Brief Report

Ambulance sanitization in Italy: a pilot study

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Abstract

The assessment of biological agents' exposure in the work environment is an employer's duty. Air and surfaces could be transmission's vehicles of pathogens. We consider the ambulance as the work environment where, respecting hygienic targets of low risk, we can prevent out-of-hospital infections for workers and patients. In this brief report we analyzes standard sanitation and fumigation; the aim is to reach the lower level of surfaces' contamination.

Keywords: Pathogens, Ambulance, Fumigation, Biological Exposure, Hygiene, Sodium Hypochlorite

Studies have been carried out on health care-related infections, especially in the intra-hospital setting[1,2,3]. However, the correlation between the hygiene and disinfection of emergency vehicles, the presence of pathogens on their surfaces and the transmission of nosocomial infections to patients is not well highlighted. In fact, little attention is paid to infections acquired by patients or operators outside the hospital despite of emergency vehicles used to transport patients come into daily contact with potentially infected subjects, who can infect the operators and other users. The Italian Society Of Emergency Medical System Nurses (Società Italiana degli Infermieri di Emergenza Territoriale – SIIET) has recently published recommendations[4] recommending the sanitization of the emergency vehicles at least every 24 hours. Concerning the treatment with Ozone (fumigation technique), currently there are no specific indications for COVID-19. However, in a study performed in 2006, Ozone treatment was found to be effective in the treatment of room sanitation during the SARS epidemic in Beijing[5].The aim of this study was to detect the microbial load inside the patient transport compartment of ambulances before and after different typologies of sanitization.

Three ambulances from the AUSL of Bologna not sanitized in the last 48 hours prior the

measurements were randomly enrolled for this study.

Microbiological samples to evaluate the aerobic mesophilic load, were taken from (1) the backrest of the transport stretcher, (2) the knob of one of the O_2 tanks connected to the internal delivering system, (3) the internal handle for opening the rear door before sanitization, on three different ambulances. The sampling kit consisted of a sponge of size 4.5x9 cm, contained by an envelope of size 114x229 mm and with volume equal to 450 mL. After the sampling, standard sanitization through sodium hypochlorite was performed on two ambulances, while fumigation through Ozone Air 80® (Bertin srl - Tecnolife srl) was applied on the remaining one. After the sanitization, the microbiological sampling was repeated for each ambulance in the same three points. Samples were analyzed with standard culture methods after 72 hours.

18 samples were totally collected, 9 before the sanitization procedures and 9 afterwards. The aerobic mesophilic load detected on the three ambulances before and after the sanitizations methods is reported in table 1. A certain degree of variability in the levels of microbial contamination present in the three ambulances before the sanitization procedure is evident, as it is statistically significant the reduction in the level of contamination of the surfaces obtained after sanitization ($p<0.05$). Both the procedure of manual sanitization by electrolytic chloride and fumigation showed to be effective techniques for the reduction of microbial load on the investigated surfaces.

Further investigation is needed to understand if the microbial contamination found in this study is the result of randomness and if it could represent a real risk of transmission of healthcare-related infections. To explore this hypothesis, it will be necessary to broaden the field of investigation, including the detection, both qualitative and quantitative, of specific groups of microorganisms (or individual species) to which have particular pathogenic relevance (e.g. streptococci, staphylococci, pseudomonas, enterobacteriaceae carbapenemase-producers, salmonella, staphylococcus aureus methicillin-resistant).

Lastly, to understand if the amount of CFU constituted a real risk, we relied on some general indicators related to hospital environments. In fact, there are no specific indicators for emergency vehicles in literature, as this area is still little investigated and not regulated by specific guidelines.

SAMPLE ID	UFC PRE SANIFICATION	UFC POST SANIFICATION	UFC POST FUMIGATION
Ambulance 1 - stretcher	6.200 CFU/sample	EstimateD 500 CFU /sample	
Ambulance 1 - O_2 knob	4.800 CFU /sample	910 CFU /sample	
Ambulance 1 - rear handle	1.100 CFU /sample	< 400 CFU /sample	
Ambulance 2 - stretcher	2.600 CFU /sample	EstimateD 800 CFU /sample	
Ambulance 2 - O_2 knob	1.000 CFU /sample	< 400 CFU /sample	
Ambulance 2 - rear handle	1.300 CFU /sample	< 400 CFU /sample	
Ambulance 3 - stretcher	6.900 CFU /sample		< 400 CFU /sample
Ambulance 3 - O_2 knob	25.000 CFU /sample		< 100 CFU /sample
Ambulance 3 - rear handle	2.500 CFU /sample		< 400 CFU /sample

Legend - CFU: Colony Forming Unit

Table 1. Results of samples' analysis before and after the standard sanitization or fumigation

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