EFFICACY IN AMBULANCES OF HYPERDRYMIST® MICRO-NEBULIZED HYDROGEN PEROXIDE SOLUTION IN REDUCING BACTERIAL CONTAMINATION

Christian Garzoni[1,2], Francesca Villa[3], Stefano Regazzoni[4], Alessandro Motti[5].

[1] Department of Internal Medicine and Infectious Diseases - Clinica Luganese, Lugano, Switzerland.
[2] Clinic for Infectious Diseases - Inselspital, Bern University Hospital and University of Bern, Bern, Clinic for Infectious Diseases - Inselspital, Bern University Hospital and University of Bern, Bern, Switzerland.
[3] Department of Internal Medicine and Infectious Diseases - Clinica Luganese, Lugano, Switzerland.
[4] Extra Hospital Emergency Response Service - Croce Verde, Lugano, Switzerland.
[5] Extra Hospital Emergency Response Service - Croce Verde, Lugano, Switzerland.

INTRODUCTION

Ambulances of Emergency Medical Response (EMR) Services routinely transport, often under hectic and operationally difficult conditions, patients who are either colonized or infected by infectious or multi-drug-resistant (MDR) bacteria. Contamination of inanimate surfaces of the vehicles' interiors by these pathogens is therefore common. Furthermore, the potential presence of MDR bacteria is unknown at the time of picking up the patients for transportation, and therefore no efficacious preventive measure can be implemented. Inanimate surfaces of non-invasive medical equipment and/or the ambulance interiors become consequently potential pathways for the transmission of Healthcare Acquired Infections (HAI). Strict disinfection protocols must therefore be put in place to maximally reduce or eliminate the threat of pathogens' transmission via contaminated surfaces in ambulances. However, the normally frantic nature of paramedics' activities, characterized by fast vehicles' turnarounds, makes it difficult to thoroughly disinfect medical equipment and surfaces after each mission. As a consequence, reservoirs of dangerous bacteria remain present on ambulances. Hence the need for new disinfection procedures and technologies that can minimize the risk of pathogens' transmission on a permanent and consistent basis. This will guarantee that vehicles carrying a new patient can fulfill their mission under excellent hygienic conditions.

[1]The HDM® technology is manufactured by 99Technologies, (Lugano, Switzerland - **www.99technologies.ch**)

OBJECTIVES

The objective of the study was to measure the effectiveness of the new HyperDRYMist® (HDM)[1]disinfection technology, based on micro-nebulized hydrogen peroxide, in consistently reducing bacterial contamination in ambulances when added to standard cleaning and disinfection procedures. The EMR selected for the study had already in place "best in class" practices in the realm of hygiene and disinfection protocols. As a consequence, the secondary aim of the study was to demonstrate that ambulance services that already apply state of the art procedures for the disinfection of their vehicles could still greatly benefit from embedding HDM to their existing protocols.

METHODS

This was a two-phase study.

Phase I. Quantification of the microbial load normally present in ambulances measured after regular conventional terminal cleaning.

Ten points of the ambulances' interiors were sampled after the execution of the standard cleaning procedure in 12 randomly selected vehicles during a period of 1 month. Routine cleaning procedure is performed by paramedics after each patient transport/rescue mission while in depth disinfection is carried out weekly. EMR's paramedics were not informed of the measurement in order to avoid biases during existing conventional cleaning procedures.

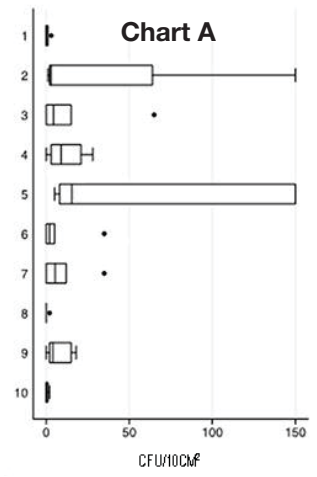
Phase II. Evaluation of the effectiveness of the HyperDryMist® technology (HDM)1 for environmental microbial load reduction.

The HDM® system was positioned in the randomly selected ambulance after standard cleaning and disinfection procedures. Tests were conducted using a ratio of 4 ml/m³ of micro-nebulized solution that as aerosolized for 2 minutes in ambulances' vans' interiors. Thereafter, the ambulances' doors were opened to ventilate the treated area and residual hydrogen peroxide concentrations were measured by using colorimetric tubes.

Bacterial contamination on 6 surfaces was assessed after standard cleaning and disinfection procedures, prior to the use of the HDM® system and after it. Sampling was done with surface-sampling slides (10 cm^2) for biological bacterial contaminants. Tests were performed on 6 ambulances in different days of the week randomly selected during a two-month-period. EMR's paramedics were not informed of the use of the technology in order to avoid behavior modification during existing conventional cleaning procedures.

RESULTS

In spite of regular terminal cleaning and weekly in depth cleaning, the sampled areas indicated a wide disparity of microbial load levels depending both on the vehicle tested and its surfaces' "ease of reach" (see chart 1, left hand side of the chart). On the basis of these data, six points with the highest microbial contamination were selected to evaluate the effectiveness of HDM® technology (see chart 1, right hand side of the chart). HDM® technology dramatically reduced the overall contamination on ambulances' surfaces. In addition, the bactericidal action of the nebulized formula reached evenly all of the vehicles' surfaces, even the difficult-to-reach areas. At the end of the disinfection process no presence of hydrogen peroxide in the ambulances' compartment was detected.



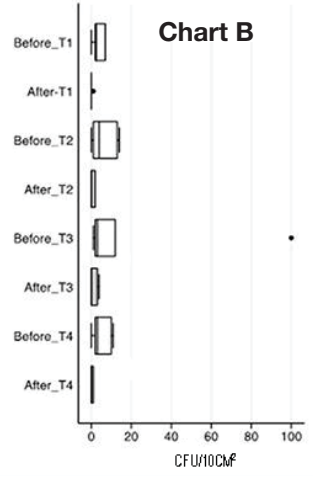


Chart A:
Bacterial Contamination measured after standard cleaning and disinfection procedures without the use of HyperDRYMist Technology.

Chart B:
Bacterial surface contamination after the ordinary cleaning procedure HyperDRYMist ®Technology and before the use of HyperDRYMist®Technology ("Before"), and after the HyperDRYMist® Technology ("After"). Experiments reported in the chart are those of 4 ambulances. After HDM® Technology bacterial colonization is dramatically reduced even in areas where conventional cleaning shows elevated residual CFU/cm^2.

The range of Modulators Micro-Nebulizers powered on the HyperDRYMist® Technology manufactured by 99 Technologies

For inquiries about the study, please send an email to Dr. Med. Christian Garzoni at:

christiangarzoni@gmail.com