

HAZARDOUS MATERIALS SPILLS AWARENESS AND RESPONSE



BASICS

OVERVIEW

- Veterinary professionals should be aware of hazardous materials (hazmat) manufactured, stored or transported through their region of practice. The potential for spills or other large-scale incidents involving chemicals is real and could occur as a result of many factors (extreme weather, terrorism, human error, rail accident, industrial accident, etc.).
- This chapter will review the potential for adverse health effects on animals exposed to chemicals in the environment, when to suspect chemical exposure has occurred, appropriate personal protective equipment to protect personnel from exposure, methods of environmental sampling to evaluate contamination, and resources/assistance for HAZMAT response.
- Awareness and response protocols are the same whether an incident is considered accidental (oil spills) or intentional (introduction of chemical agents for purpose of terrorism).
- Exposure to hazardous chemicals can occur in domestic livestock as well as captive and free-ranging wildlife.

SYSTEMS AFFECTED

- Respiratory
- Nervous
- Dermatologic
- Digestive

GEOGRAPHIC DISTRIBUTION

Potentially worldwide

ENVIRONMENTAL HAZARDS

- Hazardous material spills occur every day in homes, places of work, public settings, in water, air, and on land.
- Examples of contemporary environmental toxicants include municipal sewage, oil and petroleum-related compounds, heavy metals from mining and smelting operations, and agricultural pesticides.
- Awareness of the potential hazards resulting from chemical spills and knowledge of how to respond appropriately empowers veterinarians to protect themselves, their clients, and the animals to which they administer care.

Disasters

Accidental (natural disaster) or purposeful (terrorism) introduction of hazardous materials into environmental media (soil, sediment, water, air) can lead to adverse health effects in captive, free-ranging, or domestic animals. Contaminated animals are potential fomites for spreading disease to other animals or humans and should be evaluated in terms of their impact on public health. They also can be sentinels for an emerging zoonotic disease, allowing early detection of a public health risk. Decreases in

agricultural productivity or consumer confidence may result from known or even suspected animal disease resulting from environmental contamination. Recognition of and appropriate response to these threats are important knowledge for all veterinary professionals.

HAZARD RECOGNITION

Thousands of substances exhibit one or more characteristics of flammability, radioactivity, corrosiveness, toxicity, or other properties, which classify them as hazardous. Familiarity with signs and symptoms associated with chemical toxicity, lack of diagnosis for a chronic and on-going herd health problem, or simply a disconnect between a presumptive diagnosis and the symptoms anticipated with that diagnosis can lead to suspicion that animals may have been exposed to a hazardous substance. Environmental contamination may be the primary factor in animal disease or may be a contributing factor to an existing disease condition.

Veterinary professionals should look for signs of environmental contamination on routine farm visits: observe habitat changes (including lack of vegetation or the presence of distressed vegetation), water color, odor, location, air color, odor, and direction. Develop an awareness of potentially hazardous materials (fertilizer bags, pesticides, barrels, oil cans) in areas with, or adjacent to areas of animal access.

If a hazardous material leak is suspected some questions to ask are: What are the hazardous materials in the area? Can the source of the hazard be identified? What is the potential risk or impact of the leak or spill? To evaluate the effects of a hazardous materials spill, all substances must be identified, their dispersion (point vs. non-point source) and exposure (dermal vs. inhalation vs. ingestion) pathways established, and if possible, concentrations determined. Careful assessment ensures all hazards are identified. The source of contamination may be visible, such as industrial stacks releasing contaminants into the air, or may be less obvious, such as contaminants seeping through bedrock into the water table.

PERSONAL PROTECTION

The golden rule of hazardous material incidents is to protect yourself first. Consider scene safety and be aware of the risks of physical injury; you may not realize your own exposure at first. Personal protective equipment (PPE) includes clothing, respirators, distance and common sense. Ensure no one enters the area and contact the local authorities immediately.

- Consider exposure pathways (dermal, inhalation), environmental media (soil, water, air), and potential concentrations and toxicity posed by the substance to determine the appropriate level of protective clothing
- Protection for the head, eyes, face, and feet used with respiratory protection can minimize the risk of exposure to chemicals, impact, and noise, but may not provide protection against such things as fire, certain types of radiation, and electrical hazards.
- The two most common classes of airborne contaminants are gas/vapor and particulates.
- Gas/ vapor disperse on the molecular level when released into the atmosphere. This characteristic prevents them from being removed from the air by a mechanical filter.
- A filter must be chemically adsorbent in order to remove the contaminant from the air.
- Particulates do not disperse on the molecular level and are usually released in the form of mists, aerosols, or dust. Due to their large size, particulates may often be removed from the air via mechanical filtration. This characteristic determines the selection of air-purifying respirator filter.
- There are two types of respirators: the air-purifying respirator (APR) and the atmosphere-supplying respirator (ASR). An APR filters airborne contaminants from the ambient air using a cartridge or canister type filter. The ASR, provides breathing air from a source other than the ambient air. Caution: respirators must be properly maintained and properly fit tested in order to be effective. Do not assume a respirator

will protect you unless it is both the correct type for the substance in question and has been fit tested to your face prior to use.

ENVIRONMENTAL SAMPLING

- Environmental monitoring can either be conducted in the field or samples can be taken and sent off-site for laboratory analysis.
- Field monitoring provides real-time information that enables rapid, on-site, and decision-making. Chemical monitors are available to conduct environmental sampling in the field.
- Detector tubes allow direct reading of a wide range of chemicals with a single pump that siphons air to detect contamination. They indicate presence and concentration of toxic airborne chemicals by a colorimetric indicator.
- Collection of environmental media (soil, sediment, air, water) for laboratory analysis allows a more precise concentration to be determined for the purposes of risk evaluation and site characterization.
- When collecting environmental media for analysis, specific protocols need to be followed with regard to sample containers (plastic vs. glass), shipping (spill prevention), sample handling and cross-contamination, tracking and custody chain (important in legal proceedings), length of collection period for air sampling (important in calibration), and shelf-life or storage before analysis (degradation and metabolism). Make sure to work closely with your local HAZMAT response team.



MISCELLANEOUS

SEE ALSO

- Animal Welfare (www.fiveminutevet.com/ruminant)
- Cleaning and Disinfection (www.fiveminutevet.com/ruminant)
- Disaster and Emergency Preparedness and Response (www.fiveminutevet.com/ruminant)
- Medical Waste Management: Expired Drugs (Appendix 3)

EMERGENCY CONTACTS (USA)

- In other nations, local and regional health and safety organizations should be contacted.
- Veterinarians from the U.S. Environmental Protection Agency (EPA) respond to HAZMAT spills to assist with animal care and risk evaluation.
- Veterinarians from the Department of Homeland Security (DHS), Veterinary Medical Assistance Teams (VMAT), respond to disasters which commonly include HAZMAT spills.
- Veterinarians in private practice can report HAZMAT concerns by calling the National Response Center to access the 14-agency National Response Team (800-424-8802).
- Veterinary toxicologists certified by American Board of Veterinary Toxicologists (DABVT) and American Board of Toxicology (DABT) are available for consultation thru veterinary diagnostic labs and the Animal Poison Control Center (888-426-4435).

ABBREVIATIONS

- APR= air-purifying respirator
- ASR= atmosphere-supplying respirator
- DHS= Department of Homeland Security
- EPA= Environmental Protection Agency
- PPE=Personal Protective Equipment
- VMAT= Veterinary Medical Assistance Teams

Suggested Reading

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Acknowledgment The author and editors acknowledge the prior contribution of Bethany Grohs.

