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SHARING EXPERTISE

Prontosan®
Antibiofilm activity

Comparison In-Vitro

Paleczny J, Junka AF, Krzyżek P, Czajkowska J, Kramer A, Benkhai H, Żyfka-Zagrodzińska E, Bartoszewicz M. Comparison of antibiofilm activity of low-concentrated hypochlorites vs polyhexanide-containing antiseptic. Front. Cell. Infect. Microbiol. 2013; 13. DOI: 10.3389/fcimb.2023.111918

Biofilms are known to constitute a true risk to nonhealing chronic wounds. They develop in nearly all chronic wounds and are attached to the surface of the wound.[1] The biofilm is composed of an extracellular matrix embedding and protecting microorganisms. This pathogenic biofilm is one of the major factors of chronic wounds' persistence.[1,2] Recent data indicate that this biofilm is present in more than 75% of chronic wounds[3]. Due to difficulties related to the accurate diagnostics of biofilm in chronic wounds, this percentage may be even underestimated. Therefore, wound care products must have potent antimicrobial and potent biofilm-eradicating effects. However, despite the wide range of products currently available for wound treatment, selecting the appropriate agents remains a clinical challenge.

In the study presented by Palenczny J. and colleagues the antimicrobial and antibiofilm activities of two hypochlorite-based solutions and a polyhexanide-betaine solution were investigated in three different biofilm models on strains of methicillin-resistant *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and *Candida albicans*. The aim of the study was to compare the antimicrobial and the anti-biofilm efficacy of the hypochlorites Granudacyn®*(G) and Microdacyn60®*(M) with the polyhexanide-betaine solution Prontosan®(P).

The investigators used the cohesive spectrum of in vitro settings, including

- microtiter plate models,
- biofilm-oriented antiseptic test,
- cellulose-based biofilm model,
- CDC bioreactor model and
- Bioflux model.

A total of 78 strains of methicillin-resistant *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and *Candida albicans* were tested.

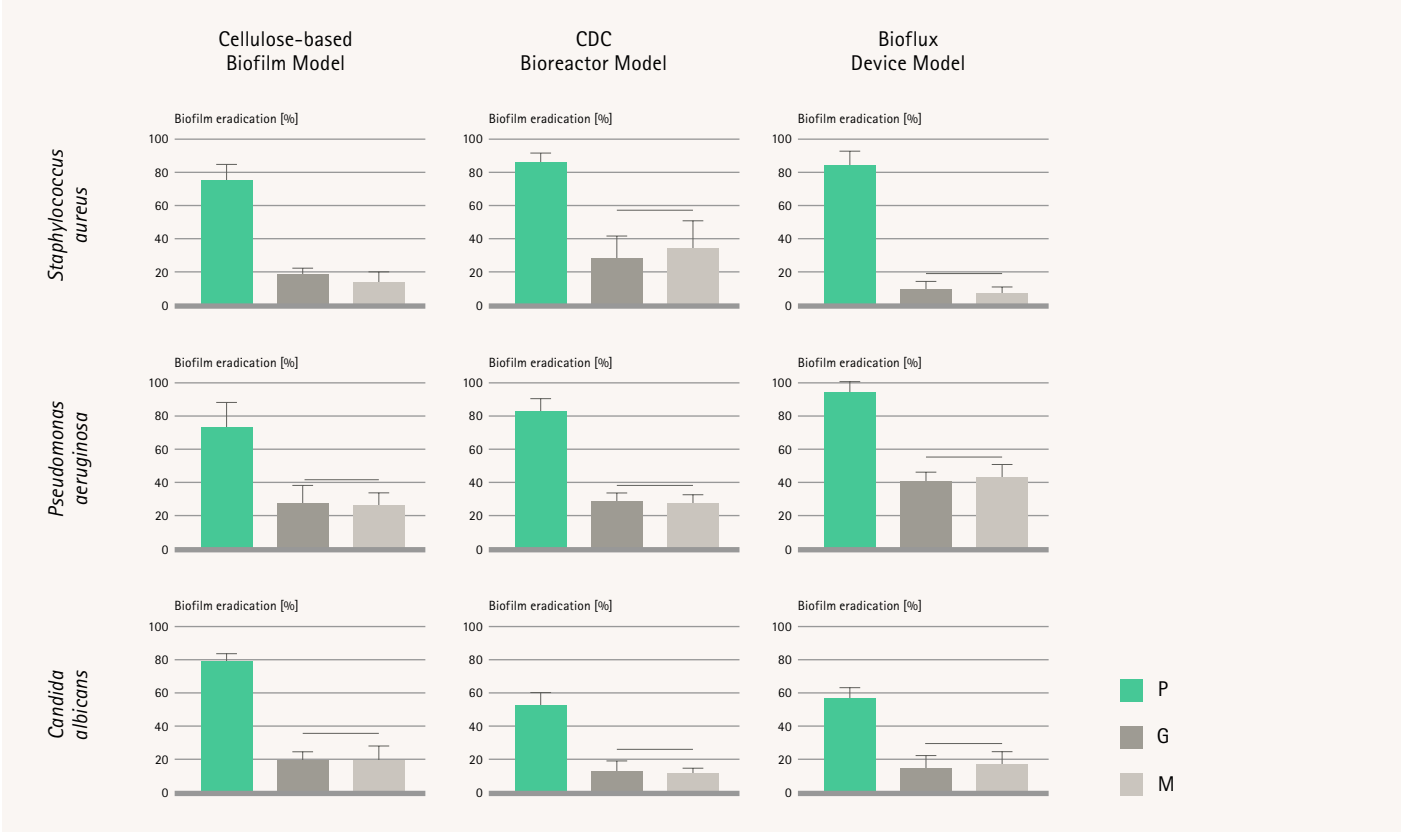

FIGURE 1: Biofilm eradication after treatment with P, G and M antiseptics in different test models. Adapted from Paleczny J, et al. 2023.

* (NaClO / HClO)

Results

All analysed strains in the three models were able to form biofilm biomass and displayed a measurable level of metabolic activity in the biofilms. However, a high variability of the biofilms was revealed. The biofilms differed regarding biofilm biomass and the degree of metabolic activity. Additionally, it could be depicted that the multiple different biofilms showed different resistance/susceptibilities to the tested 3 solutions in terms of anti-microbial effects and in terms of anti-biofilm effects.

Outcome reveals predominant efficacy of Prontosan®

Prontosan® showed much stronger activity against all investigated microorganisms compared to both hypochlorite solutions. Also, Prontosan® showed much stronger activity against all investigated biofilms than the two hypochlorite solutions. Surprisingly, the study revealed that hypochlorite has almost no anti-biofilm and only very limited anti-microbial activity. This contrasts with in-vivo studies that showed activity of hypochlorite against biofilm and microorganisms.[4] The authors conclude that these hypochlorite properties may have resulted from a rinsing effect; meaning that biofilm and microbials were physically rinsed out of the wound.

Take-Home Message

- The factual significance of biofilms and their functionalities in the process of wound healing/delay is still to be fully elucidated.
- Prontosan® should be considered the agent of choice for the treatment of biofilm-infected wounds because of its higher efficacy against biofilms and its remanent efficacy.

[1] Percival SL, Vuotto C, Donelli G, Lipsky BA. Biofilms and Wounds: An Identification Algorithm and Potential Treatment Options. Adv Wound Care (New Rochelle). 2015 Jul 1;4(7):389-397. doi: 10.1089/wound.2014.0574. PMID: 26155381; PMCID: PMC4487216.

[2] Flemming HC, Wingender J. The biofilm matrix. Nat Rev Microbiol. 2010 Sep;8(9):623-33. doi: 10.1038/nrmicro2415. Epub 2010 Aug 2. PMID: 20676145.

[3] Malone M, Bjarnsholt T, McBain AJ, James GA, Stoodley P, Leaper D, Tachi M, Schultz G, Swanson T, Wolcott RD. The prevalence of biofilms in chronic wounds: a systematic review and meta-analysis of published data. J Wound Care. 2017 Jan 2;26(1):20-25. doi: 10.12968/jowc.2017.26.1.20. PMID: 28103163.

[4] Raza T, Elsherif HS, Zulianello L, Plouin-Gaudon I, Landis BN, Lacroix JS. Nasal lavage with sodium hypochlorite solution in Staphylococcus aureus persistent rhinosinusitis. Rhinology. 2008 Mar;46(1):15-22. PMID: 18444487.

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