Enzymes enhance cleaners ability to remove biofilm.

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Introduction

To prevent surgical site infections, efficient biofilm removal from medical devices is a major problem, particularly for fragile devices like flexible endoscopes that cannot be reprocessed using harsh chemicals or high heat. Enzymatic cleaners must be properly created to achieve effective operation, which necessitates the use of gentler solutions. We chose and improved the formulation of novel enzymatic cleaners using in vitro biofilm in a 96-well plate method. Using crystal violet staining to measure the amount of biofilm removed, and a BacTiter-Glo assay to measure the effectiveness of disinfection [1].

Endoscopes are routinely employed as an effective diagnostic and therapeutic tool; nonetheless, it has been claimed that contaminated endoscopes can more frequently be related to health care-associated outbreaks of infections than to any other medical instrument. Endoscopes come into contact with various bodily fluids, and the canals on them are the perfect place for bacteria to stick. Even after washing and disinfection procedures, live germs can still be found on many endoscopes. The majority of bacteria are found in biofilms in their natural habitat, which is the main cause of this. They are encased in an extracellular polymeric coating that they self-produced and stick to surfaces. In addition to protecting the bacteria from environmental factors including UV radiation, antibiotics, and disinfection, EPS give biofilms structural stability and increase the bacteria's resistance to these stresses compared to planktonic cells. Avoiding and removing biofilms is extremely difficult, especially in moist conditions like used endoscope tubes [2].

Mechanical equipment have a tough time fitting into the long, narrow endoscope channels, and using strong chemicals or heating the area up to a high temperature could damage the delicate materials used to make the endoscopes. Mild cleaning chemicals are required to remove biofilms during the reprocessing of endoscopes. Destabilizing the EPS of the biofilm, which is made up of proteins, polysaccharides, lipids, extracellular DNA, and other materials, is one method that works well. There have been reports that certain enzymes can help remove biofilm, including cellulose, alginate lyase, amylase, and DNase I. The efficiency of biofilm dissociation can therefore be increased by adding these enzymes to cleaning solutions [3]. There are a few commercially available enzymatic cleansers, but they frequently did not exhibit the anticipated biofilm removal efficiency in actual use. The use of inappropriate test parameters during the cleaner development process, which could result in an overestimation of cleaning performance, is one of the reasons for failure. Examples of such parameters include the applicability of the used microorganisms, the conditions for biofilm formation, or readout of biofilm removal [4].

Conclusion

The efficacy of biofilm removal clearly improved with the addition of enzymes to the base formulation. When an active protease was introduced, it effectively broke down the S. aureus biofilm; but, for P. aeruginosa, adding just one enzyme to the formulation was insufficient. To effectively remove P. aeruginosa, an optimal enzyme mixture containing protease, polysaccharides, and other enzymes in a chosen base formulation was needed. As a result, a lot of commercial treatments performed well against S. aureus and blood contamination but struggled to remove P. aeruginosa biofilms. No enzymatic cleaners acted more as a disinfectant, killing the bacteria, than as a blood cleaner or biofilm remover. However, as part of the routine endoscope reprocessing, a cleaner should primarily eliminate microorganisms. Reprocessing procedure is followed by disinfection. Among the tested high-end enzymatic endoscope detergents, the novel cleaner deconex Prozyme Active demonstrated the best efficiency in biofilm removal. Additionally, it was among the best products in removing blood contamination.

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