

Case Study: Bio-decontamination of an Ambulance using hydrogen peroxide vapour in under 1-hour

Total time start to finish: <1 hour	
Site:	<i>Hampshire Ambulance Service</i>
Location:	<i>Southampton, England</i>

The Challenge

Ambulances are suspected of posing a credible infection risk to within the vehicle due to environmental nosocomial pathogens. Hampshire Ambulance Trust required a rapid, viable solution to bio-decontaminate ambulances that had previously carried infectious patients. Due to the heavy demands placed on the ambulance service it was imperative for any solution to minimise vehicle ‘down-time’ if it were to be logistically viable.

Solution

Hampshire Ambulance Trust and BIOQUELL cooperated in a trial deployment of the Room Bio-decontamination Service (RBDS) to bio-decontaminate their ambulances given the proven efficacy of hydrogen peroxide vapour (HPV) against MRSA, C.difficile and other Hospital acquired pathogens. A Clarus™ ‘R’ hydrogen peroxide gas generator was strategically placed in ambulance along with two Clarus™ R2 aeration units to remove the H₂O₂ gas upon completion of the injection phase of the cycle.

An instrumentation module was also placed inside the ambulance in order to carefully monitor the key cycle parameters via a real-time link to the external control computer.



One of the primary advantages of the RBDS system is that all of the paramedic equipment contained within the ambulance was able to remain ‘in-situ’ during the cycle enabling complete bio-decontamination of both the vehicle and medical equipment.

RBDS engineers sealed off the treatment area and cab of the ambulance thus allowing Hampshire Ambulance Trust mechanics to safely continue essential maintenance whilst the bio-decontamination was in progress, thus the bio-decontamination creates no additional vehicle ‘down-time’ other than the routine maintenance schedule.

The RBDS bio-decontamination cycle was completed within 1-hour after which the vehicle was totally free of hydrogen peroxide and able to be safely returned to ambulance crews for immediate re-deployment.

Gassing Cycle Verification

The efficacy of the bio-decontamination cycle was validated using biological indicators. 6-log inoculums of *Geobacillus stearothermophilus* spores dried onto metal discs and placed in tyvek pouches were used as biological indicators (BIs) to validate the gassing cycle. Six BIs were placed in challenging locations around the ambulance, including below the stretcher trolley, inside a medicine rack and behind items in a storage void.

The BIs were retrieved after the aeration phase of the bio-decontamination cycle and incubated for 7 days at 60°C. Two positive controls and one negative control were also incubated with the BIs. After incubation only the positive controls showed signs of growth, thus confirming a full 6-log reduction of *G. stearothermophilus* spores throughout the treatment area, and drivers cab of the ambulance.



Conclusion

The bio-deactivation target of a 6-log reduction in *G. stearothermophilus* spores was demonstrated in the treatment and cab areas of the ambulance and of all the equipment stored within. RBDS provides an effective, low temperature and residue

free bio-decontamination system, which combined with the rapid aeration method, produces a minimal complete cycle time, of less than 1 hour. Because the bio-decontamination cycle was carried out alongside the scheduled maintenance no additional vehicle 'down-time' was required, allowing the ambulance to be quickly and safely returned to crews within the hour.

Background:

Bio-decontamination within a room or chamber is achieved by depositing an even layer of 'micro-condensation' of H₂O₂ over all surfaces. The term 'micro-condensation' may be defined as a microscopic film of H₂O₂, which being at a sub-micron level is invisible to the naked eye. Scientific research has proven that it is this low temperature, residue-free deposit that rapidly deactivates micro-organisms during the gassing process.



Richard Diment, Chief Executive of the Ambulance Service Association states "Reducing Healthcare Acquired Infections is a priority for all parts of the NHS including ambulance services"; the RBDS system has proven efficacy against environmentally associated nosocomial pathogens giving the RBDS service many applications within healthcare sectors.



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