



Canine Decontamination



Guidelines for Emergency, Gross, and Technical Decontamination of the Urban Search and Rescue Canine

Lori E. Gordon, DVM
MA TF-1 US&R



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INTRODUCTION

During the course of a search, canines may be exposed to hazardous materials. Exposure to contaminants can range from the most benign dirt to potentially life-threatening hazardous materials and weapons of mass destruction, including chemical, biological, and radiological substances. They are encountered during natural disasters like floods, hurricanes, and earth quakes, as well as man-made accidents like fires and explosions, and terrorist events.

These contaminants may come in several different forms, including solids, liquids, powders, and gas. Search and rescue operations involve the sorting of collapsed materials, aerosolizing any hazards that may otherwise settle during a deployment. Working without the personal protective equipment that humans use, a search canine's risk of exposure is increased. In addition, many hazardous materials are heavier than air and tend to pool low to the ground, where canine exposure is high.

Decontamination of animals is an important component of responsible emergency response management and is a recognized part of an emergency response plan. The importance is for the health and well being of the animals affected as well as the humans to whom they may transmit hazardous materials.

This paper is designed specifically as a guide to the practical, day-to-day operations of providing a means of decontaminating a canine in the variety of situations that may occur. HazMat-related information on contamination detection, avoidance, and identification are covered elsewhere by multiple sources. Common hazards and canine medical issues are touched on briefly, with greater detail also available elsewhere.

Much of the information regarding the practical operations is directly due to the continued dedication and hard work of the members of the Massachusetts Task Force 1 Urban Search and Rescue team, of which I am honored to be a member. I wish to thank them for their tremendous support in my efforts to expand our decontamination protocols, and the obvious care they have for our search canines. I also wish to thank the handlers for their help, and especially the search canines who put up with lots of bathing!

Lorí E. Gordon, DVM
MA TF-1 US&R

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I. DEFINITIONS

When discussing decontamination there are two basic levels: gross decontamination and technical decontamination. Whether one, the other, or both are used is dependent on the particular contaminant or hazardous material involved. Having a system on site with the ability to adapt to a range of needs, from benign to emergent, is important. This will allow protection and provide safety to the canines, their human partners, and everyone else around them.

A. GROSS DECONTAMINATION

This is an initial phase of the decontamination (decon) process during which the bulk amount of surface contaminant is significantly reduced. It is designed to be done quickly.

Two types of gross decon 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, leaving no residual hazard, and addressing the medical needs of victims and responders as needed. This is a meticulous process to remove as much contaminant as possible utilizing several methods such as brushing, vacuuming, desorption, absorption, washing, chemical detoxification, chemical neutralization, and others.

Two types of technical, also known as thorough, decon are described: emergency, which always includes a medical component and non-emergency, which may or may not involve a medical component.

1. Emergency/Medical Technical Decon refers to a Hazardous Materials (HazMat) or Weapons of Mass Destruction (WMD) situation, where complete decon is a necessary component of the medical treatment in a life-threatening situation
2. Non-emergency +/- Medical Technical Decon 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 treat a canine before reaching the decon corridor is based on several factors: a life-threatening status, medical personnel presence within the hot or warm zone, on site medical supplies, and the safety of involved personnel.

II. CANINE FACTORS TO CONSIDER

Many factors regarding contamination, both canine and human share decontamination, and treatment. These properties make canine decon procedures similar, and therefore familiar to first responders. Many current decon stations are easily adapted for our working canine team members.

Several other factors have dissimilar aspects: search method, 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 well as the humans involved.

A. EXPOSURE – ROUTES, ANATOMY, and BEHAVIORAL ASPECTS

1. Ocular – the Eye

- ☉ Situational aspects include that there is no eye protection worn by the canines during search and their head (therefore their eyes) is often close to the ground, where contaminants may concentrate and sniffing aerosolizes particles into their eyes
- ☉ Anatomically the canine eye is similar to the human eye and is treated for injury and irritation in like manner
- ☉ Options are limited except to rinse the eyes, place canines in a protected environment away from dust and debris during their downtime, and treat problems appropriately



2. Inhalation – Nose and Mouth

- ∞ Scent is the canines' main search tool sense; therefore the nose is used to its utmost without the protective benefits of respiratory protective gear. The respiratory system also receives increased exposure if a contaminant is concentrated on or near the ground. Often you see their mouth is also open, taking in scent to the back of their throat where it circulates up and over the soft palate to the scent glands within the nose.
- ∞ Anatomically there are advantages and disadvantages to their particular nasal traits: the relatively long length and intricate inner 'scrolled' surface area allows for better trapping of particulate matter before it reaches the lungs. Canine lung defense mechanisms and mediators of inflammation also contribute to disease resistance; but the sensitive and vascular mucosal surface may absorb contaminants into the blood stream as well
- ∞ Options include rinsing the nose (a rather unrealistic and problematic solution when put into practice) but dogs have a great response: sneezing! And they can be taught to sneeze. When small, hold them upside down and fluid shift causes them to sneeze in response; reward for the response along with a command, and you're all set (at least in theory).



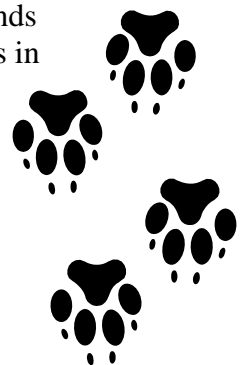
3. Ingestion – Behavioral Aspects, Tongue Exposure

- ◆ Search canine training emphasizes ignoring tempting items like chasing after scurrying animals and taste testing along the way. But hunger, and more of a concern – thirst, may override even the best trained.
- ◆ Behavior also plays a role: licking to clean off the fur, especially the face or licking toes after scratching an ear or rubbing eyes, increases ingestion exposure if these areas were contaminated; also while panting to cool off the tongue is exposed to dust and debris which is swallowed periodically.
- ◆ Options include maintaining hydration, and periodically taking a moist towelette to give a quick wipe to the face and ears



4. Dermal – Skin and Fur; Ears and Tails

- 🐾 Without personal protective equipment, a search canine's entire body is exposed to all manner of contaminants and hazards.
- 🐾 Anatomically their particular skin and fur make-up has both advantages and disadvantages; the inner ear is considered an extension of their skin:
 - 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
 - Be aware of less-haired areas susceptible to exposure (some are thin-layered and more susceptible to wounding): inner ears, tip of nose, axilla (arm pit), underbelly, inner flank, scrotum, paw pads
 - The ears offer some protection, especially if they are flopped over, and the ear canal takes a 90° turn instead of going straight to the tympanic membrane (ear drum)
 - The tail, a wonderful banner of mood and behavior, may be tucked in tight to the body, trapping contaminants underneath; don't forget to decon under and around the tail (a favorite greeting ritual)!
 - Paw pads are thick and tough, great protection. However, their exposure to the environment during urban search make them one of the most compromised and wounded parts of the canine body. Also, paw pads have sweat glands and will absorb nerve agents.
- 🐾 Options to decrease contamination include periodic wiping, palpating for wounds, and thorough decontamination appropriate to the situation at the end of the shift, even during a shift if deemed appropriate
- 🐾 Of particular importance are hands-on body checks, because skin wounds may be hidden by fur and the only symptom is pain. Due to differences in blood supply, canine skin does not blister like human skin, and must be carefully checked.
- 🐾 Periodic paw pad checks are also emphasized, and decontamination procedures important to prevent tracking contaminants back to the rest area.



5. Injection

- † Urban search is fraught with physical hazards, including some very sharp debris. The lack of PPE increases the risk of wounding as well as contamination 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. It falls to the handler, especially if medical personnel are not directly present, during search. Then after decontamination it is recommended that a veterinarian or medical personnel examine them.



B. AMBULATION, EXPOSURE PROXIMITY and RISK

Many hazardous materials tend to concentrate on the ground or low surfaces, where search canines work. Chemical agents are often disbursed as gases or aerosols that are heavier than air and therefore tend to pool near the ground. Being without protective gear, working close to the ground, and ambulating on four unprotected limbs increases a canine's risk for exposure.

Their eyes, nose, and mouth are low to the ground, their body height is low, and their paws are subjected to the environment on which they walk. In addition to their exposure proximity, they are intentionally sniffing the ground and air for victims. This increases their potential for inhalation of a contaminant.

It is not policy to intentionally send canines into potentially fatal or devastating hazards. But even the most meticulous area assessments may be limited in their scope. When weighing a potential live-victim find against hazards, some risk is assumed. A secondary device detonation also remains a possibility in a WMD situation.

C. CANINE METABOLISM

Metabolic differences between humans and canines are difficult to qualify or quantify. These refer to the rate at which the body organs handle various contaminants: absorption through the mucous membranes of the respiratory tract, digestive tract, and skin into the blood, then filtering through the liver, spleen, and kidneys.

Although canines seem more, the same or less sensitive to contaminants (next section), how much they are affected depends on many factors: personal health, condition, and age; concentration of and length of exposure to contaminant. Treatment should be based on signs, symptoms, diagnostic tests, and response to treatments.

D. SENSITIVITY

Why does this matter?

These comparisons are meant as a guide for risk assessment in sending search canines into an area. As a doctor, one must evaluate the patient, not the contaminant, to adequately treat. This is of paramount importance when the contamination is unknown; sensitivity plays little role in determining and administering care.

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: 1/4 as sensitive to inhalation form, 1/2 as sensitive to dermal form
- ☠ GB: 1/4 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: 2/3 as sensitive to inhalation form; 1/4 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

With respect to terrorism, canines would not make good carriers of disease like animals in our food supply chain. Also it does not make sense that they would be the intended victims. Therefore purposeful exposure to a biological agent is of less concern, but a concern nonetheless. Among the 300 or so possible human pathogens that could be used for terrorist purposes, few have been investigated due to characteristics that make them ideal for military use. These fall in the bacteria, rickettsia, virus, and toxin categories.

☞ 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*)

☞ Rickettsia

- Q Fever (*Coxiella burnetti*)

☞ Virus

- Venezuelan Equine Virus (VEE virus)
- Smallpox (*Variola virus*) **canines are naturally resistant**

} **canines susceptible
but less sensitive**

☿ Toxins

- Botulinim (Botulinim toxins)
- Ricin (from castor beans)
- Staphylococcal Enterotoxin B (*Staph aureus*)

} **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 may be the least likely for a terrorist to obtain, but the possibility does exist and nuclear energy accidents are also of concern.

Briefly:

☸ Alpha particles

- ☿ Limited penetration: stopped by superficial dead skin layer or paper sheet
- ☿ 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

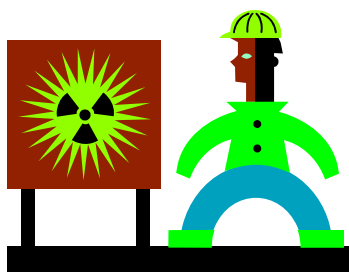
- ☿ Not particulate, more like a high-energy x-ray with long range
- ☿ Significant penetration; dangerous whether external or ingested

☸ Neutrons

- ☿ Most immediately damaging to cells on contact, travel far in air
- ☿ Stopped by water, paraffin, or plastic

Canines appear to be about 25%-50% more sensitive than humans to the acute effects of the same radiation exposure. 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.

Time, distance, and shielding are still the best option in a radiation hazard event!



E. TOXICOLOGIC AGENTS of CONCERN for DECONTAMINATION

Toxicology experts in the field have named some of the more common substances, but not all, that may be encountered by an urban search canine. These are briefly discussed to bring them to the forefront of your awareness. The importance of their decontamination lies with the health of the canine and everyone with whom they may come in contact.

♪ Studies in a real world event (World Trade Center) have revealed other contaminants.

1. Hydrocarbons

- a. Large number of motor vehicles often found in an urban disaster site can be a source: gasoline, motor oil, transmission fluid
- b. Large buildings that collapse contain many sources: general cleaners, degreasers, copier toners, printing inks, adhesives
- c. Absorption following dermal exposure less extensive than respiratory or oral, so decon removal important to prevent licking of contaminated fur

2. Polychlorinated Biphenyls (PCBs)

- a. Banned in all systems by 1979, older buildings may still have them: transformer coolant, turbine lubricant, fluorescent light ballasts, air conditioners, television sets, carbonless copy paper
- b. Oily liquids or solids, colorless to light yellow, odorless, tasteless
- c. Dermal and oral exposure may lead to multiple organ failure and cancer, so removal with soap and water to decrease absorption important

3. Hazardous Metals

- a. Present in nearly every man-made structure in an urban environment, becoming a hazard when structural integrity is compromised
- b. Search dog concerns: antimony, arsenic, beryllium, cadmium, chromium, cobalt, lead, mercury, nickel, thallium, and zinc
- c. Major concern is inhalation exposure, so wet down coat and do not brush to prevent aerosolizing the contaminant

4. Asbestos

- a. These hydrated magnesium silicates were used in fireproof fabrics and insulation for their resistance to heat and chemical degradation
- b. Still used as a binding agent in cement panels and pipes
- c. Predominantly an inhalation concern (lung inflammation, fibrosis, and cancer), no evidence for an ingestion hazard, so wet down coat or wipe with wet towels and do not brush into the air

5. Soaps and Detergents

- a. More concern with industrial disaster or if fire suppression foams used
- b. Soaps generally low in toxicity, detergents are more irritating
- c. Cationic detergents can be very toxic: corrosive, painful, and may interfere with muscle function, causing paralysis. Decontamination required to minimize these effects

6. Acids and Alkalis

- a. Acids found in toilet bowl cleaners, drain openers, battery fluid
- b. Alkalis found in oven cleaners, bleaches, pipeline and household cleaners
- c. A concern in industrial settings, both are highly corrosive and cause mild to severe burns with oral, corneal, or dermal contact
- d. Further damage to the respiratory system if encountered as vapor, mists, or aerosol

7. Ethylene Glycol

- a. Most commonly known in antifreeze, also deicing solutions, paint solvents, photo developers, brake fluid, inks, solar units, polish, cosmetics
- b. Slightly viscous, colorless, odorless, highly flammable clear substance that has a slightly sweet to bitter taste
- c. Most exposures are oral, and dehydrated dogs are more likely to drink ethylene glycol; highly toxic: neurologic signs, kidney failure
- d. Decontamination, especially the feet, to prevent ingestion by licking
- e. Some products contain a dye that lights up under a black light (for detection of radiator leaks) so this can be tried on the canine for a suspected contamination

8. Propylene Glycol

- a. In home and industrial settings, this is a clear, colorless, odorless, tasteless, slightly syrupy liquid found in pharmaceuticals, inks, antifreeze, deicing solutions, lubricants, and resins
- b. Absorption is rapid after ingestion, so clean off the fur to prevent licking of the contaminant
- c. Although approximately one third as toxic as ethylene glycol, it is still toxic and in sufficient amounts will cause organ damage and seizures, possibly coma

9. Phenol

- a. Large amounts may be present at industrial sites in the form of resins, detergents, dyes, indicators, medical and veterinary antiseptics, disinfectants, preservatives
- b. A colorless to white crystalline in pure solid form, while commercially a liquid with some water; distinct sweet tarry disinfectant odor
- c. Very caustic at 5% and quickly absorbed through the skin, causing muscle tremors, convulsions, coma and death
- d. Ingestion is also very bad, so decontamination to decrease dermal absorption and prevent oral ingestion from licking is very important

10. Alcohols

- a. Primarily in solvents or as intermediary chemicals
- b. Unless ingested in large quantities these generally do not cause severe problems
- c. All alcohols can be absorbed via dermal, oral, or respiratory exposure

F. ENVIRONMENTAL TOXIN EXPOSURE – WORLD TRADE CENTER

A study was performed (ref #4) to assess environmental toxin exposure of the New York Police Department working canines. The twenty-seven canines tested were divided into prolonged exposure and brief exposure groups. All were deployed during the initial three weeks after the attack. Blood and hair samples were obtained for toxicologic evaluation, including many of the agents of concern described in the previous two pages.

References cited in the paper analyzed the air surrounding ground zero, which contained clouds of visible particulate matter: cement, glass, fiberglass, asbestos, and lead. Jet fuel combustion and structure fires resulted in release of soot, dust, polychlorinated biphenyls, chlorinated hydrocarbons, and dioxins. Clean-up operations continued to release polycyclic aromatic hydrocarbons.

Results for the canines included the following:

1. **Blood lead** concentrations (normal < 10 $\mu\text{g}/\text{dL}$)
 - a. Significantly higher in 17 prolonged exposure canines (5.6-22.6 $\mu\text{g}/\text{dL}$) when compared to brief exposure canines
 - b. Clinical signs of lead toxicosis were not appreciated in these canines
2. **Polychlorinated biphenyls**
 - a. All blood concentrations were less than the limit of detection
 - b. Dust samples collected at the site had low concentrations
3. **Metals**
 - a. Serum copper, iron, zinc, and magnesium were detected
 - b. All levels were within reference ranges
4. **Arsenic**
 - a. 21 of 25 canines tested had detectable levels, all within normal ranges
 - b. 2 canines had levels of 0.56 ppm, more than background threshold of 0.4 ppm
5. **Environmental toxins** – detected in 22 of 27 canines (81%)
 - a. 3-methyl quinoline
 - b. Isoquinoline
 - c. Quinoline
 - d. 2-(1-phenylethyl) phenol
 - e. Diphenylamine
 - f. Surfynol
 - g. Cedrol

} compounds known to be carcinogenic, mutagenic
6. **Negative for:**
 - a. Polycyclic aromatic hydrocarbons: naphthalene, acenaphthalene, anthracene, fluorine, phenanthrene, fluoranthrene, pyrene, chrysene, and others.

G. 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 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
- Blisters – the blood supply to the canine skin differs from humans, and they do not form blisters. Burns-like wounds will occur instead, so the wetness and pain from the injury can be detected on the skin

G. FAMILIARIZATION and TRAINING

Like humans, dogs need training. Although the canines will not be setting up a decon station, they certainly will be going through it. They are highly intelligent and advanced in their training, but familiarizing them with a decon procedure will make the real thing that much less stressful for all concerned.

Canines may have a limited understanding of a dangerous environment with respect to a human's, so it falls to the handlers and other team members to protect them. But they also pick up on our emotions. They use their sense of smell and their expectation of their handler's normal reactions. When these are off, make no mistake; they know there is something different going on. Familiarization and training will help reduce the apprehension that may surface during an actual deployment.



H. PREVENTATIVE MEASURES



1. Skin and Pads

Dermal absorption is one of the most important routes of exposure to chemical, biological, and radiological substances, as they are without PPE.



- Bathing, rinsing, or simply wiping their coats (baby wipes are a great option) decreases the particle build up and dermal absorption of toxins. Don't forget inside of ears, where little to no hair decreases protection
- Booties provide protection to the vulnerable paw pads when tracking over rubble, but there is concern about decreased traction. Most American-trained canines do not learn to work with these, but familiarizing a canine with them may come in handy in certain search situations (Katrina homes)
- Frequent body checks for cuts and abrasions will allow for early treatment, decreased absorption of toxins, and decrease further contamination (44.4% of NYC Police canines at WTC reported cuts and abrasions)

2. Eyes

Ocular exposure is also a concern when thinking of ways to decrease exposure and absorption. US&R canines do not wear eye protection.

- Goggles designed for dogs are available (Doggles, MidKnight Creations LLC); familiarize before introducing them at disaster
- Regular flushing of their eyes with saline or purified water solutions will help remove ocular irritants. Keep applicator tip away from hitting cornea
- Conjunctival irritation was most common injury documented in New York State Police Canines at the World Trade Center terrorist attack (62.9%)



3. Nose and Mouth

Canines naturally lick their nose and mouth numerous times during the course of a day. This leads to an ingestion route of exposure of whatever collects in and around their nose and mouth.

- Routinely wiping the canine's nose and mouth (baby wipes are convenient, pH balanced, and mild) will decrease oral route of exposure



4. Hydration

Maintaining adequate hydration, in cold weather as well as warm, is a constant challenge. Many canines defer drinking due to the excitement and stress levels.

- Encourage drinking of bottled water in small, frequent amounts.
- Maintenance ~ 2-4 ml/kg/hr; additional for heat, workload, time
- Flavoring the water is an option for canines that won't drink
- Dehydration documented in 48.1% of NYC Police canines at WTC



5. Adequate Work-Rest Cycles

This is an important aspect in maintaining health

- Minimizes fatigue, illness; maximizes search efficiency and safety
- FEMA guidelines: for every 20-45 minutes of work, equal time rest
- Fatigue was the other most common documented injury reported in New York State Police Canines at the World Trade Center attack (62.9%)

III. 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) put out by U.S. Department of Transportation

2. Powders

- 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
- Use scissors with caution so as not to lacerate the canine. Clippers will not work for long.

4. Physical removal of the contaminant:

- High volume, low pressure water augmented by soap is the recommendation
- Rinse-wash-rinse cycle 3 times for maximum benefit
- Lukewarm water and standard household dish soap (Dawn®, Palmolive®) are common; military known to use lower-suds Prell®
- **CAUTION: some HAZMATs become reactive when exposed to water.** Check pages 342-347 of the 2008 ERG for a partial listing.
- The soap's high pH begins to neutralize many chemical agents and dissolve small amounts or thin-coated petroleum agents
- Go from head to tail, shoulder to forelegs, back to belly, hips to back legs



5. Eyes, Ears, Nose and Mouth

- Small bottles of over-the-counter eye rinse (ophthalmic saline and sterile water available) ideal to gently but firmly flush eyes
- If too difficult to manage (uncooperative canine, too difficult with all your protective gear on) then remove as much contaminant around eyes with non-alcohol based towelettes; further eye issues can be 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!

6. 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). Some decontamination line protocols actually include a dilute bleach wash down 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 the canine to drink any **contaminated run-off** if your decontamination is not elevated or the run-off is not draining away to a collection spot. 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
- Be cognizant of the **weather conditions** and include necessary shelters in post-decontamination care of your 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

B. HUMAN SAFETY in a DECONTAMINATION LINE

Basic guidelines for PPE when handling animals include gloves, protective eyewear, durable clothing, and protective footwear. Each disaster presents its own health and safety risks. The safety officers, HazMat specialists, and command staff should continuously monitor the deployment site conditions and modify the PPE as needed.

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.

Some PPE suggestions include:

1. Knee-length rubber boots with slip-resistant soles
2. 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
3. Double gloving with an outer heavy fabric glove may provide additional protection against bites and scratches
4. N-96 particulate respirators to protect against spray mists during decontamination
5. Eye protection with tight fitting goggles to protect against splash hazards (safety glasses do not protect from splashes)
6. 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
7. 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, and this should apply to the canine decon line even though they are without PPE
8. Back and knee injuries are common when working with animals; remember posture, knee pads, consider a raised platform to perform decon

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 decon is performed and medical attention given
- If emergent and the removal of the contaminant is itself part of the treatment, technical emergency decon 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 handler should accompany the canine through decon if possible.

- 🐾 If the handler is unable to, another experienced handler may do so
- 🐾 If a canine cannot be safely taken through without the handler, confine canine to contain contamination
- 🐾 If handler requires decon and no other can take canine through, confine canine until handler is clean, can don protective clothing, then take canine through
- 🐾 If handler unable to take canine through and no other can safely do it, confine canine, consult to consider options, including sedation, without getting hurt!

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 decon corridor via physical barriers

3. Rinse – Wash

- Initial gross decon 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 three times 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

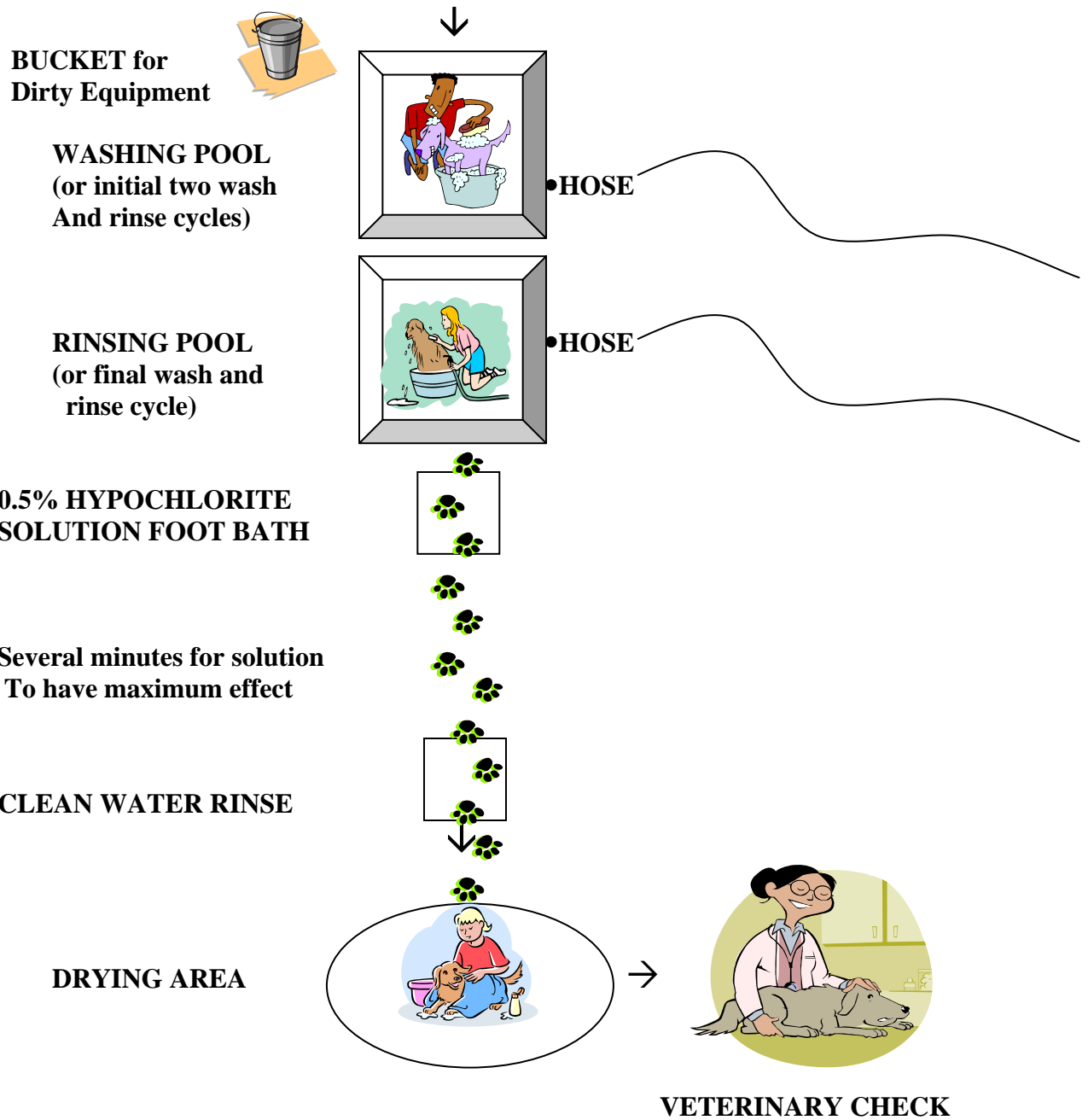
Spray on solution or walk canine through a diluted bath if biological contamination suspected. There are several options, each with their own spectrum of activity, advantages and disadvantages.

- ***Hypochlorite*** (bleach) 0.5%; this is household bleach diluted 1:10. Be sure and rinse off bleach solution once done; a range of 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%

6. Monitor, Treat, Return to Service

- Monitor for contamination, including radioactive checks when dry
- Special attention to eyes, ears, nose, throat, paws, and under the tail
- Repeat decon if necessary, otherwise new collar/leash and continue to medical
- Complete medical/veterinary evaluation and treatment as needed
- Return to service

D. DECONTAMINATION CORRIDOR



E. HAZMAT SPECIFICS: CHEMICAL, BIOLOGICAL, and RADIOLOGICAL

1. Chemical Exposure



Remove

- ⊗ Relocate to a well-ventilated upwind area
- ⊗ 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

2. Biological Exposure



One of the concerns with biological exposure is that it will likely go unnoticed until victims develop symptoms and seek medical attention. The good news for dogs is that they are resistant to many of the agents most likely to be used by terrorists. The bad news for dogs is they are potential transmission vectors.

Decontamination is essential if exposure to particulate, liquid or aerosol biological agent has occurred within the past several hours. It may not help but certainly won't hurt if the exposure is not discovered for several days.

Remove

- ⊗ Relocate to a well-ventilated upwind and upgrade area
- ⊗ 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 longterm

3. Radiological Exposure

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. Decon is similar to other hazard removal.

Remove

- ☞ Relocate to a well-ventilated upwind and upgrade 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
- ☞ HAZMAT and medical monitoring

F. CONCERNING PETROLEUM-BASED CONTAMINANT

July 2007 the Massachusetts Task Force 1 conducted a canine decontamination drill to test our ability to remove a petroleum-based contaminant from our search canines.

The 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.

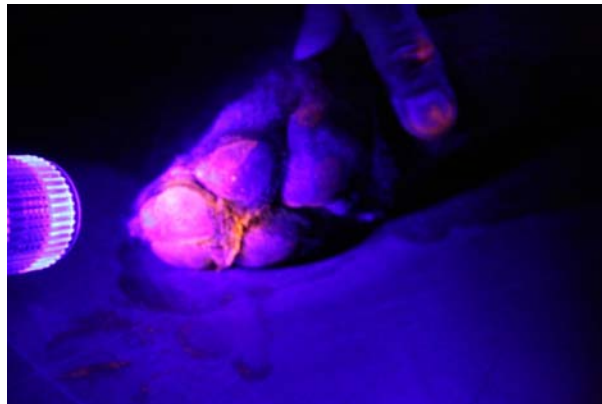


Germ® Powder Glo Germ®
Liquid

Both the oil-based liquid and powder forms were placed on the ground and the dog walked over the 'contaminated' area. Confirmation of contamination was achieved by checking the paws under a black light.



Glo Germ® Canine Contamination



Confirmation of contamination under black light

The canine was brought to the first pool: 'dirty' collar & leash exchanged for clean ones, wash down and shampoo. Special care was taken to use the surgical scrub brushes on the footpads, where at prior team drills much of the contaminant was found to remain.



Shampoo and Rinse Stations



Paw cleansing
(Joy®, diluted Dawn®, Prell® all work)

After 1-2 shampoo & rinse cycles, handler and canine proceeded to the second pool for final shampoo and rinse, another collar/leash exchange if deemed necessary. Baby hand wipes were used to cleanse the face and inner aspect of the ears. Then handler and canine stepped out onto the 'clean' area to towel dry the dog and for the handler to remove the level B suit.



Paws were rechecked under black light illumination to assess level of decontamination.



Paw Contamination Before Decontamination

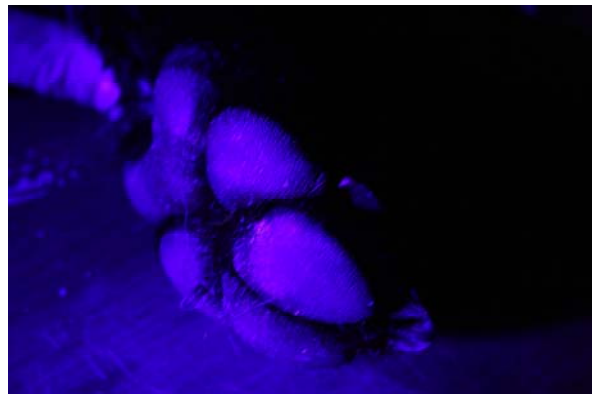


Paw Contamination remains after Soap/Shampoo Only

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 decon corridor. When the paws were checked under the black light for level of decontamination, no grossly visible evidence remained of the Glo-Germ®. *So for an oil-based contaminant, pre-treatment with mineral oil may significantly increase the efficiency of the decon.*



Paw Contamination Before Decontamination



No evidence of contamination after Mineral Oil, then shampoo/rinse decon

IV. DECONTAMINATION SYSTEM-DESIGNS

A. GROSS and TECHNICAL DECONTAMINATION – Human System

In August 2005 a full set-up of the WMD decontamination unit was performed and included was a canine decontamination run. The handler wore a Lakeland Industries Level B Tychem[®] 9400 suit, and went through a Reeves gross decontamination shower, then through a TVI Corporation 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 WMD 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 decon 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.



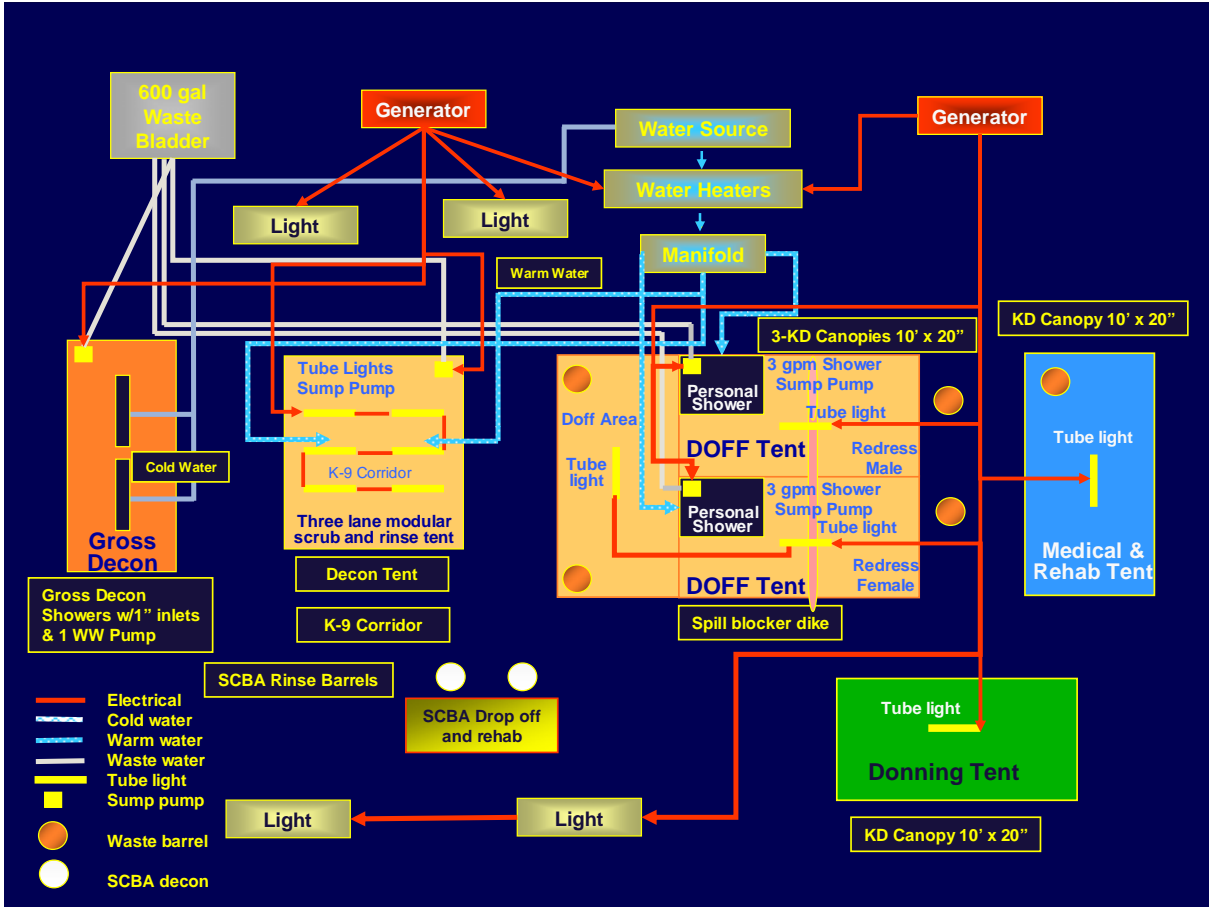
- Enter the area and decontaminate the handler first, who should try to avoid dripping potentially hazardous run-off from their body onto the canine, then they can decontaminate their canine
- If there is more than one helper in this area, one can do the handler and another begin shampooing the canine.
 - This decreases time spent in decon, 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 TVI decon tent, you may need to take down one hanging wall to widen the area to accommodate both handler, canine, and a helper(s)



DECONTAMINATION FLOOR PLAN

1. Canine decontamination corridor
 - a. Stands alone (MA TF-1 K9 Decon System)
 - b. Corridor goes from hot to warm to cold zone
 - c. Adaptable level of decon based on contaminant

2. Gross and technical decontamination with a canine decontamination corridor within the 3-lane modular scrub and rinse tent



Gross Decon



Technical Decon Corridor

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.



The additional equipment dedicated to a decon set-up we designed in December of 2007 was received and incorporated into the system. The complete set-up consists of the following items:

🐾 TVI Corp www.tvicorp.com	2 TVI canine pools @ \$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



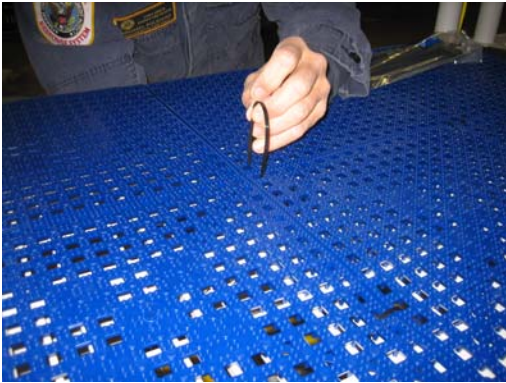
This is one of two shelving units before modification. After modification each unit will be placed within a canine pool. The material is light weight plastic.



These are the TVI canine pools. A port is visible at the bottom along the far side. A hose and pump can be connected to manage dirty water and contaminants



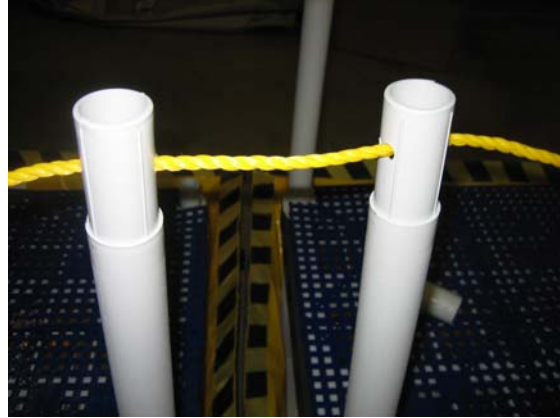
Six 12"x12" DriDek® panels were connected and their corners cut to accommodate the shelving poles. The edge connectors were trimmed to create a smooth edge.



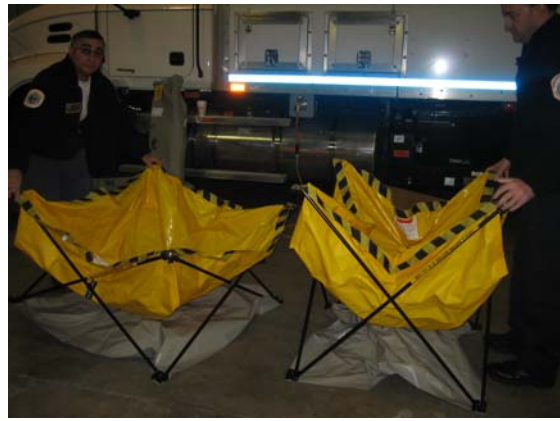
Cable ties are used to secure the flooring to the shelf. This is to prevent the floor from slipping during the decontamination procedure.



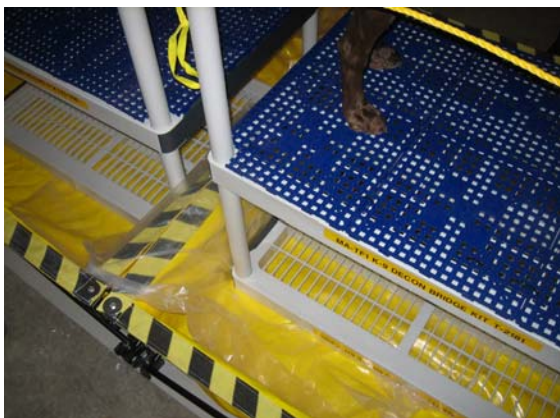
This is one of the modified assembled shelf units.



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 decon corridor, discouraging dogs from jumping off the side.



The TVI canine pools 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 decon (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 decon, 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 decon, 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 be kneeling on the ground to perform the decon

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

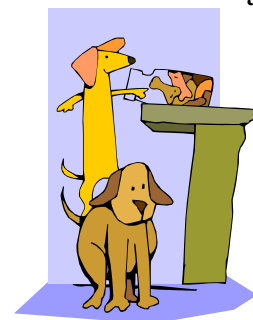


- 🐕 One railing pole broke at its base and was duck-taped back; one shelf cracked
 - Replace posts with stronger pole (PVC pipe)?
 - Consider stainless steel shelving (heavier but more durable)
- 🐕 One of the state trooper German Shepherds was wobbling on the scaffolding
 - Lash the 2 shelving units 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



at

V. CANINE DECONTAMINATION KIT

A. Equipment – General

1. Box container
 - We chose to pack the K9 decon 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 decon 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 decon 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 WMD or HazMat decon model uses two separate areas: one for wash station and another for the rinse station
 - We like the TVI Corp canine pools (www.tvicorp.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 decon 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-decon 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 decon
 - 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
 - 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
9. Large absorbent towels
 - For drying canine after decon

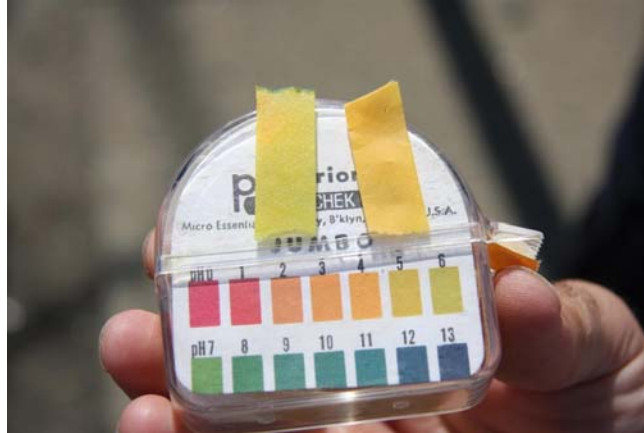
D. Canine Supplies

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 decon 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 decon
5. Leashes
 - Disposable leashes can be used as a collar and leash combination to replace contaminated leashes and collars that must be removed



ADDENDUM – Litmus Paper Use in Canines

Litmus paper may be used on humans to monitor the presence of an acidic or alkaline contaminant on the skin. Before this same method can be extrapolated for use in canines, determination of baseline skin pH needs to be established.



Litmus strip on the left, moistened in bottled water, was pressed onto **human forearm skin**. **pH 6.0**

Litmus strip on the right, moistened in **bottled water only**, was read out as **pH 5.0**



Litmus strip on the left, moistened in **bottled water only**, was read out at **pH 5.0**

Litmus strip on the right, moistened in bottled water and then pressed to **canine abdomen**, was **pH 8.0**
Another test on the **canine inner ear** also read out as **pH 8.0**

Therefore, if litmus paper is to be used to monitor a contaminant, it must be noted that the baseline for normal canine skin is different than for humans. Baselines may also differ from area to area, in heat versus cold, and between individual canines.

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