National Association of Institutional Linen Management

Utilizing The Skills of Jail Support Services Personnel In The War on Terrorism Decontamination

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One of the most important activities in the consequence management of terrorism is proper decontamination. With chemical weapons, you have an immediate recognition of the attack. You have victims, equipment and facilities to decontaminate. With chemical weapons, decontamination is usually performed with soap and water as quickly as possible because the faster decontamination is performed- the less the severity of the symptoms. In contrast, a bio-terrorism attack may take several days to identify, decontamination of victims may not be useful but equipment and facilities will still need to be decontaminated. Unlike chemical agents where decontamination is usually conducted with large amounts of soap and water (sometimes with a product to degrade the chemical agent), biological agents require the use of disinfectants to kill the bacteria, spore or virus.

Inmate populations have an infectious disease rate five to ten times that of a normal population. In most communities, the only facilities that have personnel responsible for decontaminating biohazard environments and a stock of disinfectants are hospitals and the jail. Unlike the environmental services personnel at a hospital; the support services personnel at the jail are supposed to be trained first responders. Unlike hospitals which have established sanitation training programs for their hourly personnel through organizations such as the National Association of Institutional Linen Management (NAILM) and the International Executive Housekeepers Association (IEHA); I have found that training in sanitation and knowledge of disinfectants by detention personnel is woefully inadequate. Sanitation training is minimal at most correctional academies and the only place I know where sanitation is taught as a science is at the National Corrections and Law Enforcement Training and Technology Center (NCLETTC) in Moundsville, WV.

The Label:

While everybody is familiar with Material Safety Data Sheets (MSDS) and knows to have them on file; disinfectants have a very different legal Status. Not only are disinfectants required by OSHA to have a MSDS; they also fall under the Federal Insecticide Rodenticide and Fungicide Act (FIFRA). FIFRA, enforced by EPA, creates another legal document called the "Label". Unlike the MSDS which deals only with safety; the "Label" contains directions for use, test results, which made it (EPA establishment number) and other information.

You must read the "Label" of all disinfectants very carefully <u>because ANY DEVIATION from</u> the directions for use on the "Label" constitutes a violation of federal law. The "Label" will also list the bacteria, viruses and molds it has been tested against and found to kill. This statement should also name the methodology used in the tests. Only official methodology (AOAC or EPA test methods) can be used for validating this statement.

In the test results section, you will find another important statement that will go something like this; "tested upon a previously cleaned surface". There are very few disinfectants which have an approved "one step" cleaning/disinfecting procedure. The vast majority of disinfectants require a two step procedure; the surface must be cleaned of organic debris and then the disinfectant is applied and allowed to air dry.

The directions for use on the “Label” will specify what dilution to use to achieve the desired effect. It will specify different dilutions for sanitizing, disinfecting, for different viruses and bacteria. You must be familiar with the terms used on the “Label”.

Definitions:

Commonly used terms relating to disinfectants include:

Antiseptic - chemicals used to inhibit or prevent the growth of microbes on living tissue.
Disinfectant - chemicals used to inhibit or prevent the growth of microbes on inanimate objects.
Sanitize - reduce the number of microbes to a safe level.
Sterilize - eliminate all microbes (inactivates or kills)
Bactericide - kills bacteria. Fungicide -kills fungi.
Viricide - kills virus
Sporicide - kills spores (fungi and bacteria)
Biocide - kills living organisms.
Bacteriostat - inhibits the growth of bacteria.
Detergent- A synthetic cleaning compound containing water conditioning, surfactants and emulsifying chemicals
Anionic Detergent - (soaps) have free negative ions when combined with calcium and magnesium in hard water.
Cationic Detergent - Quaternary ammonium contains positively charged ions which remain suspended in solution.

Effectiveness:

Disinfectant effectiveness depends on many factors. These include:

- Type of contaminating microorganism -Each disinfectant has unique antimicrobial attributes.
- Degree of contamination -This affects the time required for disinfection and the amount of chemical required and amount of protein containing material present. Protein based materials absorb and inactivate some chemical disinfectants.
- Type of chemical-It is important to understand the mode of action in order to select the appropriate disinfectant.
- Concentration and quantity of chemical-It is important to choose the proper concentration and quantity of chemical that are best used for the disinfection of each situation.
- Contact time and temperature –Sufficient time and appropriate temperature, which are proportional to the degree of contamination, must be allowed for action of the disinfectant.
- Residual activity and effects on fabric and metal.
- Application temperature, pH and interactions with other compounds must be considered.
- Toxicity to the environment and relative safety. .
- Cost.

The Disinfectants

The common classes of disinfectants are discussed before. Several classes of disinfectants which have little use in a detention facility such as phenolics, aldehydes and acid sanitizers are not discussed.

Hypochlorites

Chlorine disinfectants are effective against fungi, bacteria, viruses and algae. Chlorine is more effective than most disinfectants against spores. Household bleach (5.25-6 percent NaCl), a common source, is cheap and readily available. Chlorine disinfectants corrode metals, concrete and deteriorate fabrics. Chlorine has no cleaning properties except to digest proteins. Chlorine solutions irritate mucus membranes, eyes and skin.

To emphasize the safety hazard of chlorine when I train detention personnel; I put a thin slice of lunch meat in a bottle with household bleach and another slice in a bottle with a quat disinfectant. After 5-10 minutes, the only thing left in the bottle with the bleach is a layer of fat and some connective tissue. I tell the students that their face is made of protein and which chemical would they like an inmate to throw in their face.

Organic materials such as feces inactivate chlorine disinfectants, therefore, surfaces must be clean before using a chlorine disinfectant. In order to obtain maximum results with chlorine disinfectants they must remain in contact with surfaces for several minutes. The effectiveness decreases when application temperatures are below 65 degrees. Decreasing the temperature to 50 degrees cuts the effectiveness in half. Water temperatures or above room temperature accelerate the evaporation of chlorine from the solution.

Summary:
Chlorine: is a good emergency disinfectant but should not be routinely used in a detention facility because of safety and reactivity;

- Provides wide germicidal activity and is relatively nontoxic;
- Has limited activity when in the presence of organic matter;
- Has poor residual activity and is corrosive;
- Has fair effectiveness as a sporicidal agent;
- Is effective at low concentrations for disinfecting objects; and
- Has a low cost, but requires frequent applications.

Iodophor Disinfectants
Iodine and iodophors (organic iodine) can be included in a time release formulation and with soaps (surgical scrubs). Iodine and iodophors are bactericidal, sporicidal, viricidal and fungicidal. Iodine, like chlorine, is inactivated in the presence of organic material and they must be applied multiple times in order to thoroughly disinfect. Organic iodines such as betadine surgical scrubs generally do not irritate tissues. Iodine has a distinctive brown color similar to iced tea. When the active iodine evaporates from the solution, it loses its color.

Summary:

- Provides wide germicidal activity and are relatively nontoxic.
- Has limited activity when in the presence of organic matter.
- Has poor residual activity, is corrosive, stains fabric and equipment.
- Has fair effectiveness as sporicidal agents, but better than chlorine.
- Effective at low concentrations for disinfecting objects.
- Has a low cost but requires frequent applications.

Alcohols
Alcohols are commonly used topical disinfectants. They are effective against Gram + and Gram -bacteria, and enveloped viruses. Alcohols are not effective against bacterial spores and viruses.

Alcohols require time to work and they do not penetrate organic material. While alcohol may be used on small hard surface items such as telephone handsets; it is too expensive for general use.

Summary:

- Provides wide gennicidal activity, is non corrosive, poses a fire hazard and is irritating to tissues.
- Has limited activity in the presence of organic matter and limited residual activity.
- Is not effective against bacterial or fungal spores.
- Excellent when used at 70-95 percent concentration for disinfecting instruments, etc.

Peroxides
Peroxides such as hydrogen peroxide are often used to d clean wounds. The activity of peroxides is greatest against anaerobic bacteria. Hydrogen peroxide is not viricidal and in some cases is damaging to tissues, resulting in a prolonged healing time. Hydrogen peroxide d is useful for cleaning surgical sites after closure, but use sparingly to avoid penetrating suture lines which would inhibit healing.

Summary:

- Has moderate to wide germicidal activity, is moderately corrosive and has limited toxicity.
- Rendered ineffective in the presence of organic matter.
- Poor to limited residual activity.
- Not effective against bacterial or fungal spores.
- Most valuable as a cleansing and deodorizing agent and is moderate in cost.

Quaternary Ammonium Compounds

Quaternary ammonium (QA) disinfectants contain NH4. The labels often list a form of ammonium chloride (AC) such as: alkyl aryl, benzyl, didecyl, dimethyl, ethylbenzyl, octyl, or a combination of different AC. Benlitconium chloride (BC) is a more tissue friendly QA than AC. QA disinfectants are effective against Gram + and Gram - bacteria and viruses. They are not effective against fungi and bacterial spores QA compounds bind to organic inst material including soaps so the area to be disinfected must be cleaned and rinsed free of soap. Extremely hard water also deactivates QA disinfectants. QA compounds are generally low in toxicity, but prolonged contact can be irritating. Quats are cationic compounds and incompatible with other detergents and disinfectants.

Summary:

- Wide germicidal range, non corrosive and low toxicity.
- Reduced efficiency and residual activity in the presence of organic matter.
- Not sporicidal, effective against vegetative bacteria, fungi and viruses.
- Limited effectiveness in soaps, detergents and hard water salts.

I have attempted to show how properly trained jail support personnel can be a major community resource in the war on bio-terrorism. No longer can support services be the dumping ground for all the malcontents on the jail staff. Support services needs to have the best educated and trained personnel in the jail. Properly trained support services personnel can not only prevent you from being sued (poor food, insanitation, health care related); they should be a major community resource in the consequence management of a terrorist attack.