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Disinfection of reusable elastomeric respirators by health care workers: A feasibility study and development of standard operating procedure

To the Editor:

We thank the authors for their comments about disinfection of medical equipment with chlorine. In contrast with our work, they engaged a small number of staff in extensive training to prepare for safe handling of a small number of highly contagious patients with Ebola virus disease. They do not present their standard operating procedure, but they state that they used bleach solutions with a chlorine concentration of 5,000 ppm, as recommended by the World Health Organization. In contrast with their program, which relied on extensive training of personnel, our work was aimed at developing a standard operating procedure to be used in the event of a pandemic of respiratory illness, especially influenza. Anticipating a large surge of patients, and the possibility of very limited staffing caused by illness among health care workers, we aimed to develop a standard operating procedure that could be deployed with minimal training. We used chlorine concentrations of 50-400 ppm, as recommended by manufacturers of elastomeric respirators. The contrasts between the 2 programs illustrate the range of applications for standard operating procedures to address different clinical needs. We are pleased to learn of the success of their program.

Conflicts of interest: None to report.

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Letter to the editor regarding "The prevalence and influencing factors of methicillin-resistant *Staphylococcus* aureus carriage in people in contact with livestock: A systematic review"

To the Editor:

We thank Liu et al[1] for their meta-analysis on the prevalence of methicillin-resistant *Staphylococcus aureus* (MRSA) carriage among persons in contact with livestock. Although the results are interesting, the extreme heterogeneity ($I^2 = 96.9\%$) makes it questionable whether a pooled prevalence estimate offers a meaningful statistic. The extreme heterogeneity is further demonstrated by the authors' forest plot. Confidence intervals on prevalence estimates above the summary estimate are extremely wide compared with those below the summary estimate. In addition, 2 studies included in the meta-analysis report zero prevalence; 1 study reports 85% prevalence, a considerable disparity. Some results require further explanation. For example, the odds ratio for smoking was significantly <1, suggesting that smoking is protective against MRSA carriage. Based on their

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results, the authors conclude that there may be transmission of MRSA between animals and humans. If this conclusion is correct, it begs the question of whether the transmitted MRSA strains are human-associated strains. If the transmission is a livestock-associated strain, is it a human health concern? Further research is needed to address these important questions.

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1. Liu W, Liu Z, Yao Z, Fan Y, Ye X, Chen S. The prevalence and influencing factors of methicillin-resistant Staphylococcus aureus carriage in people in contact with livestock: A systematic review. Am J Infect Control 2015;43:469-75.

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Biofilm removal: Erroneous methodologies cause even more confusion?

To the Editor:

We would like to bring the readers' attention to the gross experimental error in the article "Evaluation of detergents and contact time on biofilm removal from flexible endoscopes" by Ren et al[1] that completely invalidates the results and conclusions of the article.

It appears the authors overlooked our warning[2] on a similar results-invalidating error made by Vickery et al[3] in 2004 that before using protocols based on enumerating bacterial survivors, the absence of cytotoxicity of the tested detergent must be confirmed. It is simply wrong to equate the killing of bacteria to the removal of the biofilm from the surface.

The minimum bactericidal concentration (MBC) of benzalkonium chloride (BAC) on *Escherichia coli* is approximately 45 ppm.[4] The Intercept detergent (tested by Ren et al[1]) contains 4.8% BAC,[5] or 480 ppm, at use dilution of 1:100. In other words, the authors disregarded the presence of interfering substance at levels of approximately 10 times greater than the MBC. Our previous letter[2] was pointing at the same experimental error when Vickery et al[3] were assaying biofilms by enumerating survivors after exposure of the biofilm to 1,000 ppm of BAC (>20 times greater than the MBC). To confirm, we performed a quick test on the MBC of BAC against *E coli* (as per the U.S. Environmental Protection Agency [EPA] methodology[6]) and confirmed that there were no survivors when approximately 200 organisms of *E coli* (ACCC 8196) were exposed to 100 ppm of BAC (B6295 Sigma) for 2 minutes. It is of no surprise that both groups of researchers have not recovered any survivors after exposing biofilms to the interfering substance at concentrations of 10-20 times the MBC. All AOAC, European Standard, and U.S. EPA test protocols emphasize the need for cytotoxicity validation, and it is rather surprising that the authors overlooked this textbook validation step.

Strong cationic detergents such as BAC (used in both Matrix and Intercept formulations; Sigma Aldrich, St. Louis, MO) result in dense clusters of dead cells as can be seen in the Scanning Electron Micrographs images from Ren et al[1] (Fig 1A and Fig 1B). These clusters form pockets of protein and carbohydrate-rich bioburden, which potentially interferes with the subsequent disinfection-sterilization step. The thicker the bioburden, the greater the probability of failure. If one evaluate the distribution of bioburden using the U.S. EPA criteria for biofilm cleaners—"prepares the surface for application of a registered disinfectant intended to kill biofilm,"[7]—the surface covered by easily accessible single cells as in Fig 1B[1] is far more desirable than the dense clustered nutrient-rich conglomerates of Fig 1A.[1] In other words, when using the U.S. EPA criteria, the rating of the cleaners and conclusion of the study should be exactly opposite to the one made by the authors.

The authors[1] have also chosen to deviate significantly from standard methods,[8] with respect to replacing the nutrient-poor

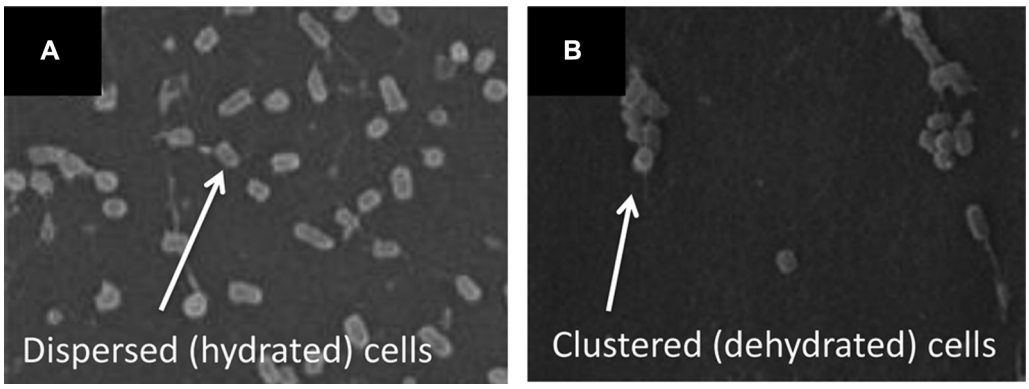

Fig 1. Scanning Electron Micrograph micrographs taken from Ren et al[1] indicating (A) disperse and hydrated cells and (B) clustered and dehydrated dead cell bodies.