-removable clothes
    - Accurate animal identification before, during, and after decontamination
    - Ingestion of contaminants by animals secondary to instinctive grooming behaviors and drinking and/or inhalation of waste water.
    - Animal production operations such as dairies require daily feeding and milking. These processes must continue as a matter of animal health and welfare whether the animals or their products eventually enter the food supply or not.
- In a major incident, it is likely that the resources for primary human needs will be insufficient, particularly in the immediate aftermath of the incident. While limited human resources should not be diverted to support animal issues, ignoring animal issues completely will potentially encourage people to circumvent the monitoring and decontamination process and pose a danger to themselves, others, and the environment outside the incident zone.
- Nearly every community has experienced professionals that work with animals on a routine basis, and if appropriately trained and equipped, such personnel could support animal decontamination operations without detraction from services for people.
- Biological contaminants create a number of unique challenges. The disease agent may be a single known organism or may be one or more components of a mixed contamination, such as in floodwaters. Biological contamination requires careful management, particularly when zoonotic diseases may be involved.
- Contaminated livestock and poultry may be temporarily or permanently rendered unfit for food, fiber or other use. In such cases, these animals must be identified, confined, and when appropriate, euthanatized and disposed of in such a way as to accommodate public health, animal welfare and environmental concerns.
- If past experiences such as Hurricane Katrina are at all predictive, then it should be assumed that the media and general public will have an intense interest in the status of animals in a disaster, from small-scale hazardous materials spills up to the level of a catastrophic nuclear or radiological incident.

Additional Radiological Assumptions:

- In a large scale radiological or nuclear incident an array of radionuclides with varying emissions and energy levels may be present in a variety of concentrations based on timeline and proximity to the detonation/release. The effect of this release on an animal or its caretaker will be relative to the length of exposure, the type of the radiation (alpha, beta, gamma, neutron), and the concentration and energy levels of the particular radionuclides involved. There is no one-size-fits-all decontamination procedure for all of the diverse scenarios potentially resulting from a release. It should be assumed that exposed livestock and poultry may have absorbed radioactive materials through both oral and inhalation pathways, with some animals being internally contaminated to the degree that they constitute a danger to their handlers and the food supply. Some radioactive

substances readily aerosolize and may become resuspended if simple mechanical means (brushing for example) are utilized to remove external contamination; this could lead to inhalation by the care provider. A respirator, dust mask, or even a dampened bandana may offer some protection against inhalation of resuspended particles. Shielding, such as wearing an apron and heavy rubber gloves, while also keeping some distance from the animal being washed may provide adequate protection from low concentrations of beta-emitting materials. That same shielding will not prevent irradiation by gamma-emitting materials whether the animal is externally or internally contaminated. However, the decontamination of animals has not been thoroughly investigated.

- In a large scale radiological or nuclear incident, it is likely that human fatalities will occur from radiation effects, blast effects, or combinations of the two. Others who do not die from the immediate effects may receive radiation doses that increase their probability of cancer. Some cancers can present as rapidly as two years post-exposure. While no plan can prevent all deaths or cancers, we should seek to limit increased death and cancer rates from radiation exposure as much as possible given available resources. If animal issues can be managed to lower human death rates by such practices as properly decontaminating and monitoring animals and preventing food animals from entering the food chain, then it should be an essential consideration.

Major Issues and Challenges

Operational Challenges - General and Chemical:

- Simply allowing animals to roam and potentially escape from contaminated environments or allowing them to starve in place are not reasonable options. On the other hand, exposing responders to unnecessary risk in order to decontaminate and care for animals is problematic as well. Not addressing this issue in a humane and reasonable manner could result in highly negative public perceptions and volatile reactions.
- What local, state or national resource(s) can be mobilized to support animal decontamination and related missions? Personnel performing animal decontamination must have appropriate PPE, training, and the necessary medical clearances and respirator fit testing.
- Animal monitoring and decontamination strategies must be able to adapt to the specific incident, availability of local resources, current and changing weather conditions, and other factors surrounding the incident.
- Does bathing provide adequate decontamination or are additional measures needed such as therapeutic or prophylactic treatments?
- Concentrated or captive animal populations pose unique management challenges. Such facilities include biomedical research institutions, zoos, veterinary hospitals, animal shelters, boarding kennels, stables, wildlife rehabilitation or sanctuary facilities, and others. U.S. livestock operations range from small farms to large-scale production units. In some cases, it may be difficult or impossible to evacuate entire facilities on short notice. The decontamination of some animal species may be extremely challenging or ultimately not feasible.
- Some owners may be reluctant to release the animals to the care of others and may be unwilling to cooperate with animal decontamination efforts. Others may exit contaminated areas with their animals while avoiding decontamination sites and jeopardizing public, animal, and environmental health.

Operational Challenges - Radiological or Nuclear:

- The key operational challenge for animal caretakers and veterinary personnel will be how to safely manage potentially hundreds or thousands of pets, livestock, poultry, or wildlife contaminated by a nuclear power plant accident, a military weapons accident, a purposeful dissemination of radionuclides, or the intentional detonation of a nuclear weapon.
- The incident type and the zone[2] within the incident will have major impacts on any animal operations. Any operational guidelines should be considered "tools in the toolbox" for use according to the type, scale, conditions, zone, and available resources of a particular incident.

Operational Challenges - Biological:

- Exposure or contamination of animals with disease organisms involves an array of complex issues. Management will depend on many factors including:
    - Is the disease agent zoonotic (contagious between animals and people) and therefore a threat to human as well as animal health?
    - Is the exposed animal susceptible to the agent, or potentially an unaffected carrier or contaminated fomite?
    - Is the disease reportable to State or Federal authorities with potential consequences to animal health, human health, and agricultural production systems?
    - What disinfectants are appropriate for destruction of the disease agent? Can or should such disinfectants be applied safely and effectively to a live animal?
    - Is a quarantine period needed to protect against disease transmission by the animal?
- In addition to live animal decontamination, cleaning and disinfection of animal production facilities, transportation conveyances, feed supplies, manure, carcasses, etc. must also be considered. State and Federal animal health officials and their supporting partners are working to address many of these tremendous issues and challenges pertaining to the biological decontamination of animals and animal-associated infrastructures.

Technical Challenges – General and Chemical:

- Many animals can be expected to be uncertain or fearful of people wearing PPE, increasing the likelihood of kicks, crushes, bites or escape behaviors. Animal containment and restraint capabilities will often be necessary to allow decontamination and treatment, increasing contact between animals and caretakers.
- In many cases, simple bathing of the affected animals may provide adequate decontamination and best reduce the potential aerosolization of the contaminant and consequential cross contamination of the caretaker.
- What is the ideal technique and sequence for animal decontamination in order to minimize time and wastewater generation? Wastewater should be managed according to incident policy. In a large incident, this could involve disposal through a sanitary sewer system.
- If farmers, ranchers, animal owners, and veterinary personnel participate in decontamination operations, how do we best protect them from injury or illness?
- Some pets and livestock will accompany people evacuating from a contaminated area. This could include pets, horses, small ruminants, small backyard or show poultry flocks, and valuable breeding

[2] Zones for a nuclear detonation include the no-go zone, the major damage zone, the minor damage zone, and dangerous fallout zone.

stock. Processes must be in place to monitor animals exiting the incident scene and to provide instructions through the media on safe and effective decontamination and management for animals that have already left the incident scene.

- Some animals may be so severely injured and/or contaminated as to require humane euthanasia. What mechanisms will present the least risk to responders and what carcass management techniques will be the most efficient in protecting responders and the environment?
- If we are unable to effectively respond to the needs of livestock, poultry and other animals in a biological, chemical, or radiological emergency, how do we explain/justify that deficiency in the middle of a catastrophic incident to the American public and the agricultural sector?

Technical Challenges – Radiological or Nuclear Incident:

- A surveillance system for animals must be in place to determine level of contamination, severity of injuries, and onset of signs of radiation sickness. Incident-specific treatment protocols and strategies for surveillance must be rapidly established by considering the available resources, best practices, and the number of animals affected.
- By what procedures are livestock and poultry best decontaminated given radionuclide source, deposition, ingestion, and duration of contact for the variety of radioactive materials potentially involved in a radiological accident or purposeful contamination event?
- For nearly each class of radionuclide there exists a form of radiotherapy. The potential for some of these products, such as Prussian blue to decorporate Cs137 from livestock and dairy animals, has been demonstrated in countries where animals were contaminated by the Chernobyl accident in 1986[3]. However administration strategies and dosages requirements for the effective use of these medications in returning livestock and dairy animals to productivity need validation through research and field trials. Which medications are potentially contraindicated in what species? Will medication inventories allow treatment for both animals and people?
- Do human monitoring procedures yield valid results for animals in order to assess the success of decontamination procedures?
- Can we apply the ALARA[4] (As Low as Reasonably Achievable) principles to animal decontamination?
- Concepts for decontamination of radioactive particulates, such as high-powered, filtered vacuum units (perhaps including palletized central vacuum units), or chemical shearing should be investigated.

Recommendations:

The following recommendations aim to better prepare the Nation for the management of animal populations in major biological, chemical, nuclear or radiological incidents:

- Empower partnerships between Federal agencies, States, Tribal Nations, Territories, local jurisdictions, academic institutions, zoological facilities, and non-governmental partners. The Animal Decontamination Best Practices Working Group of the National Alliance of State Animal and Agricultural Emergency Programs (NASAAEP) is supported by the USDA Animal and Plant Health Inspection Service and is one such example of the type of broad partnerships that need continued support.

[3] International Atomic Energy Agency report: Chernobyl 20 Years After.

[4] ALARA is a requirement for all radiation safety programs, it stands for As Low As Reasonably Achievable, and it reflects a radiation safety principle for minimizing radiation doses and releases of radioactive materials.

- More fully determine the type, capability, and number of resources needed to address animal issues within a large-scale biological, chemical, radiological, or nuclear emergency.
- Continue scientific research and eventual development of best practice procedures. State animal health officials, USDA APHIS Veterinary Services, the United States Animal Health Association Committee on Animal Emergency Management, and other partners are working to address many of the challenges pertaining to biological contamination. While some progress has been made in this sector, numerous challenges remain.
- Identify and prioritize funding for the scientific study of animal decontamination procedures for a full array of potentially-hazardous materials. For radioactive particulates, vacuum technologies for animal decontamination merit further investigation. Barrier creams may hold promise for reducing exposures of veterinary personnel to other potentially-hazardous materials as they conduct animal decontamination operations.
- Use results of the above studies to develop and validate an array of operational practices that can be matched to incident types, needs, resources, and conditions.
- Create tools tailored to animals for triage/assessment, collection and preservation of samples for diagnostic or forensic purposes, therapeutic and welfare considerations, long-term treatment and management strategies, and a formulary for a variety of common species.
- Develop best practices materials and documents and disseminate them to the animal and agricultural communities through veterinary medical colleges and the Extension Disaster Education Network.
- Create just-in-time training modules and train a core cadre of instructors to deliver the training to incoming animal response resources and/or livestock facility owners when needed.
- Provide sufficient funding and training to form nationally-deployable teams of veterinary personnel with expertise in animal decontamination. The USDA APHIS should be able to field such teams for radiological surveillance and response. AVMA Veterinary Medical Assistance Teams (VMATs) and the HHS National Veterinary Response Team consist of personnel qualified (within the context of current knowledge limitations) to provide all-hazards animal decontamination planning recommendations and training for state and local jurisdictions and to also deploy as animal decontamination teams following larger-scale incidents.

References:

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