



Ultraviolet Light Disinfection for EMS Vehicles

EMS Vehicles are used to transport sick or injured people to hospitals or other treatment facilities. These passengers may be harboring bloodborne or airborne pathogens which can be spread to equipment, surfaces, and crew members within the vehicle. This risk of contamination requires that the vehicle maintains a high-level disinfection program to ensure that future passengers, as well as crew members, do not become infected from a previous passenger. Ultraviolet light can help reduce the risk of infection by improving upon an existing contamination control program. Ultraviolet light is affordable, easy to use, and achieves a high level of disinfection quickly.



Effectiveness of Traditional Cleaning Methods

A study conducted by Johns Hopkins Medical Institutions tested the effectiveness of the traditional cleaning methods that ambulances undergo. Ambulances were swabbed for bacterial contamination without prior warning to the associated EMS crews in order to test the true effectiveness of the cleaning methods. The areas tested were chosen due to their higher probability of transferring contamination and included the knurled oxygen flow regulator knob, the bench seat, the radio microphone knob, the lower track of a sliding door near the patient’s head, and the driver’s side door handle. All of these areas are frequently touched by the EMS workers and were thought to be difficult to clean with standard spray and wipe techniques. All ambulances in the study were found to contain moderate to large amounts of contamination, with three of the seven bacterial organisms isolated having strong resistances to antibiotics¹.

Site	% Of sites contaminated before traditional cleaning	% Of sites contaminated after traditional cleaning
Folds in stretcher mattress	66.7%	50%
Off side wall near stretcher mattress	66.7%	8.4%
Inside cupboard or drawers	33.4%	16.7%
Steering wheel	33.4%	41.7%
Inside mask-Entonox	58.4%	41.7%
Inside suction bottle	70%	20%
Rails of grid/track or floor	91.7%	66.7%
Cutter, J., Nigam, Y. A preliminary investigation into bacterial contamination of Welsh emergency ambulances. Emerged Med J 2003;20:479-482.		

A similar study was conducted in Wales to determine the extent of bacterial contamination in ambulances as well as the effectiveness of the cleaning procedures. The results of this study are shown in the table above and illustrate that traditional cleaning methods are effective at reducing the level of contamination, but to various degrees of success. It was found that the cleaning method actually increased the rate of contamination of steering wheels as the cleaning method spread the contamination from another location².

Several other studies were conducted throughout the United States all yielding similar results:

- 50.6% of all agencies tested across Ohio had an ambulance contaminated with MRSA³
- 4.6% of EMS workers tested in Ohio were colonized with MRSA, which is higher than the rate of the colonization of the general public but on par with what was reported for other healthcare settings.³
- Out of a fleet of 21 ambulances in the western USA, 10 of the ambulances tested positive for MRSA.³
- A recent study in Maine showed that 25 out of 51 ambulances had at least one area test positive for MRSA.³
- *Staphylococcus aureus* was found in 69% of the ambulances tested from 34 municipalities around Chicago. 77% of these strains found were resistant to at least one antibiotic.⁴

How does UV solve these problems?

UV light has been proven to be effective for killing viruses, bacteria, molds, and spores. UV light will kill all common microorganisms that are exposed to the light. UV light is able to reach surfaces that are harder to wipe down, such as the control knobs referenced earlier. UV light provides chemical-free, liquid-free disinfection that does not require any mixing or storage of hazardous chemicals.

When UV light is used the exposure can be observed through a window to easily determine if critical surfaces are adequately exposed, while when just spray and wipe is used it is extremely difficult to determine if an area has been missed. (Dummy bulbs (non UV-C bulbs) can also be used to set up a cycle/exposure initially with a person in the area if the exposed area cannot be seen safely through a window.)

Our Lantern has been designed for use within EMS vehicles and kills most bacteria and viruses within a four foot radius in just a minute or two. The Lantern will kill most bacteria and viruses within a ten foot radius in 5-10 minutes. The UV bulbs utilized by the Lantern have a 9,000 hour rated lifespan and operational costs are less than a penny per disinfection.

1. Alves, D., Bissell, R. Bacterial Pathogens in Ambulances: Results of Unannounced Sample Collection. *Prehospital Emergency Care* 2008;12:218-224.
2. Cutter, J., Nigam, Y. A preliminary investigation into bacterial contamination of Welsh emergency ambulances. *Emerg Med J* 2003;20:479-482.
3. Stevenson, K., Bell, C., Hoet, A., and Lu, B. 2010. MRSA Colonization in EMS Personnel and Equipment as a Risk Factor for Secondary Injury in Ohio Trauma Patients. Ohio Division of EMS Injury Prevention Research Grant.
4. Rago JV et al. *Am J Infect Control*. 2012;40(3):201-205.