

Hospital Decontamination System and Decontamination Methods for Assistance Dogs that Accompany Incoming Disaster Victims

Considerations for Human Hospital Policy
Canine Decontamination in a
Disaster/Hazmat/CBRNE Event

Lori E. Gordon, DVM

MA-TF 1 US&R

NVRT-1

2014

Hospital Decontamination System and Decontamination Methods for Assistance Dogs that Accompany Incoming Disaster Victims

Considerations for Human Hospital Policy in a Disaster/Hazmat/CBRNE Event

I. INTRODUCTION	Page 2
II. PREPAREDNESS	
A. External Agencies	Page 3
B. Internal Hospital Policy Considerations	Page 4
III. DEFINITIONS	
A. Gross Decontamination – Emergency and Non-Emergency	Page 5
B. Technical Decontamination – Emergency and Non-Emergency	Page 5
IV. CANINE FACTORS TO CONSIDER	
A. Exposure – Routes, Anatomy, Behavioral Aspects	Page 6
B. Canine Sensitivity – Chemical, Biological, Radiological	Page 7
C. Physical Signs and Symptoms	Page 9
V. DECONTAMINATION PRINCIPLES, PROCEDURES, and GOALS	
A. Canine Decontamination Basic Information	Page 10
B. Human Safety in a Decontamination Line	Page 12
C. Going Through a Decontamination Line	Page 12
D. Decontamination Corridor	Page 14
E. Hazmat Specifics – Chemical, Biological, Radiological	Page 15
VI. DECONTAMINATION SYSTEM-DESIGNS	
A. Canines in a Human System – Gross and Technical	Page 18
B. Canine-Design System – MA TF-1	Page 20
C. Field Test	Page 24
D. Commercial System- Limited Water Conditions	Page 26
VII. CANINE DECONTAMINATION KIT	
A. General Equipment	Page 27
B. Human PPE	Page 28
C. Decontamination Supplies	Page 28
D. Canine Supplies	Page 29
VIII. REFERENCES	Page 30

Hospital Decontamination System and Decontamination Methods for Assistance Dogs that Accompany Incoming Disaster Victims

Considerations for Human Hospital Policy in a Disaster/Hazmat/CBRNE Event

I. Introduction

During the early stages of reaction to a mass casualty event, first responders and well-meaning private citizens may rush to transport people with emergent care needs to a hospital. The need for decontamination may not yet be established, as some chemical, many biologic, and non-particulate radiologic contamination are not readily apparent. Natural disasters also present challenges as flood waters and building debris may spread contamination to victims. Even if a contaminant is suspected, perimeters delineating hot, warm, and cold zones and decontamination points may not be set up for several hours. In a mass casualty event the need for decontamination may be overwhelming.

Service dogs, required by the Americans with Disabilities Act to be allowed the same access to a hospital as that afforded the public in general, are likely contaminated along with their owner. Standard Operating Procedures developed by hospitals for use in the event of a disaster or mass casualty event should include decontamination as part of their management guidelines. Efforts to contain the contaminant, decontaminate patient victims, as well as protect hospital personnel and patients, should include service dogs that accompany their owners to the hospital.

Hospitals need to be able to perform Mass Casualty Incident (MCI) decontamination on their own. Given any situation in the community the local fire department would be at the incident site and not able to respond to the hospital. Millions of dollars have been spent to train hospitals in mass decontamination and is part of their Joint Commission requirements. Canine do add a complexity to such events.

II. Preparedness

Being prepared for a variety of potential disaster events is a great challenge. Including service animals in a hospital setting is just one of many considerations. Options for dealing with contaminated service dogs may be divided into two main categories:

- External Agency Operations – government, local, and volunteer organizations
- Internal Operating Procedures – the hospital

Emergency preparedness often includes back-up plans, so having both an internal policy of operations and an external agency for decontamination may serve a hospital well. These relationships should be formed before an event, not during!



A. External Agencies

There are organizations that include MCI decontamination in their operations. Some are designed for people but can accommodate a dog, others are animal-specific. Depending on the size and location of the disaster, decontamination units may be positioned at the disaster site or nearby (hot to warm to cold zones), and/or on hospital grounds. These various agencies may vary widely in their level of Hazmat training, qualifications and experience. If not engaged at the scene, some of these may be available to assist in hospital decontamination.

1. Mass Decontamination Units (MDUs)

These human-based systems are deployed to the scene. If available they may be set up prior to any hospital ERs allowing entrance, especially if it is a known exposure. They may be a little unnerving to an animal for several reasons: being handled by strangers in even stranger gear with respiratory and other apparatus, equipment noises, unfamiliar environment of tents with curtains, showers, and the presence of many people are among some of the challenges. Several agencies exist with the ability to conduct advanced Hazmat/CBRNE decontamination operations. They each have advantages and disadvantages. These include but are not limited to:

- a. Military – National Guard
 - CBRNE Enhanced Response Force Packages (CERFP) – Department of Defense, 17 states; National Guard active duty
 - Homeland Response Force (HRF) - there is one HRF located in each of the 10 FEMA Regions. They offer the same abilities as a CERFP but with more resources
 - Civil Support Teams (CST) – these typically only have a personal shower system to decontaminate up to one person at a time. They are not equipped to perform mass decontamination or canine decontamination easily.
- b. Hazmat teams
 - Local city, county, state teams (like Rhode Island and Massachusetts)
 - Fire Department - some would be at the incident site and not able to respond to the hospital. Other departments have units specifically assigned to hospitals.
- c. Private companies, local and regional



Vigilant Guard Training Exercise, Exeter, RI 2012

2. Animal Decontamination Systems Operatives

In 2004 Massachusetts Task Force 1 Urban Search and Rescue began conducting annual canine decontamination drills. Over the next 3 years we refined and improved our operations based on the difficulties experienced at these drills. Among these were canine safety, human safety, and successful decontamination. By 2007 a formal protocol was established and a canine decontamination unit we developed was added to our cache. FEMA formerly approved acquisition of the system for all their search and rescue task force caches in 2011. A unit for a minimum water availability environment was added in 2011.

This protocol and decontamination system has been available via the US&R Veterinary Group (www.usarveterinargroup.org) upon request since 2008. All 4 Hazmat Decontamination Teams in Rhode Island have adopted the design system. The National Veterinary Response Team has a PowerPoint presentation version at their on-line learning center.

Several animal-focused groups may be available for hospitals to utilize for their assistance dogs decontamination. Pre-established relationships and planned response protocols with these groups are another option for a hospital. These organizations include veterinarians, veterinary technicians, and animal handlers.

- National Veterinary response teams (NVRT)
 - Federal organization; decontamination mission is in process for approval
- Veterinary Medical assistance teams (VMAT)
 - Non-governmental organization (NGO), sponsored by the American Veterinary Medical Association (AVMA)
- Animal Response Teams (ART)
 - SMART is State of MA Animal Response Team



SMART K9 Decontamination Drill at Human Hospital

B. INTERNAL PROTOCOLS - HOSPITAL OPERATING PROCEDURES

In formation of a hospital-based service dog decontamination procedures protocol, there are several factors to consider: types of decontamination, exposure-related anatomical features of dogs, physical signs and symptoms of exposure, decontamination principles, procedure, and goals, safety guidelines, decontamination systems, and logistical needs. Once a plan is approved, *familiarization and training* are paramount to success. Each drill brings to light what works and what does not, allowing improvements before a disaster hits.

III. DEFINITIONS

There are two levels: gross decontamination and technical decontamination. Each is used dependent on the particular contaminant or hazardous material involved. A system with the ability to adapt to a range of needs will provide protection and safety to the dogs, their human partners, and everyone else around them.

A. GROSS DECONTAMINATION

This is an initial phase of the decontamination process during which the bulk amount of surface contaminant is significantly reduced. It is designed to be done quickly. Two types of gross decontamination are described: emergency and non-emergency.

1. Emergency Gross Decontamination is used to immediately reduce contamination of those with potentially life-threatening exposure, where immediate medical attention is required. The goal is to save lives.
2. Non-Emergency Gross Decontamination is bulk removal of a non-life threatening contaminant, although also designed to be done as quickly as possible.

B. TECHNICAL DECONTAMINATION

This process involves an established corridor, specific stations, and detailed guidelines designed for complete removal of contaminants. It may be a part of addressing the medical needs of victims and responders. This is a meticulous process to remove as much contaminant as possible utilizing several methods such as brushing, vacuuming, adsorption, absorption, washing, chemical detoxification, chemical neutralization, and others.

Two types of technical, or thorough, decontamination: (1) emergency, which includes a medical component, and (2) non-emergency, which may or may not involve a medical component.

1. Emergency/Medical Technical Decontamination refers to a Hazardous Materials (Hazmat) or CBRNE situation, where complete decontamination is a necessary component of the medical treatment in a life-threatening situation
2. Non-emergency +/- Medical Technical Decontamination refers to a contaminant that is not immediately life threatening, but must be removed completely to avoid future complications. Regardless, a medical check is always recommended.

♫ **NOTE:** The need and ability to medically treat a canine before and/or after decontamination is dependent on several factors: a life-threatening status, medical personnel willing or able to treat a dog, veterinary presence, medical supplies, and safety of involved personnel.

IV. CANINE FACTORS TO CONSIDER

There are aspects, both canine and human, that share similar properties for decontamination and treatment. This makes canine decontamination procedures similar, and therefore familiar, to first responders. Many current human decontamination stations are easily adapted for animals.

Other aspects are dissimilar, including anatomical differences and behavior. It is important to become familiar with the special considerations for canines in order to effectively decontaminate without doing further harm to them as well as the humans involved.

A. EXPOSURE – ROUTES, ANATOMY, and BEHAVIORAL ASPECTS

1. Ocular – the Eye

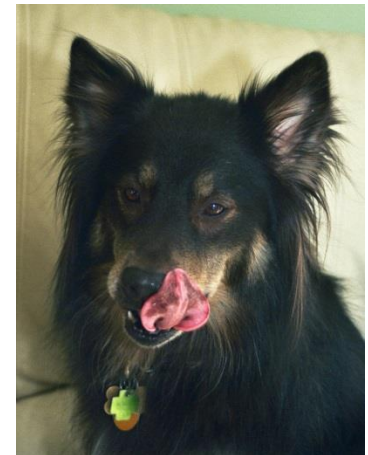
- ☞ Anatomically the canine eye is similar to the human eye except for the third eyelid, and is treated for injury/irritation in like manner
- ☞ The eyes can be flushed with eye rinse
- ☞ Conjunctival irritation was most common injury documented in New York State Police Canines at the World Trade Center terrorist attack (62.9%)

2. Inhalation – Nose and Mouth

- ∞ Anatomical advantages to canine nasal traits include the relatively long length and intricate inner ‘scrolled’ surface area which allows for better trapping of particulate matter before it reaches the lungs, and canine lung defense mechanisms and mediators of inflammation also contribute to disease resistance
- ∞ Anatomical disadvantages include their sensitive and vascular mucosal surface which may absorb contaminants into the blood stream
- ∞ Options include rinsing the nose (a rather unrealistic and problematic solution when put into practice) but dogs have a great response: sneezing!

3. Ingestion – Behavioral Aspects, Tongue Exposure

- ◆ Dogs like to sniff and eat things. Curiosity, hunger, and thirst are driving forces.
- ◆ Inhaling scent brings aerosolized contaminant particles in where they may be swallowed.
- ◆ Behavior also plays a role: licking to clean off fur and paws increases ingestion exposure if those areas were contaminated.
- ◆ Decontamination process will decrease what they lick off and swallow



4. Injection

- † Sharp debris contamination is by injection into the body. This may be in the form of punctures, scrapes, burns, or lacerations.
- † Wounds are an entry point into the body’s vascular system. Behaviorally a canine licks their wound, further increasing contamination by ingestion. The compromised tissue may be very small or quite obvious.
- † Options include being vigilant with observation and hands-on checking of the canine. After decontamination it is recommended that a veterinarian examine them.

5. Dermal – Skin and Fur; Ears and Tails; Paw Pads

- 🐾 These have both advantages and disadvantages
- 🐾 Fur can trap contaminants, keep them from contacting skin, especially if the agent is caustic or burns, but this fur ‘trap’ also makes decontamination more difficult and may hide wounds for hours to days
- 🐾 Ears offer some protection, especially if flopped over, and the canal takes a 90° turn instead of going straight to the tympanic membrane
- 🐾 Less-haired areas are more susceptible to exposure: inner ear pinnae, tip of nose, axilla (arm pit), underbelly, inner flank, scrotum, paw pads
- 🐾 The tail may be tucked in tight to the body, protecting mucosal perineal and vulva areas, but also may trap contaminants underneath; don’t forget to decontamination under and around the tail (a favorite greeting ritual)!
- 🐾 Paw pads are thick and tough, great protection. However, there are sweat glands and toxins (nerve and other agents) can be absorbed through the paws



B. CANINE SENSITIVITY to CBR AGENTS

1. Chemical Agents

Threat chemicals are classified into industrial, warfare, and riot control agents. These may be incapacitating or lethal. Lethal substances include choking, blood, blister, and nerve agents. In a comparison to human chemical agent exposure, canines exhibit the following *general* sensitivity. (*fractions - less sensitivity, whole #s - higher sensitivity*)

△ Nerve agents

- ☠ GA: ¼ as sensitive to inhalation form, ½ as sensitive to dermal form
- ☠ GB: ¼ as sensitive to inhalation form; 2 times as sensitive to dermal form
- ☠ VX: about the same sensitivity as humans to inhalation and dermal forms

△ Blister agent

- ☠ HD: $\frac{2}{3}$ as sensitive to inhalation form; ¼ as sensitive to dermal form

△ Blood cyanide agent

- ☠ AC: 4 times as sensitive to inhalation form; same sensitivity to dermal

△ Riot Control Agents:

- ☠ CN, CS, OC: quite insensitive to these

2. Biological Agents

Although dogs are unlikely targets for biological terrorism (animals in our food supply chain may be targeted) they may act as carriers. Among the 300 or so possible human pathogens that could be used for terrorist purposes, only a few have been investigated due to characteristics that make them ideal for military use.

✂ Bacteria

- Anthrax (*Bacillus anthracis*) **canines are 500-1000 times more resistant**
- Typhoid (*Salmonella typhus*) **canines are naturally resistant**
- Brucellosis (*B. abortus*, *B. melitensis*, *B. suis*) **canines transmit to human**
- Plague (*Yersinia pestis*) **intermediate host for flea transmission**
- Tularemia (*Francisella tularensi*) **canines susceptible but less sensitive**

- ☹ **Rickettsia**
 - Q Fever (*Coxiella burnetti*)
 - ☹ **Virus**
 - Venezuelan Equine Virus (*VEE* virus)
 - Smallpox (*Variola* virus) **canines are naturally resistant**
 - ☹ **Toxins**
 - Botulinum (Botulinum toxins)
 - Ricin (from castor beans)
 - Staphylococcal Enterotoxin B (*Staph aureus*)
- } **canines susceptible but less sensitive**
- } **canines susceptible but less sensitive**

3. Radiological Agents

Two radiation concerns are *exposure* and *contamination* by radioactive material:

Exposure occurs by external irradiation, when all or parts of the body are exposed to penetrating radiation from an external source. This is primarily an *external* exposure, but may become *internal* through wounds or broken skin.

Contamination occurs when the radioactive materials in the form of gases, liquids, or solids are released into the environment. This can result in both *external* and *internal* contamination. The concern with terrorism is the use of a Radiological Dispersal Device (RDD) or ‘dirty bomb’ to effect contamination.

Ionizing radiation is less likely for a terrorist to obtain, but the possibility does exist and nuclear energy accidents are also of concern (Fukushima Daiichi Nuclear Power Plant, Japan, 03/2011). Medical and industrial sources are also possible contaminants. These sources could be in any community that we respond to that has been hit by a flood, mudslide or any other type of event.

- ☸ **Alpha particles**
 - ☹ Limited penetration: stopped by superficial dead skin layer or sheet of paper
 - ☹ Ingestion is very dangerous
 - ☹ Presence may be masked by water
- ☸ **Beta Particles**
 - ☹ More penetration but generally travels just a few inches in the air
 - ☹ Stopped by inner skin layers but also dangerous if ingested
- ☸ **Gamma Radiation**
 - ☹ Not particulate, more like a high-energy x-ray with long range
 - ☹ Significant penetration; dangerous whether external or ingested
- ☸ **Neutrons**
 - ☹ Most immediately damaging to cells on contact, travel far in air
 - ☹ Stopped by water, paraffin, or plastic

Canines appear to be 25%-70% more sensitive than humans to the acute effects of the same radiation exposure. The range is due to different effects on varied body systems (skin, GIT, RBCs, WBCs, etc...) Effects are usually delayed, and specific signs and symptoms depend on many factors related to the exposure and to the victim. Treatments are similar for both species.



C. PHYSICAL SIGNS and SYMPTOMS

Many signs of toxin exposure (chemicals, blister agents, nerve agents, blood agents) can be seen in both humans and canines:

- Cough, choking, gasping for air
- Red eyes and gums, tearing, salivation
- Pupils pinpointed or dilated
- Nausea, vomiting, abdominal cramps, diarrhea, fatigue
- Muscle twitching, disorientation, seizures, paralysis, involuntary urination/defecation

Other signs are difficult to detect, recognize or confirm in the canine:

- Headache
- Chest tightness
- Sweating – detectable in the poorly-haired areas of the body (axilla/arm pits, flank/upper-inner thigh) and paw pads
- Skin rash – if not on poorly haired areas, fur makes it difficult to visually detect redness and rashes until the skin begins to ooze from secondary infection and inflammation. A good physical examination can pick up a sensitive affected area
- Small wounds (punctures) and burns (thermal or chemical) will occur, but not as obvious blisters. Wetness and pain from the injury can be detected on the skin during medical checks.



V. DECON PRINCIPLES, PROCEDURES, and GOALS

A. CANINE DECONTAMINATION BASIC REMOVAL INFORMATION

1. Consult reference book if possible

- *Material Safety Data Sheet* (MSDS)
- *Emergency Response Guidebook* (ERG) U.S. Department of Transportation

2. Powders (any dust, debris, known or unknown)

- Initially wipe off with a moist towel to decrease the amount to be washed
- Brushing is not recommended as this will aerosolize the contaminant and possibly further inhalation exposure

3. Thick Caked On Contamination

- Break down with mechanics' hand wash products, mineral oil (especially good for petroleum-based contaminant), or scraped off with a putty knife
- Scissors with caution (lacerate canine); clippers will not work for long.

4. Absorbents for liquid decontamination

- Flour, baking soda, diatomaceous earth, Fuller's earth, synthetics
- Careful as these have their own inhalation hazards

5. Physical removal of the contaminant:

- High volume, low pressure water augmented by soap is the recommendation
- Rinse-wash-rinse cycle as much and as many times as deemed needed
- Lukewarm water and dish soap (Dawn®, Palmolive®) are common; can dilute with water to decrease suds; military known to use lower-suds Prell®
- **CAUTION: some contaminants become reactive when exposed to water.** Check pages 342-347 of the 2008 ERG for a partial listing.
- Soap's high pH neutralizes many chemicals, dissolves some petroleum agents
- Go from head to tail, shoulder to forelegs, back to belly, hips to back legs

6. Eyes, Ears, Nose and Mouth

- Small bottles OTC eye rinse (saline, ionized water) ideal to gently flush eyes
- If too difficult to manage (uncooperative, protective gear inhibits capability) then remove as much contaminant around eyes with non-alcohol based towelettes; further eye issues handled at medical or veterinary station
- Do not apply petroleum-based or other eye ointments which may absorb contaminant and worsen corneal damage
- Avoid getting soap into eyes, nose, and mouth. Although neutral shampoos may be safer for the cornea and mucous membranes, they are not as effective as the higher pH shampoos in neutralizing many chemical agents
- Soaps are not as harmful in ears, however a dog will shake vigorously if water gets inside their ears; we are trying to delay the inevitable shake until the end!

7. Special Considerations

- Alternate decontamination agents for **chemicals that worsen if exposed to water** include applying baking soda or flour to form a caked-on product, then brushed or comb out or physically remove by wiping, brushing or combing off
- Special care and attention should be directed to adequately decontaminate **the paw**; deep-crevassed pad edges can trap particles. Use a soft-bristled brush. We use a dry surgical scrub brush (BD E-Z Scrub 160 Ref 1603).
- **Eye flushing** with 0.9% saline, purified water, or tepid tap water for 15 minutes is important for blistering (mustard, Lewisite), blood and metabolic agents (arsine, cyanide)
- Bathing the canine with **0.5% hypochlorite** (bleach) followed by soap and water is recommended for blistering agents (vesicants). Dilute bleach is included in some decontamination protocols after soap and water for other hazardous materials, especially flood water deployments.
- Dermal exposure to **phenols** requires all personnel wear gloves, gowns, and masks then blot the fur and skin with paper towels before washing
- **Never use hydrocarbon-based solvents** to clean a dog! They cause their own painful damage by defatting the skin as well as increasing dermal absorption of other contaminants like polychlorinated biphenyls (PCBs)
- Do not allow canine to drink **contaminated run-off**. Basket muzzles will not prevent this, regular muzzles do not allow for decontamination of the face. Consider elevation of the wash/rinse site or providing for drainage of run-off
- Important to **clean the area around the nose and mouth** to decrease what licking will bring into the mouth, leading to ingestion exposure of contaminants. Oral exposure and subsequent ingestion increase absorption and worsen medical problems
- If after **radiation exposure** decontamination there is still contamination, clip the hair of the area still hot, re- decontamination, and recheck.
- Be cognizant of the **weather conditions**. Consider shelters in post- decontamination care of set-up: fans and shade if warm/humid to avoid hyperthermia; dryer or heated protective environment to avoid hypothermia in cold climates
- Post decontamination **veterinary check** should always be included in the protocol, after decontamination; pre- decontamination medical treatment must be performed by a properly protected responder

B. HUMAN SAFETY in a DECONTAMINATION LINE

Basic guidelines for Personal protective Equipment (PPE) when handling animals include gloves, protective eyewear, durable clothing, and protective footwear. Each disaster presents its own health and safety risks. A safety officer or Hazmat specialist should be consulted.

Occupational Safety and Health Administration (OSHA) guidelines define the level of protection required for specific hazards. PPE is divided into 4 categories: from most to least protection they are Level A, B, C, and D. Level A is used when the greatest protection for skin, respiratory, and eye systems are needed. Level D is for nuisance contamination only.

Specific courses and training are required to properly utilize Level A, B, and C protective equipment. Level C equipment requires additional training per OSHA guidelines 1910.120 Level D is similar to the protection hospital workers may use in a contamination unit.

Other factors, like heat stress and hypothermia, are also conditions to be considered under which the personnel are clothed as well as their time involved. PPE suggestions include:

- Knee-length rubber boots with slip-resistant soles
- Nitrile and polyvinyl chloride gloves offer good protection from acids and other chemicals (often in flood waters), are durable and resistant to abrasion and tearing
- Double gloving with an outer heavy fabric glove may provide additional protection against bites and scratches
- N-96 particulate respirators to protect against spray mists during decontamination
- Eye protection with tight fitting goggles to protect against splash hazards (safety glasses do not protect from splashes)
- If the hazard does not require level A or B suits, a waterproof over-garment can be used to prevent liquids from soaking through to undergarments
- Individuals working in the human decontamination line must be attired in PPE not more than one level less than that of the individuals they are decontaminating; this should apply to the canine decontamination line even though they are without PPE
- Back and knee injuries are common when working with animals; remember posture, knee pads, consider a raised platform to perform decontamination

C. GOING THROUGH THE DECON LINE

1. Assessment – Emergency (Life-Threatening) or Non-Emergency

- If emergent but the contaminant is itself not life threatening, gross emergency decontamination is performed and medical attention given
- If emergent and removal of the contaminant is itself part of the treatment, technical emergency decontamination is performed and further medical treatment given
- In a non-emergent situation, gross and/or technical decontamination is performed based on the contaminant involved

♫ *Note: the owner should accompany the canine through decontamination if possible.*

- ♫ If the owner is unable to take dog through, an experienced dog handler may do so
- ♫ If a dog cannot be safely taken through without the owner, confine dog in a kennel to contain contamination

2. Preparation

- Remove all equipment and gear from the canine and place in Hazmat container until cleansed (bleach solution), deemed safe, or disposed
- Muzzle use considered to prevent licking, drinking wash water, or bite prevention; cage muzzles allow for panting, can still drink through them; may be better tolerated
- Maintain control so as not to spread contaminants to clean areas by maintaining a decontamination corridor via physical barriers

3. Rinse – Wash

- Initial gross decontamination water removal of bulk of contaminant, or other methods as described for water-reactive substances, powders, and very thick contaminants
- Cleanse head with towelettes as described (around eyes, inner ears, nose, mouth)
- Option to rinse eyes with eye rinse (saline, purified water) but in reality this is often difficult with all the PPE the humans wear
- Wash and rinse, repeat as needed, from top of back to tail and down body and legs
- Special attention to paw pads and don't neglect under the tail

4. Drying

- After the inevitable K9 shake-off of water, allow air drying with attention to the weather conditions (shelter if cold/windy)
- Option to dry with towels or an air dryer
- Canine now should be next to or within the designated 'cold zone'

5. Antimicrobial Station Option

Spray on solution or walk canine through a diluted bath if biological contamination suspected. Options have varied spectrum of activity, advantages and disadvantages.

- *Hypochlorite* (bleach) 0.5% (household bleach diluted 1:10); rinse off once done (ranges of 15-60 min); 100-500 ppm may be used on equipment
- *Biguanide* (chlorhexidine) 0.05-4%
- *Quaternary ammonium* 400 ppm, 0.1-2%
- *Iodophore* (povidone-iodine) 100ppm
- *Peroxygen* 20 g/L or 1%
- *Alcohol* (ethyl, isopropyl) 70%
- *Chlorine dioxide?* (oxidizer, ICA Tri Nova)

6. Monitor, Treat, Return to Owner

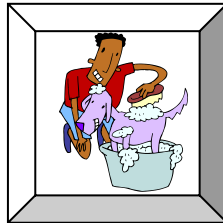
- Monitor for contamination with attention to eyes, ears, nose, throat, paws, under tail
- Repeat decontamination if necessary, otherwise new collar/leash, continue to medical (veterinary) for a physical examination
- Complete medical/veterinary evaluation and treatment as needed
- Return to owner

D. DECONTAMINATION CORRIDOR

BUCKET for Dirty Equipment

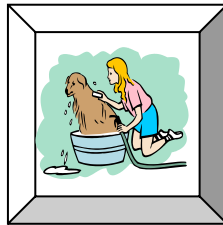


**WASHING POOL
(or initial two wash
And rinse cycles)**



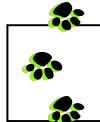
•HOSE

**RINSING POOL
(or final wash and
rinse cycle)**



•HOSE

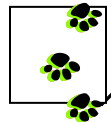
**0.5% HYPOCHLORITE
SOLUTION FOOT BATH**



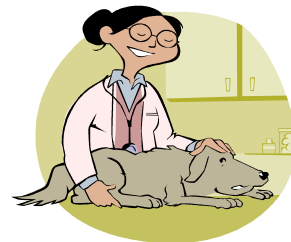
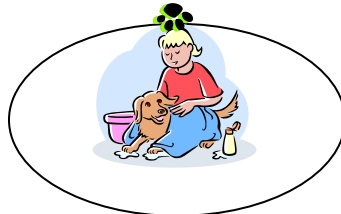
**Several minutes for solution
To have maximum effect**



CLEAN WATER RINSE



DRYING AREA



VETERINARY CHECK

E. HAZMAT SPECIFICS: CHEMICAL, BIOLOGICAL, and RADIOLOGICAL

1. Chemical Exposure

If the level of contamination is high, and appropriate PPE is not available or personnel are not trained to this level, the dog should be placed in a kennel and protected from others until such aid is available.

Remove

- ☒ Remove, replace all gear with metal or nylon disposable items
- ☒ Remove liquid contaminant by pinching or blotting (do not rub, as this spreads the contaminant)
- ☒ Wet down if contaminant is dry/powder (brush may aerosolize) then brush coat to remove most of it

Wash

- ☒ High-volume, low-pressure lukewarm water, soap if available
- ☒ Do not delay if warm water or soap is not available
- ☒ Special attention to paws and pads that can trap material in crevices

Monitor

- ☒ Immediate medical evaluation, veterinary if available
- ☒ Continued monitoring for changes in health status
- ☒ Recheck and monitor for contamination

Concerning Petroleum-Based Contaminants

July 2007 the Massachusetts Task Force 1 conducted a canine decontamination drill to test their ability to remove a petroleum-based contaminant from the search canines. The contamination test product was Glo-Germ®, a non-toxic product used to test efficiency of hand-washing in pre-school children. It is not visible in regular light but shines bright orange under a black light.

The handler and two other team members were placed in a level B suit to give them the experience of having to don this level of personal protection, as well as get the dogs used to interacting with people in a suit.

After paw contamination was confirmed using a black light, soap and water decontamination was performed. Paws rechecked under black light illumination still had test product contamination.

It was then suggested that since the contaminant was oil based, perhaps dissolving it in some mineral oil would help break it up before applying the detergent. The theory is that *like dissolves like*. So a bottle of mineral was used at the beginning of the decontamination corridor.

When the paws were checked under the black light for level of decontamination, no grossly visible evidence remained of the Glo-Germ®.

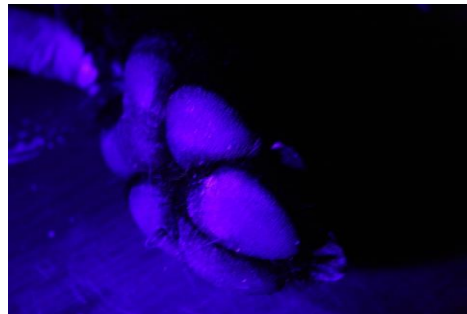
Conclusion: *for an oil-based contaminant, pre-treatment with mineral oil may significantly increase the efficiency of the decontamination.*



Confirmation of contamination



Still contaminated after soap & water



No contamination with miner oil spray before soap & water

2. Biological Exposure

This may go unnoticed until victims develop symptoms and seek medical attention.

Though dogs are resistant to many agents labeled as terrorist threats, they are potential transmission vectors. Decontamination is essential if exposure to a particulate, liquid or aerosol bio agent has occurred within the past several hours. Decontamination may not help but won't hurt if exposure is not discovered for several days.

Remove

- ⊗ Remove, replace all gear with metal or nylon disposable items
- ⊗ If agent is in powder form, wet down the canine to prevent it from aerosolizing and being breathed in by them or anyone else
- ⊗ Remove visible dust or solid with a brush, pinch or blot liquid contamination (don't wipe as this just spreads it around)

Wash

- ⊗ High-volume, low-pressure lukewarm water, soap if available
- ⊗ Do not delay if warm water or soap is not available
- ⊗ Special attention to paws and pads that can trap material in crevices

Monitor

- ⊗ Dry the canine and monitor both the dogs and yourself for health changes
- ⊗ Monitoring by Hazmat
- ⊗ Veterinary examination and rechecks, possibly long term

3. Radiological Exposure

When ill-equipped to handle a radiation exposure event, dogs should be isolated upwind and protected within a kennel until professional decontamination and monitoring can be accomplished.

Radioactive materials do not give immediate signs of exposure. Detectors are the most sensitive indicators of exposure. Due to the threat of terrorists using a dirty bomb, any explosion should be assumed a radiological hazard until determined otherwise.

Contamination can be picked up on the canine's coat and paws. Decontamination is critical to prevent further spread, limit absorption (beta and gamma), and remove a source for further inhalation or ingestion of the hazard. Decontamination is similar to other hazard removal.

Remove

- ☞ Relocate to a well-ventilated upwind and updrift area
- ☞ Remove, replace all gear with metal or nylon disposable items
- ☞ If in dust or powder form, wet down so as not to aerosolize agent into canine's breathing zone

Wash

- ☞ High-volume, low-pressure lukewarm water, soap if available
- ☞ Do not delay if warm water or soap is not available
- ☞ Special attention to paws and pads that can trap material in crevices

Monitor

- ☞ Alpha radiation is masked by water, so thoroughly cleanse and rinse the canine and be checked for radiation once dried off
- ☞ Medical examination
- ☞ azmatnd medical monitoring

♪ If radiation detected after multiple decontamination, consider clipping hair from contaminated spot(s), decontaminate again, and recheck. Full body hair clipping is not practical, and may cause irritation and wounding. Clippers should be veterinary quality with a 40 Blade. Animals that cannot be decontaminated to the satisfaction of a Hazmat or Safety Officer can be temporarily contained in a crate.

****Be aware of the weather conditions so that the animal is protected from adverse effects of extreme heat or extreme cold.**

VI. DECONTAMINATION SYSTEM-DESIGNS

A. GROSS and TECHNICAL DECONTAMINATION – Human System

In August 2005 a full set-up of the Hazmat/CBRNE decontamination unit was performed and included was a canine decontamination run. The handler wore a Lakeland Industries Level B Tychem® 9400 suit, went through a Reeves gross decontamination shower, and then through an IRT Tent (Immediate Response Technologies) decontamination shelter. No test contamination material was used. Concerns with the process of sending a canine through these specific team equipment units were addressed.

Stage 1: Gross Decontamination

This is a shower designed to remove any visible or non-visible contaminant from the person or canine. By decreasing the gross amount of CBRNE or Hazmat contaminant, the thorough shampooing stage can be much more effective.



- The handler will be the main person to decontaminate their canine in most situations unless they are incapacitated.
- Should the canine become difficult to handle, options discussed:
 - Giving an intramuscular injection of midazolam. Valium is not ideal, as it is poorly absorbed IM and stings. Medazolam is a better option.
 - Safety cage muzzle (like the track dogs) that will not interfere with panting or impinge on the muzzle area, and protects others from being bitten
 - Nylon muzzle that will prevent the canine from drinking contaminated water or licking contaminated fur
- Enter the gross decontamination water shower after initial blotting (don't rub) of any visible liquid or powder with a wet paper towel. Stay for as long as it takes to remove as much visible contaminant as possible, or as long as is deemed appropriate by HAZMAT and medical personnel based on the suspected contaminant, especially if it is not visible.
- Replace collar and leash with clean ones provided between here and the next stage.

Stage 2: Technical (Thorough) Decontamination

This is a shower area designed to further decontaminate personnel to a point at which they can remove all contaminated clothing, proceeding further to a personal enclosed shower if necessary. For the canines, it is decontamination to a point at which they are safe from further skin contaminant effects and safe for others to be around or handle.



- Enter the area and decontaminate the handler first, who should try to avoid dripping potentially hazardous run-off from their body onto the canine, then they can decontaminate their canine
- If there is more than one helper in this area, one can do the handler and another begin shampooing the canine.
 - This decreases time spent in decontamination, important if medical attention needed or if the cold water may cause or add to a hypothermia situation
 - Have 2 hoses with spray nozzles for each helper to use on the handler and canine, or one for a helper to use on the handler and one for the handler to use on their canine
- In a IRT decontamination tent, you may need to take down one hanging wall to widen the area to accommodate both handler, canine, and a helper(s)



B. CANINE DECONTAMINATION SYSTEM

The Massachusetts Task Force 1 Urban Search and Rescue team has been working towards an efficient, compact, affordable canine decontamination station that is simple to set up and adopts HAZMAT guidelines with respect to handling contaminated run-off. The innovation applied by several team members is second only to their dedication and appreciation for the contribution made by our canine team members. (IRT = Immediate Response Technologies)

The complete set-up consists of the following items:

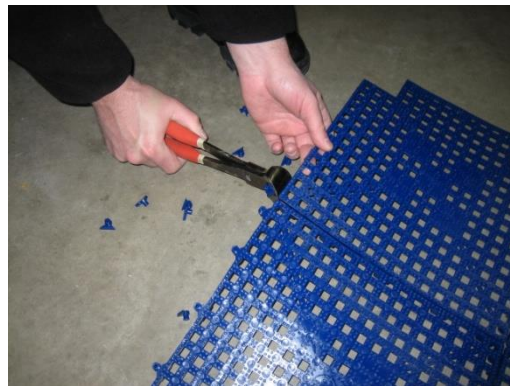
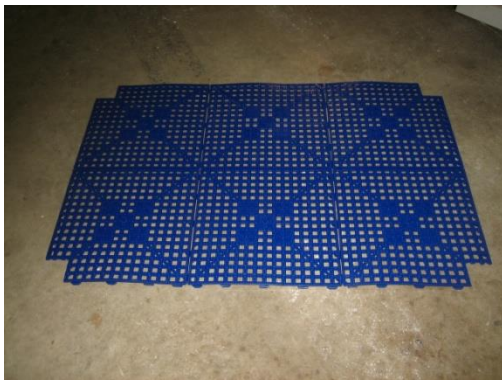
🐕 IRT LLC www.imresponse.com	2 IRT Hazmat Basins @ \$400 ea	\$800
🐕 Home Depot	4 plastic shelving units	\$ 70
🐕 Home Depot/Lowes	Sump pump for waste removal	\$ 70
🐕 Dri Dek: www.dri-dek.com	12 Dri-Deck 12"x12" panels	\$ 60
🐕 Local hardware store	2 lengths of rope	\$ 5
🐕 Local hardware store	Plastic cable ties	\$ 5
🐕 Local hardware store	1 plastic sheet	\$ 10
🐕 Local hardware store	2 Hoses	\$ 20
	Wash Hose & Wand	\$ 25



This is one of two shelving units before modification.



IRT Hazmat Basins. Ports are visible at the bottom along the far



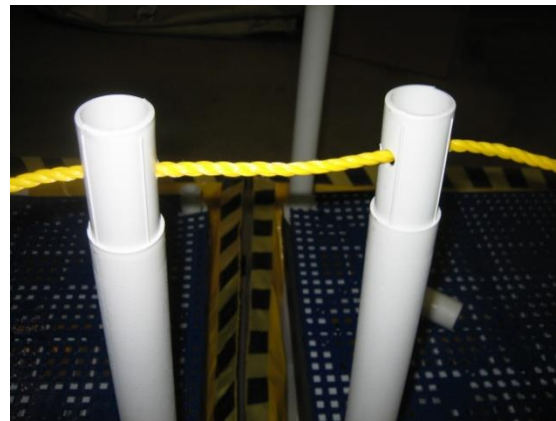
Six 12"x12" DriDek® panels were connected and their corners cut to accommodate the shelving poles. The edge connectors were trimmed to create a smooth edge.



Cable ties are used to secure the flooring to the shelf. This is to prevent the floor from slipping during the decontamination procedure.



This is one of the modified assembled shelf units.

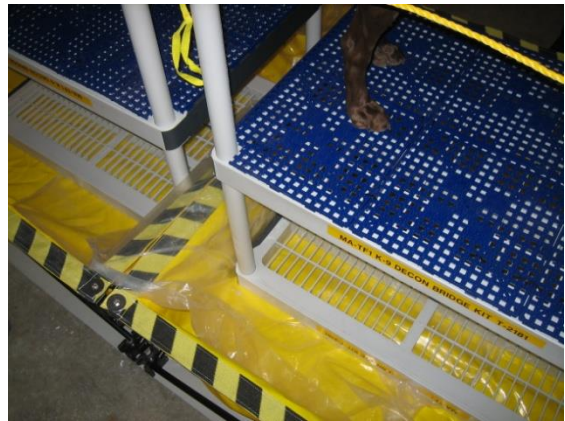


Next,
a
hole
was

drilled at the top end of the poles that are to function as a railing. This presents a border along the decontamination corridor, discouraging dogs from jumping off the side.



The IRT Hazmat Basins are compact, light-weight, durable, and easily assembled.



The assembled shelving units are placed within the two pools. One end will be for the initial decontamination (shampoo; mineral oil to break up petroleum followed by shampooing). The canine then is walked to the second unit for rinsing. A plastic sheet has been placed between the two pools to prevent contaminated water from falling through.



After decontamination, the canine goes off the set up to an area dedicated to drying. If deemed necessary, a basin filled with 1-2 inches of 0.5% hypochlorite solution (1:10 diluted household bleach) followed by a basin filled with clean water can be set up for the canine to walk through. Then a drying station would follow. Veterinary check is recommended.

ADVANTAGES of THIS SYSTEM

1. Inexpensive
 - a. In 2007 the total cost was just over \$1000 for the entire assembled unit
 - b. This includes all the added flooring, ropes, plastic sheeting and cable ties
2. Light weight
 - a. Total weight measured 47 pounds (21 kg): shelving assembly weighed 35 pounds (16 kg), each pool weighed 6 pounds (2.5 kg)
3. Compact, taking up minimal storage space when packed
 - a. Shelving assembly measured 2' x 3' x 1.5'; each pool measured 4' x 10'
4. Durable
 - a. The units held up under several canine decontamination drills
 - b. Field testing required
5. Easy to Assemble
 - a. The entire unit took 15 minutes the first time, 10 minutes the second time
 - b. Familiarity of the team personnel achieved with our yearly drills
6. Containment of run-off
 - a. Hose attachments in the pools allow contamination containment
7. Reusable, and inexpensive to replace parts
8. Easy on the decontamination personnel
 - a. Back injuries and strains have been identified as a major occupational hazard when working with animals
 - b. Elevation of the working surface puts minimal strain on personnel backs
9. Promotes better decontamination of the canines
 - a. Elevation of the unit puts the canine at an easier level to perform a better decontamination, especially the paws and foot pads that require special attention
10. Prevents canines from drinking contaminated water
 - a. During a drill in hot weather where the canine was standing in a plastic pool, he drank some of the wash water before it was caught by the handler
11. Protects PPE suits from damage
 - a. Personnel do not need to kneel on the ground to perform the decontamination



C. FIELD TEST

On December 28 and 29, 2007 local and state resources were used in efforts to locate human remains in a pile of debris from a fire.



Human Remains Detection (HRD) certified canines were used to narrow the search and they successfully located human remains.



Hazards included asbestos as well as human body parts

- 🐕 Asbestos presented an inhalation hazard for the canines
- 🐕 Also it is a digestion hazard due to the licking habits of dogs



Our decontamination system design was assembled within a tent with a warm air ventilation port in use. Water was also heated with a diesel-powered unit



- ❗ One railing pole broke at its base and was duck-taped back; one shelf cracked
 - Replace posts with stronger pole (PVC pipe)?
 - Consider stainless steel shelving (heavier but more durable)
- ❗ One of the state trooper German Shepherds was wobbling on the scaffolding
 - Lash the 2 shelving units together? Sandbag the base of the units?
- ❗ Some canines were not our US&R team dogs
 - Did very well despite never having been trained on the units



Suggestion by one of the MA state troopers: have dog treats waiting at the end of the line

- ❗ This will reward them for going through the process
- ❗ Positive reinforcement rewards are always the best!
- ❗ Can do *during training*, as food not good to have in a contaminated area

D. Low-Water Commercial System

1. **Anivac** is a self-contained 'dry-vac' system for animals
 - a. Sends water through adjustable nozzles deep into hair coat directly to skin.
 - b. Uses 90% less water than regular bathing
2. **Accelerated Hydrogen Peroxide**
 - a. **AHP** (Accelerated Hydrogen Peroxide) is a synergistic blend of commonly used, safe ingredients that when combined with low levels of hydrogen peroxide produce a potent germicide and cleaner.
 - b. Personnel safety: AHP converts to water vapor and oxygen when drying and in its in use form does not require personnel protective equipment.
 - c. Environmental: AHP is Volatile Organic Compound (VOC) and Nonylphenol Ethoxylates (NPE) free. While drying it converts to water vapor and oxygen
3. **Advantages**
 - a. Minimal water required (2 liters per medium size dog)
 - b. Accelerated oxygen for biological decontamination
 - c. H₂O₂ solution 3 minutes to sanitize, 5 minutes to disinfect
 - d. Small, portable, light weight (small unit - 32 lbs.)
4. **Disadvantages**
 - a. Requires power source
 - b. Vacuum noise
 - c. Approved for use on equipment; animal use approval?



VII. CANINE DECONTAMINATION KIT

A. Equipment – General

1. Box container
 - We chose to pack the K9 decontamination kit smaller items in one box. HazMat has this box in their cache section.
 - The larger items (pools and shelving) are separate but kept in the same area.
2. Waterproof tarp
 - 1-2 of these are laid on the ground, and the decontamination set-up (pools and shelving) are placed on top.
3. Sealable industrial strength plastic bags
 - These are used to contain contaminated items
 - Either this or a length of heavy plastic sheeting is placed over where the 2 pools meet to prevent contaminated water from leaking between the pools
4. Hose
5. Spray nozzle or wand
 - Allows for water to be better directed underneath the canine (belly wash)
 - An adjustable water flow
6. Buckets
 - Used to throw in the contaminated collars, leashes, and used brushes until they can be collected in bags for disposal
 - Also can be used to decontaminate metal items that will be reused
7. Water heater (separately stored item)
 - To prevent hypothermia in a cold weather deployment
 - A tent or other environment that can be warmed and provides wind protection is needed as after water decontamination the canines will not be dry for a while
 - If not available, consider a groomers drying unit to quickly dry the canine
8. Pools – 2 (separately stored item)
 - A CBRNE or Hazmat decontamination model uses two separate areas: one for wash station and another for the rinse station
 - We like the IRT Hazmat Basins from Immediate Response Technologies (formerly TVI Corp) canine pools (www.imresponse.com) that have a hose connection to divert contaminated water away, are easily set up and fold down to a small unit for storage
9. Elevated Shelving
 - Advantages include keeping the canine out of contaminated water, preventing them from drinking that water, easier to decontamination properly (especially under the belly and the paws), easier on your back, and easy to assemble
 - We used plastic shelving from Home Depot that was inexpensive, light-weight, and easily assembled but will probably not stand up to more than one 2 week deployment
10. Shallow Pan or Box
 - If a biologic hazard is suspected, walk the canine through a foot bath of dilute Clorox solution (0.5% sodium hypochlorite made by 1:10 dilution in water)

B. Equipment – Human PPE

1. Eye protection
 - 4-8 pairs of goggles if needed to protect from contaminated water spray
 - The canines will inevitably shake themselves at some point as well
2. Gloves – 2 boxes
 - Latex or all non-latex to cover latex allergies, these often tear with much use
 - A heavier over-glove if needed for protection from more hazardous materials
3. Masks
 - Situation-appropriate issue
4. Tyvek Suits or situation-appropriate issue protective suit

C. Decontamination Supplies

1. Mineral Oil – 1-2 bottles
 - We put this in spray bottles for easy application to areas of petroleum-based contamination (usually on the paws and in between the toes)
 - The adage ‘like dissolves like’ is the basis for using this oil to break up the contaminant, then applying a shampoo or soap to remove it from paws or hair
2. Spray bottles – 2, for mineral oil application
3. Ophthalmic (Eye) Rinse – 4 bottles
 - This is used if there are clear signs of eye irritation or contamination, otherwise it is left for the post-decontamination medical check to use if needed
 - There are over-the-counter saline and purified water solutions
4. Liquid soap
 - Dish detergents Dawn® or Palmolive® traditionally used in animal decontamination
 - For a low suds alternative dilute the above 50:50 with water or use Joy® or Prell® products. These work just as well with a thorough scrub
5. Dog shampoo
 - After several soap washes, the oil-based protection on their skin is gone and the coat becomes dull
 - This will help re-establish the coat after several soap shampoos
6. Surgical scrub brushes
 - Not harsh, stiff enough to work; we found surgical scrub brushes work well
 - The BD E-Z Scrub 160 Ref 1603 (2 boxes, 30/box) have a plastic bristle side and a sponge side
7. Absorbent material
 - Baking soda or cornstarch are typically used to absorb a liquid contaminant and then be wiped off
 - Other: diatomaceous earth, Fuller's earth, soil, activated charcoal, synthetics
 - This decreases the contaminant burden that must then be removed
8. Moist towelettes
 - They can be used to wipe sensitive areas around the eyes, nose, mouth, and inner ears as well as prepuce and vulva where soaps can be very irritating
 - These can be used to wipe off powder contaminants before they aerosolize, as brushing may put powders into the air and further contaminate personnel
 - Large absorbent towels - for drying canine after decontamination

D. Canine Supplies

1. Dog dryer or shelter from cold
 - In addition to warm water, a heated shelter area is good to continue the drying process during cold weather
 - A groomers dryer will hasten the drying process, but a warm protected environment will be fine along with monitoring the canine for signs of hypothermia (temperature check is the easiest!)
2. Emergency Blankets
 - Protection if wet in a cold environment
3. Scissors
 - Bandage scissors are preferred as they have a blunted tip that won't cut the skin when taking off bandages
 - Never shave or use clippers to remove hair to skin level, as this may cause abrasions and worsen contamination
4. Muzzles
 - 6 cage muzzles, 2 each various sizes
 - We use basket muzzles so the canines can still pant if needed as well as receive some water decontamination through the muzzle
 - Intended use is for known aggressive canines, or questionable situations when the handler is not present and another handler unavailable
 - Aggressive canines that cannot be muzzled may need to be contained in an area (tied in a safe spot or kenneled) until qualified personnel can help handle them for decontamination
5. Leashes
 - Disposable leashes can be used as a collar and leash combination to replace contaminated leashes and collars that must be removed



VIII. REFERENCES

1. Clementi C, Weapons of Mass Destruction Terrorist Agents. *ASPCA Animal Poison Control Center*
2. Department of Homeland Security. Standardized Decontamination Procedures. *Urban Search and Rescue Weapons of Mass Destruction Enhanced Operations*. SM4-1 to 4-17.
3. Eifried, Gary. Weapons of Mass Destruction and Hazardous Materials; *Protection, Decontamination, and Medical Aid for K-9 Teams*. EAI Corporation 2006.
4. Fox, PR. Assessment of acute injuries, exposure to environmental toxins, and five-year health surveillance of New York Police Department working dogs following the September 11, 2001, World Trade Center attack; *JAVMA*, Vol 233, No. 1, July 1, 2008 Pages 48-59
5. Gordon LE. Recommendations for Canine Technical Decontamination. www.usarveterinarygroup.org August 2005.
6. Gordon LE. Canine Emergency and Gross Decontamination Procedures. www.usarveterinarygroup.org April 2006.
7. Gordon LE. Massachusetts Task Force 1 Canine Decontamination Station. www.usarveterinarygroup.org December 2007
8. Gwaltney-Brant SM, Murphy LA, Wismer TA, Albretsen JC. General toxicologic hazards and risks for search-and-rescue dogs responding to urban disasters. *J Am Vet Med Assoc* 2003; 222:292-295.
9. Hachey, Dave, President Anivac Corporation. www.AnivacFirst.com.
10. Murphy LA, Gwaltney-Brant SM, Albretsen JC, Wismer TA. Toxicologic agents of concern for search-and-rescue dogs responding to urban disasters. *J Am Vet Med Assoc* 2003; 222:296-304.
11. OSHA www.OSHA.gov
12. Otto CM, Downend AB, Serpell JA, Ziemer LS, Daunders M. Medical and behavioral surveillance of dogs deployed to the World Trade Center and the Pentagon from October 2001 to June 2002. *J Am Vet Med Assoc* 2004; 225:861-867.
13. Otto CM, Franz MA, Kellogg B, Lewis R, Murphy L, Lauber G. Field Treatment of search dogs: lessons learned from the World Trade Center disaster. *J Vet Emerg Crit Care* 2002; 12(1):33-42.

14. Slensky KA, Drobatz KJ, Downend AB, Otto CM. Deployment morbidity among search-and-rescue dogs used after the September 11,2001, terrorist attacks. *J Am Vet Med Assoc* 2004; 225:868-873.
15. Soric S, Belanger MP, Wittnich C. A method for decontamination of animal involved in floodwater disasters. *J Am Vet Med Assoc* 2008; 232:364-370.
16. Wenzel JG. Awareness-level information for veterinarians on control zones, personal protective equipment, and decontamination. *J Am Vet Med Assoc* 2007; 231:48-51.
17. Wingfield W, Nash S, Palmer S, Upp J: *Veterinary Disaster Medicine*; Wiley-Blackwell; 2009
18. Wingfield W, Palmer S,: *Veterinary Disaster Response*; Wiley-Blackwell; 2009
19. Wismer TA, Murphy LA, Gwaltney-Brant SM, Albretsen JC. Management and prevention of toxicosis in search-and-rescue dogs responding to urban disasters. *J Am Vet Med Assoc* 2003; 222:305-310