



# IPAC-CANADA PRACTICE RECOMMENDATIONS

## Environmental Cleaning and Disinfection for Emergency Vehicles

This document was developed by IPAC Canada based on best available evidence at the time of publication to provide advice to Infection Prevention and Control Professionals. The application and use of this document are the responsibility of the user. IPAC Canada assumes no liability resulting from any such application or use.

**It is strongly recommended that prehospital care (PHC) services contact an Infection Prevention and Control Professional to assist with assessment of practices and/or purchases that involve prevention and control of infections.**

### **Objective**

To provide guidance for the disinfection of environmental surfaces in PHC vehicles following off-loading of clients/patients/residents/individuals, thus rendering the surfaces safe for responding to subsequent calls within a practical period of time.

### **Stakeholders**

PHC managers and workers, particularly those involved in policy and practice for cleaning and disinfecting emergency vehicles.

### **Background**

The principles of *Routine Practices* are based on the premise that all clients/patients/residents/individuals' secretions, excretions and body fluids and their environment might potentially be contaminated with harmful microorganisms. These simple preventive practices must be followed at all times by staff in the PHC setting, regardless of whether or not an illness is "known", to protect clients/patients/residents and themselves from the risk of infection.

As per *Routine Practices*, emergency vehicle surfaces and equipment that has been contaminated with blood and/or body fluids, or has been in contact with non-intact skin, mucous membranes or the contaminated hands of the healthcare provider, requires cleaning and disinfection prior to use with another individual.

*Routine Practices* include<sup>1</sup>:

- 1) Hand hygiene
- 2) Use of personal protective equipment (PPE) when indicated
- 3) Standardized cleaning and disinfection protocols

### **Infection Prevention and Control Practice Recommendations for Cleaning and Disinfecting Emergency Vehicles<sup>2</sup>:**

1. PHC services must have clear, evidence-based policies and procedures detailing the indications for cleaning and disinfection of emergency transport vehicles, paying particular attention to frequency, processes and materials. Policies and procedures, directives, and/or standard operating guidelines must incorporate all appropriate components of *Routine Practices* and must include a protocol for cleaning of blood spills. For additional information, a *Prehospital Care Audit*

**DEVELOPED BY:**

**IPAC-Canada's**

**Prehospital Care Working  
Group**

**May 2014**

*Tool*, which addresses this area and many other components, can be found at: <http://www.ipac-canada.org/AuditToolkit/toolkithome.php>.

2. Routine cleaning and surface disinfection should occur following each transport or emergency vehicle use, paying particular attention to frequently touched surfaces and horizontal surfaces, as well as adhering to the manufacturer's recommended wet contact time (specified on the cleaning and disinfection product label). This recommendation pertains to transports that require delivery of PHC, if they are visibly contaminated with blood and/ or body fluids, or if they have had direct or indirect contact with non-intact skin or mucous membranes. This also pertains to vehicles that were used to provide PHC but were not used for client/patient/resident/individual transport to a healthcare facility, for example, when returning a client to their home
3. Place biomedical waste (according to local regulations) in a clearly marked biohazardous waste receptacle. PPE should always be worn when handling biohazardous materials.
4. Ensure all sharps are discarded immediately after use in an appropriate sharps container, located at point-of-use.
5. Remove used linens/blankets for laundering. Avoid agitation (shaking) or over-handling of linens. PPE should always be worn when handling contaminated linens.
6. Adhere to appropriate cleaning protocols to prevent recontamination of freshly cleaned/disinfected surfaces:
  - a. Cleaning should proceed from cleanest to dirtiest areas. These areas may vary depending on the type of call and the degree of contamination in the treatment area.
  - b. Clean/disinfect all reusable equipment used during the call according to the Spaulding Classification (see *Glossary*) for medical devices and patient care equipment.
7. If the vehicle is heavily contaminated, it should be taken out of service and manually "deep cleaned" (see *Glossary*).
8. The paramedic/first responder responsible for operating the vehicle should remove and discard any PPE no longer required and perform hand hygiene prior to entering the cab in order to avoid inadvertent contamination of this area. The continued use of respiratory PPE is required for diseases transmitted by the airborne route, unknown and severe acute respiratory infection, or by directive.

### **Newer Technologies<sup>2</sup>**

In the past, disinfectant fogging was not a recommended technique for disinfection of areas or surfaces. However, newer technologies have come on the market, including hydrogen peroxide vapour, ozone gas, super-oxidized water and ultraviolet irradiation.

Disinfectant fogging via vapourized hydrogen peroxide, super-oxidized water, ozone and other gaseous chemistries should not be used for routine disinfection of air or land ambulances/emergency vehicles. Indications for consideration of this type of disinfection technology, following a thorough manual cleaning process, include:

- a) Instances whereby complex electrical equipment or soft/complex furnishings are considered contaminated and are difficult to clean/disinfect using traditional methods
- b) Elimination of anthrax spores

- c) Elimination of *Clostridium difficile* or other pathogens implicated in outbreak situations where transmission is epidemiologically linked to the PHC environment.

Although fogging technologies do have applications in health care, it is important to consider other factors before procuring such technology. Surfaces require manual cleaning prior to any disinfection process. Ozone gas can decontaminate equipment in the presence of biological material; however, thorough manual cleaning prior to any disinfectant application must still be completed.

Completion of fogging processes can vary from one to five hours, so turnaround time should be taken into account.

The costs associated with these types of technology may be prohibitive when considering which indications for use would reasonably occur in the PHC setting. As well there may be occupational health and safety considerations associated with some technologies.

There is some evidence that certain types of fogging may be less effective on vertical surfaces than on horizontal surfaces. In the case of hydrogen peroxide vapour, the optimal methodology is still under investigation.

**Published**

September 16, 2014

**Contacts**

Lisa Young ([lisa.1.young@bcehs.ca](mailto:lisa.1.young@bcehs.ca))

## Glossary of Terms

**Deep Clean:** A thorough cleaning and disinfection process that occurs on a regular schedule and in instances whereby the vehicle is grossly contaminated. Includes the following:

### *Driver's compartment*

1. remove all equipment from the front of the vehicle
2. clean and vacuum floor
3. clean and disinfect all interior surfaces, including walls, doors, radio equipment, dash and windows

### *Patient compartment*

1. remove stretchers, clean and disinfect including mattress and belts; check for wear or damage
2. remove wall suction, clean and disinfect area
3. remove contents of cupboards and shelves; clean and disinfect all surfaces
4. clean, disinfect and dry all hard surface items before returning to cupboard or shelf; inspect for damage and expiration dates; repair/replace as needed
5. HEPA-filter vacuum, clean and disinfect floor
6. clean and disinfect chairs, bench seats, seat belts
7. clean and disinfect all interior surfaces, including ceiling and walls
8. remove scuff marks
9. check interior lighting
10. empty, clean and disinfect waste containers
11. clean interior windows

### *Equipment storage compartment*

1. remove all equipment and sweep out compartment
2. clean and disinfect compartment and restock

**Disinfectant:** A product that is used on surfaces or medical equipment/devices which results in disinfection of the equipment/device. Disinfectants are not to be used for skin antiseptics. Some products combine a cleaner/detergent with a disinfectant.

**Disinfection:** The inactivation of disease-producing microorganisms. Disinfection does not destroy bacterial spores. Medical equipment/devices must be cleaned thoroughly before effective disinfection can take place.

*Low-level disinfection (LLD):* A process capable of killing most vegetative bacteria and some fungi, as well as enveloped (lipid) viruses (e.g., influenza, hepatitis B and c, and HIV). LLDs do not kill mycobacteria, non-enveloped ~~viruses~~ [viruses](#) or bacterial spores. LLD can be used for processing non-critical items and some environmental surfaces.

*High-level disinfection (HLD):* A process capable of killing vegetative bacteria, mycobacteria including *Mycobacterium tuberculosis*, fungi, and lipid and nonlipid viruses, as well as some, but not necessarily high numbers of bacterial spores. HDL is the minimum level of reprocessing required for semi-critical medical devices

*Sterilization:* A validated process to render a product free from viable microorganisms

Items must be cleaned thoroughly before effective sterilization can take place.

**Routine Clean:** The physical removal of foreign material (e.g., dust, soil) and organic material (e.g., blood, secretions, excretions, microorganisms). Cleaning physically removes rather than kills microorganisms. It is accomplished with water, detergents and mechanical action. It is necessary to maintain a specific measure of cleanliness and must be effective and consistent to reduce the transmission of microorganisms.

**Routine Practices:** The principles based on the premise that all patients/residents, their secretions, excretions and body fluids and their environment might potentially be contaminated with harmful microorganisms. It is the system of infection prevention and control practices recommended to be used with all patients/residents during all care to prevent and control transmission of microorganisms in all health care settings. *Routine Practices* has several components, including hand hygiene, use of PPE, cleaning and/or disinfection of equipment and/or surfaces between use on all patients/residents, and safe sharps handling.

**Spaulding Classification:** A strategy developed by Dr. Earle H. Spaulding for reprocessing contaminated medical devices which classifies devices as critical, semicritical, or noncritical based on the risk from contamination of a device to a patient. Three different levels of disinfection are applied based on this risk scheme:

*Noncritical items:* those that either touch only intact skin but not mucous membranes or do not directly touch the patient. Reprocessing of noncritical items involves cleaning and/or low level disinfection.

*Semicritical items:* devices that come in contact with nonintact skin or mucous membranes but ordinarily do not penetrate them. Reprocessing semicritical items involves meticulous cleaning followed by, at minimum, high-level disinfection.

*Critical items:* instruments and devices that enter sterile tissues, including the vascular system. Critical items present a high risk of infection if the item is contaminated with any microorganisms, including bacterial spores. Reprocessing critical items involves meticulous cleaning followed by sterilization.

## Appendix A

### Selection of Cleaning and Disinfection Products

Cleaning is the physical removal of foreign material (e.g., dust, soil) and organic material (e.g., blood, secretions, excretions, microorganisms). Cleaning physically removes rather than kills microorganisms. It is accomplished with water, detergents and mechanical action.<sup>2</sup>

Disinfection is the inactivation of disease-producing microorganisms. Disinfection does not destroy bacterial spores.<sup>2</sup> Medical equipment/devices must be cleaned thoroughly before effective disinfection can take place. Cleaning, followed by disinfection, will kill the majority of pathogenic microorganisms on a surface, however only sterilization will kill all microorganisms on an object. Sterilization is used for critical re-usable medical and some semicritical reusable devices.

Any disinfecting product being considered for purchase must have a drug identification number or DIN, meaning that it is approved for use in Canada.

There are products available that both clean and disinfect which may be appropriate for your service. It is important to check with your product supplier.

There are several principles that must be adhered to when choosing cleaning and disinfecting products for your prehospital care service.

#### 1. What do you want to clean and disinfect?

All items used by more than one emergency service worker and/or used on multiple individuals require cleaning between each use. However not every item require the same level of disinfection. Certain items, such as McGill forceps, require cleaning and high-level disinfection (sterilization is preferred) at a minimum between uses<sup>2</sup>. Other items, such as blood-pressure cuffs, may require cleaning and low-level disinfection only. Each reusable item requiring cleaning and disinfection must be evaluated according to Spaulding's classification system, and have the appropriate cleaner and disinfectant applied accordingly.

#### 2. What pathogens do you want to kill?

The choice of a cleaning and disinfectant product must be justified by the pathogenic organism that you want to kill. The pathogen must be able to both survive on a surface, and then be able to move off that surface in order to put others at risk. It is important to ensure that the product is effective against pathogens that put your staff and individuals under your care at risk such as antibiotic-resistant organisms (e.g., MRSA), Norovirus, *Clostridium difficile* and influenza.

#### 3. How long do you have to wait for the surface to be disinfected?

Each disinfectant product has a different 'wet contact time' required to properly kill pathogens. Some products, such as those based on quaternary ammonium compounds (QUATs), may require wet contact times of at least 10 minutes, which may be hard to achieve under busy working conditions.

Since disinfection cannot happen unless the surface has been cleaned, the time it takes to properly remove all visible contaminants from the surface must also be added to the wet contact time when evaluating the product.

#### 4. Product safety

Every cleaning and disinfecting product must also be evaluated for both its environmental safety as well as the potential harm it could cause to the user. Besides evaluating the risks to the worker's health or the environment, you should also consider how long it would take to use the product safely. For example, a highly

toxic product may clean or disinfect quickly, but the time it takes for the worker to put on proper Personal Protective Equipment (PPE) and preparing the product for use may significantly reduce its benefits.

## **5. Compatibility**

Cleaning and disinfection products must be compatible with the material on which it will be used. Damage and corrosion to equipment parts may occur rapidly if the cleaner and disinfectants chosen are incompatible.

As well, not all disinfectants are compatible with all cleaning products. If you already have a cleaning product in place and are adding a new disinfectant or changing your old one, it is important to ensure the cleaning product won't adversely react with the new disinfectant.

Every prehospital care service will have its own unique challenges when choosing appropriate cleaning and disinfecting products. It is recommended that any potential purchase be first discussed with your affiliated Infection Prevention and Control Professional. If your service does not have infection prevention and control expertise, you may refer to your local acute care hospitals, your local health unit, your Regional Infection Control Network (if available), the IPAC Canada prehospital care interest group, or local IPAC Canada chapter (refer to this website for IPAC Canada-related links: <http://www.ipac-canada.org> ).

## References

1. Provincial Infectious Diseases Advisory Committee (PIDAC). Routine Practices and Additional Precautions in All Health Care Settings. 2012 [accessed June 14, 2013]; Available from: [http://www.publichealthontario.ca/en/eRepository/RPAP\\_All\\_HealthCare\\_Settings\\_Eng2012.pdf](http://www.publichealthontario.ca/en/eRepository/RPAP_All_HealthCare_Settings_Eng2012.pdf).
2. Provincial Infectious Diseases Advisory Committee (PIDAC). Best Practices for Cleaning, Disinfection and Sterilization in All Health Care Settings, 3rd edition. 2013 [accessed June 14, 2013]; Available from: [http://www.publichealthontario.ca/en/eRepository/PIDAC\\_Cleaning\\_Disinfection\\_and\\_Sterilization\\_2013.pdf](http://www.publichealthontario.ca/en/eRepository/PIDAC_Cleaning_Disinfection_and_Sterilization_2013.pdf).

## Additional Bibliography

Barbut, F., Menuet, D., Verachten, M., and Girou, E. (2009). Comparison of efficacy of a hydrogen-peroxide dry-mist disinfection system and sodium hypochlorite solution for eradication of *Clostridium difficile* spores. *Infection Control and Hospital Epidemiology*; 30 (6): 507-514.

Boyce, J., Havill, N., Otter, J., McDonald, C., Adams, N., Cooper, T., Thompson, A., Wiggs, L., Killgore, G., Tauman, A., and Noble-Wang, J. (2008). Impact of hydrogen peroxide vapor room decontamination on *Clostridium difficile* environmental contamination and transmission in healthcare setting. *Infection Control and Hospital Epidemiology*; 29 (8): 723-728.

Canadian Standards Association. (2009). CAN/CSA-Z314.3-09 *Effective Sterilization in Health Care Facilities by the Steam Process*. Rexdale, Ont.: Canadian Standards Association.

Canadian Standards Association(2008). CAN/CSA Z314.8-08 *Decontamination of Reusable Medical Devices*. Mississauga, Ont.: Canadian Standards Association.

Greater Sudbury Emergency Medical Services. *Vehicle and Equipment Policy and Procedure Manual*, Section 4 (revised August 2006).

Ontario Ministry of Health and Long-Term Care (Emergency Health Services Branch). *Infection prevention and control best practices manual for land ambulance paramedics*, Version 1.0 (March 2007).

Ontario Ministry of the Environment. *The Management of Biomedical Waste in Ontario*. (November 2009). Available at:

[http://www.ene.gov.on.ca/stdprodconsume/groups/lr/@ene/@resources/documents/resource/std01\\_079528.pdf](http://www.ene.gov.on.ca/stdprodconsume/groups/lr/@ene/@resources/documents/resource/std01_079528.pdf)

Ontario Ministry of Health and Long-Term Care (April 2014). Provincial Infectious Diseases Advisory Committee. *Best Practices for Hand Hygiene in All Health Care Settings*. Available at: <http://www.publichealthontario.ca/en/eRepository/2010-12%20BP%20Hand%20Hygiene.pdf> .

Sehulster, L, and Chinn, R.Y. (2003). Guidelines for environmental infection control in health-care facilities: Recommendations of CDC and the healthcare infection control practices advisory committee (HICPAC). *MMWR* , 52(RR-10):1-42. Available at:

<http://www.cdc.gov/mmWR/preview/mmwrhtml/rr5210a1.htm>.

World Health Organization (2009). *WHO Guidelines on hand hygiene in health care first global patient safety challenge: Clean care is safer care*. Available at:

[http://whqlibdoc.who.int/publications/2009/9789241597906\\_eng.pdf](http://whqlibdoc.who.int/publications/2009/9789241597906_eng.pdf).