Effectiveness of ATP bioluminescence to assess hospital cleaning: a review
Emma Ceriale

G Messina1,2, E Ceriale2, N Nante1,2,3, P Manzi3
1Health Services Research Laboratory, University of Siena, Siena, Italy
2Post Graduate School of Public Health, University of Siena, Siena, Italy
3Teaching Hospital “Le Scotte”, Medical Manager, Siena, Italy
Contact: cerialeemma@gmail.com

Background
Healthcare-associated infections represent a cause of patients morbidity and mortality. Contamination of hospital surfaces plays an important role in the transmission of several healthcare-associated microorganisms. In this perspective methods for evaluating hospital surfaces’ cleaning gain importance. Traditionally, these include visual inspection and quantitative microbiology; more recently fluorescent markers and ATP bioluminescence have been introduced. This latter seems to provide interesting perspectives, detecting the presence of ATP on surface (as Relative Light Units, RLU), a proxy of organic matter and microbial contamination. Several studies have investigated the effectiveness of this technology in health care environment. The aim of this study was to summarize the most significant results on the subject.

Methods
A literature review was conducted. The keywords: “ATP” AND “Bioluminescence” AND “Hospital” AND “Surfaces” were searched in Pubmed and Scopus databases to find relevant data from 2000 to March 2014. In Pubmed we found 17 studies, 3 of which were judged irrelevant and 1 was a review; so we considered 13 studies. In Scopus we found 96 papers, 25 of which were appropriated and already included in Pubmed. Finally we considered 25 articles.

Results
11 studies were carried out in UK, 8 in the USA, 3 in Australia, 1 in Turkey, Japan and Italy. 12 studies (48 %) compared the effectiveness of ATP bioluminescence to assess microbiological contamination in hospital surfaces with aerobic colony count (ACC), 11 evidenced a significant correlation between the two methods, although poor for 5 studies. 20 studies indicated a RLU benchmark value, discerning between clean and dirt surfaces. This was 250 for 9 studies, 500 for 4, 100 for 3. One paper considered 2 values 250 and 500 RLU and others 3 taken as cutoff: 127, 45 and 300 RLU.

Conclusions
ATP bioluminescence is a not standardized methodology: each tool has different benchmark values, not always defined. In addition there is only a poor correlation between ACC and RLU. The technique requires better accuracy, nevertheless, with a proper calibration of each tool, it is useful in hospital surfaces where is required cleanliness, but not sterility, for real-time results.

Key messages
• Prevention measures play a central role to avoid infections, among them the evaluation of hospital surfaces’ cleaning gain importance.
• Visual assessment, quantitative microbiology and bioluminescence can be use alternatively, depending on the operating conditions (time, resources, surfaces, etc.).