LETTER TO EDITOR

Disinfection of ICU Room: Using the New Technologies for Diagnosis and Decontamination of Infections

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Antibiotic resistance is a global problem that threatens the life of today's and future human generations. Moreover, new antibiotic researches and developments have failed to introduce new potent antibiotics. Hence, many efforts are being made to increase the knowledge of public and healthcare workers and also decrease the resistance of microorganisms [1-2]. One of these efforts was the "World Antibiotic Awareness Week" that was held by World Health Organization on 16-22 November 2015. The theme of this campaign was"Antibiotics: Handle with Care". The message of this theme is that antibiotics are a valuable treasure and we should save them. To achieve this goal, we should prevent the spread of infections. Critical care specialists and ICU personnel can have an important role in this campaign [3].

It is estimated that 20% to 40% of health care-associated infections are transmitted by hands of the personnel via touching contaminated surfaces of the room or patients [4]. Health care-associated infections have a high economic burden and also are one of the main causes of mortality, morbidity and prolonged hospital stay [5-6]. Traditional disinfection strategies are not being successful to remove all contaminations and have some defects [7]. Therefore, new technologies, devices and methods have been invented to improve the efficacy of disinfection.

ATP-bioluminescence assay is one of these methods. It works by detection of ATP (Adenosine Triphosphate) that is present in all organic materials like bacteria.This method is an index for organic contaminations, its results are ready in a few seconds, and is approved in several studies [8-9]. The ATP bioluminescence can be considered as a sensitive and rapid method for assessing organic contaminations of ICU rooms [9-10].

Activated or boosted hydrogen peroxide biosanitizers are a new generation of water based and biofriendly disinfectants. Vaporized or aerosolized form of this biosanitizers can disinfect all surfaces, after terminal cleaning, without disturbing the arrangement of the room and without critical hazard to the personnel and patients [7-11]. We used these new technologies for the first time in General ICU of Imam Khomeini Hospital Complex, Tehran, Iran.

After the patient was brought out of the isolated ICU room, surface sampling with Ultrasnap™ ATP-surface test swabs (Hygiena Co.) was done. A 5x5 cm surface of each 5 places including: bedside, ventilator machine touch screen, bin's door, room floor and washing sink were sampled. ATP values of swabs were immediately measured by luminometer and recorded. Values were recorded as Relative Light Unit (RLU) that means the organic load of surface detected by bioluminescence technique. A Saniswiss automate-biosanitizer (Saniswiss Co. by Kimia-Teb Tadbir Co.) device was placed in the room (this device can aerosolize the surface biosanitizer and disinfect the surfaces of the room).The door of the room closed and after 12 mins of activity (it was set according to estimated room volume and manufacturer's instruction), and after 40 minutes of rest, the door was opened. Sampling done again as was explained before and ATP values measured.

According to results, organic load of bin's door was the highest (6379 RLU) which decreased to 470 RLU after disinfection. Ventilator touch screen (1372 RLU) and room floor (1175 RLU) were other contaminated surfaces and their organic load decreased to 170 RLU and 247 RLU respectively. Bedside organic load was 199 RLU which decreased to 31 RLU, and likewise washing sink (91 RLU) decreased to 33 RLU. We found in this pilot study that, automate-biosantizer could reduce the organic load of surfaces from 65% to 93%. Mean of organic load was 1843.2±2598.82 RLU before and 190±181.86 RLU after disinfection. Wilcoxon test was applied to compare the means and the differences were statistically significant (P=0.043).

According to available documents, one round of disinfection by vaporized hydrogenperoxide in contaminated ICU surfaces by Acinetobacter baumannii, Methicillin-resistant Staphylococcus aureus (MRSA) and other multidrug resistant organisms (MDROs) is highly effective [11-12]. It is well shown that this method can significantely reduce the risk of acquiring MDROs when compared to standard cleaning methods [7]. This method is effective against Clostridium difficile and does not require furniture and equipments to be moved away from the walls [4]. In previous studies it was reported that disinfection efficacy of this method is between 88-100% for microorganisms like MRSA, Serratia and Clostridium difficile [4]. The significant but weaker results in our study can be related to lack of physical cleaning of dirt and debris.

We should be aware that these technologies are

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adjuvants, and cannot replace, standard cleaning and disinfection methods [4]. But we can apply them to reduce the rate of infections specially MDROs. Reducing the rate of infections will reduce the antibiotic use, reduce costs and we will reach to the motto of WHO, i.e, "Antibiotic: handle with care".

The limitations of our study were a small sample size and performing the procedure without physical cleaning. We suggest that these issues are taken into consideration in future studies.

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