

# Online Research @ Cardiff

This is an Open Access document downloaded from ORCA, Cardiff University's institutional repository: <http://orca.cf.ac.uk/110108/>

This is the author's version of a work that was submitted to / accepted for publication.

Citation for final published version:

Maillard, Jean-Yves 2018. Are amine-only-containing products sporicidal? Journal of Hospital Infection 99 (1) , pp. 115-116. 10.1016/j.jhin.2018.02.002 file

Publishers page: <http://dx.doi.org/10.1016/j.jhin.2018.02.002>  
<<http://dx.doi.org/10.1016/j.jhin.2018.02.002>>

Please note:

Changes made as a result of publishing processes such as copy-editing, formatting and page numbers may not be reflected in this version. For the definitive version of this publication, please refer to the published source. You are advised to consult the publisher's version if you wish to cite this paper.

This version is being made available in accordance with publisher policies. See <http://orca.cf.ac.uk/policies.html> for usage policies. Copyright and moral rights for publications made available in ORCA are retained by the copyright holders.



Letters to the Editor

Are amine only-containing products sporicidal?

Sir,

*Clostridium difficile* infection is linked to significant morbidity and mortality. *C. difficile* (endo)spores can survive on surfaces in healthcare settings for long period of time, which makes the elimination of these spores from surfaces important. Bacterial spores are notoriously resistant to chemical and physical processes [1,2] and not surprisingly they are used as biological indicators for many sterilization processes. Their resistance is intrinsic and linked to their structure, dehydration and the presence of small acid soluble proteins in their core protecting them from external chemical and physical damage [2]. When compared to other microorganisms, bacterial endospores are among the most resistant “microorganisms” to disinfection [3]. Our understanding of sporicides have not really changed since the 1990 [4] with the excellent review by Russell, although biocidal products have become more complex in their composition. Literally a “sporicide” is a biocide/product that can kill spores and we need to reflect on the distinction between this definition and the requirement from the regulator for manufacturers’ to make a sporicidal claim on label. In the literal sense, killing one spore would satisfy the definition of a sporicide. In reality, for a sporicidal product, the destruction of  $10^3$  spores is required under defined conditions [5]. There is no approved European standard sporicidal test for *C. difficile*, although a UK-derived sporicidal *C. difficile* test has been proposed [6], for which a  $10^5$  reduction in spores is required. These efficacy tests rely on an efficient and demonstrable neutralisation protocol, and failure to quench the active(s) can lead to a misinterpretation of a “sporicidal” activity [7]. Unfortunately, a misinterpretation of the neutralisation validation test results when following a standard protocol, can also lead to erroneous sporicidal claim [8]. Complex formulations, notably where several amine-based biocides are used, can be difficult to neutralised. Our current understanding of sporicides, in the sense that a sporicide should kill  $10^3$ - $10^6$  spores, has not really changed over the years, and only a few biocides have been shown to have a sporicidal activity [1,4,7]; amine-based products are, to date, not among these [4,8,9]. It is thus puzzling and possibly concerning that products containing solely amines are being used as sporicides in healthcare settings.

#### Conflict of interest statement

None

#### Funding source

None

#### References

- [1] Maillard J-Y. Innate resistance to sporicides and potential failure to decontaminate. *J Hosp Infect* 2010;77:204-9.
- [2] Leggett MJ, McDonnell G, Denyer SP, Setlow P, Maillard J-Y. Bacterial spore structures and their protective role in biocide resistance. *J Appl Microbiol* 2012;113:485–98.
- [3] Maillard J-Y, S Bloomfield, J Rosado Coelho *et al.* Does microbicide use in consumer products promote antimicrobial resistance? A critical review and recommendations for a cohesive approach to risk assessment. *Microb Drug Res* 2013;19:344-54.
- [4] Russell AD. Bacterial spores and chemical sporicidal agents. *Clin Microbiol Rev* 1990;3:99-119.
- [5] BS EN14885:2015. Chemical disinfectants and antiseptics — Application of European Standards for chemical disinfectants and antiseptics. 2015. British Standard Institution: London
- [6] Fraise AP, Wilkinson MAC, Bradley CR, Paton S, Walker J, Maillard J-Y, *et al.* Development of a sporicidal test method for *Clostridium difficile*. *J Hosp Infect* 2015;89: 2-15.
- [7] Leggett MJ, Setlow P, Sattar SA and Jean-Yves Maillard J-Y. Assessing the activity of microbicides against bacterial spores: knowledge and pitfalls. *J Appl Microbiol* 2016;120:1174-80.
- [8] Wesgate R, Rauwell G, Criquelion J, Maillard J-Y. Impact of standard test protocols on sporicidal efficacy. *J Hosp Infect* 2016;93:256-62.
- [9] Siani H, Cooper C, Maillard J-Y. Efficacy of “sporicidal” wipes against *Clostridium difficile*. *Am J Infect Control* 2011;39:212-8.

#### Corresponding author

Jean-Yves Maillard  
School of Pharmacy and Pharmaceutical Sciences  
Redwood Building  
King Edward VII Avenue  
Cardiff CF10 3NB  
United Kingdom  
Tel: +44(0)2920879088  
Email: maillardj@cardiff.ac.uk