EDITORIAL

BIOFILM DISRUPTION STRATEGIES IN CLINICAL SETTINGS

Syed Sohail Ahmad[1], Muhammad Danish[1]

Biofilms are structured microbial communities surrounded by an extracellular polymeric matrix produced by the microorganisms themselves. They account for nearly 80% of clinical infections. These biofilms exhibit resistance not only to antibiotics but also to the human immune response, highlighting the need for efficient countermeasures. The clinical relevance of biofilms is further supported by their strong association with healthcare-associated infections, particularly involving medical devices, which result in increased mortality, morbidity, and healthcare expenditures.[1]

Numerous strategies have been developed to address the challenges posed by biofilms. Prospective prophylactic strategies include incorporating antimicrobial coatings and surface modifications into medical devices. The introduction of liquid reservoir silicone-based urinary catheters as an alternative to conventional antimicrobial treatments represents another step in this direction. The biofilm biology of notorious pathogens, such as Pseudomonas aeruginosa, has been extensively studied at the molecular level, enabling the development of tailored therapeutic strategies based on insights into their molecular composition.[2]

Recent patents indicate a shift in biofilm inhibition strategies. For example, the University of Sydney has obtained a patent for a topically applied formulation containing surfactants and biocides.[3] Additionally, recent studies suggest that plant-derived compounds have the potential to significantly disrupt bacterial biofilms.[4]

To effectively combat persistent infections caused by biofilms, it is essential to adopt a multi-faceted approach that combines scientific advancements with clinical interventions. For instance, bacterial adaptation to biocides like benzalkonium chloride may enhance biofilm formation, underscoring the importance of prudent antimicrobial use and innovative biofilm disruption methods.[5]

The fight against biofilm-associated infections requires a multifaceted approach that fosters collaboration among advanced materials scientists, microbiologists, and clinical practitioners. Stakeholders must work together to address the challenges of the biofilm paradigm, emphasizing opportunities for innovation and collective action.

References:

1. Percival SL, Suleman L, Vuotto C, Donelli G. Healthcare-associated infections, medical devices and biofilms: risk, tolerance and control. Journal of medical microbiology. 2015;64(4):323-34.
2. Tolker-Nielsen T. Pseudomonas aeruginosa biofilm infections: from molecular biofilm biology to new treatment possibilities. Apmis. 2014; 122:1-51.
3. Kumar TDA, Manos J, Whiteley GS, Glasbey TO. Biofilm disrupting composition for use on chronic wounds. Google Patents; 2022.
4. Ahmad SS, Siddiqui MF, Maqbool F, Ullah I, Adnan F, Albutti A, et al. Combating Cariogenic Streptococcus mutans Biofilm Formation and Disruption with Coumaric Acid on Dentin Surface. Molecules. 2024;29(2):397.
5. Elekhnawy EA, Sonbol FI, Elbanna TE, Abdelaziz AA. Evaluation of the impact of adaptation of Klebsiella pneumoniae clinical isolates to benzalkonium chloride on biofilm formation. Egyptian Journal of Medical Human Genetics. 2021; 22:1-6.

[1]Rehman College of Allied Health Sciences (RCAHS)

This editorial may be cited as; Ahmad S, Danish M. Biofilm disruption strategies in clinical settings. Rehman J Health Sci. 2024;6(2).116