

How Reliable are ATP Bioluminescence Meters in Assessing Decontamination of Environmental Surfaces in Healthcare Settings?

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ABSTRACT

This study evaluated the ability of four ATP bioluminescence meters to accurately determine the efficacy of disinfectants in healthcare settings. By comparing ATP bioluminescence meter results to actual cell culture tests, the researchers determined that these widely-used meters may not always provide accurate results, and that their activity may be affected by various disinfectant ingredients.

BACKGROUND

The estimated burden of hospital-acquired infections in the United States hovers around five to 29 billion dollars annually, much of which is caused by pathogens that can survive on high-touch environmental surfaces in healthcare settings. While most people recognize the importance of cleaning and disinfection for optimal infection control, it's equally important to ensure that disinfection protocols are working as they should. Since culture or PCR-based methods of evaluating disinfection do not produce results quickly, the ATP bioluminescence meter is frequently used as a tool to measure extent of disinfection. This study aimed to measure the accuracy and linearity of four leading ATP bioluminescence monitoring systems using various disinfectant chemistries against *S. aureus*.

STUDY

Four ATP bioluminescence meters were tested: Kikkoman Luminester PD-20, EnSURE Hygeine Meter –

ATP-205, Clean-Trace NG Luminometer UNG2 and Charm novaLUM. ATP standard solution was used, along with *S. aureus* in 4% tryptone soya agar. A variety of commercially-available disinfectants were tested, with a range of different active ingredients. Each meter was first tested for its linearity in reading standard ATP solutions using progressively higher dilutions. The meters measured ATP and reported relative light units (RLUs). Then, the meters were tested to determine whether they could accurately assess the level of disinfection of *S. aureus* by comparing conducting a series of tests and comparing the RLU readings to actual colony forming units (CFUs) as determined by culture-based tests.

RESULTS

The EnSURE Hygeine Meter produced the results most closely correlated to the actual amount of ATP, whereas results from the Charm novaLUM meter delineated most from the actual amount.

When comparing RLUs from each meter against the actual CFUs from disinfection tests against *S. aureus*, the Charm novaLUM meter was most strongly correlated with culture tests, whereas the Kikkoman Luminester PD-20 meter showed the weakest correlation. Different disinfectants also had varying effects on meter readings, based on interactions between disinfectant product ingredients and the mechanism of each meter.

STUDY CONCLUSIONS

These findings clearly indicate that ATP bioluminescence meters face challenges in providing accurate readings at the level of precision required in healthcare facilities. Studies such as this one can help inform healthcare practitioners about the various methods of evaluating the success of environmental decontamination efforts.

IMPLICATIONS FOR INTERVENTION[®]

The results also indicate that certain inert ingredients (i.e. not hydrogen peroxide) may interact with the mechanism of ATP bioluminescence meters and offset their readings. As this method gains traction throughout the swine industry, it's important to consider its many limitations in accurately measuring whether disinfection has been achieved.